Forests and the climate

Manage for maximum wood production or leave the forest as a carbon sink?

12-13 March 2018, Stockholm, Sweden

Organizers:
The Royal Swedish Academy of Agriculture and Forestry
The Royal Swedish Academy of Sciences
The Royal Swedish Academy of Engineering Sciences
Economic support:
The Swedish Foundation for Strategic Environmental Research, Mistra
The Swedish Research Council Formas
The Swedish Energy Agency
Chalmers University of Technology

Conference background

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- June 26, 2017. Roundtable discussion: ***The EASAC report "Multi-functionality and sustainability in the European Union's forests"***
- September 23, 2016. Seminar: ***Whole-Rotation Carbon Budgets in Swedish forests***
- June 22, 2016. Seminar: ***Forests, Bioenergy and the Global Climate***

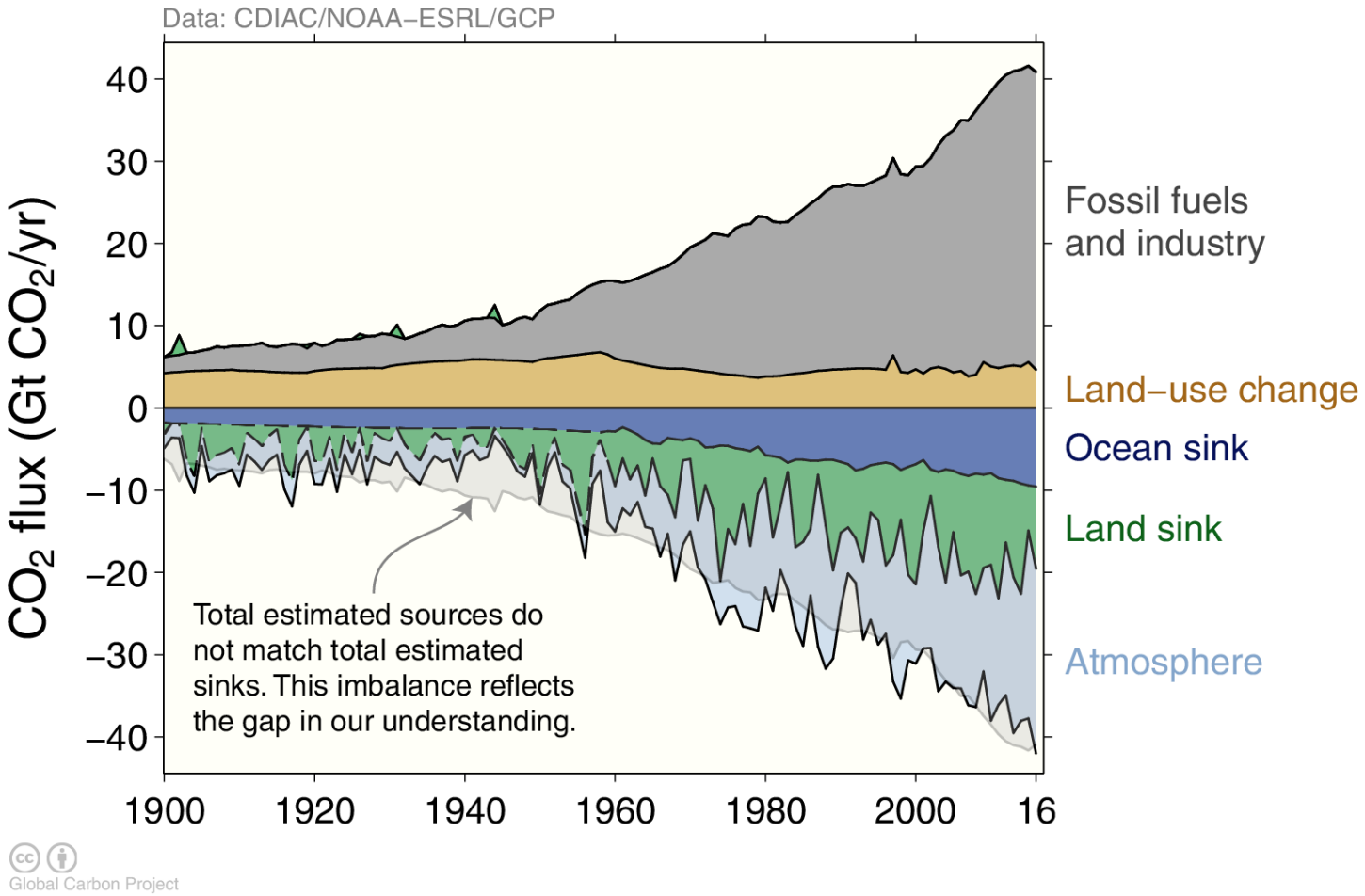
This conference

- **dialogue** about the roles of forests and forest management in climate change mitigation, to advance scientific understanding of the topic and **clarify divergent views and their underlying rationales**
- identify **knowledge gaps** and priorities for future research and data collection
- produce and disseminate a **state-of-the-art view of forests and climate** that reflects the outcomes of the exchanges of opinions and areas of agreement

This conference

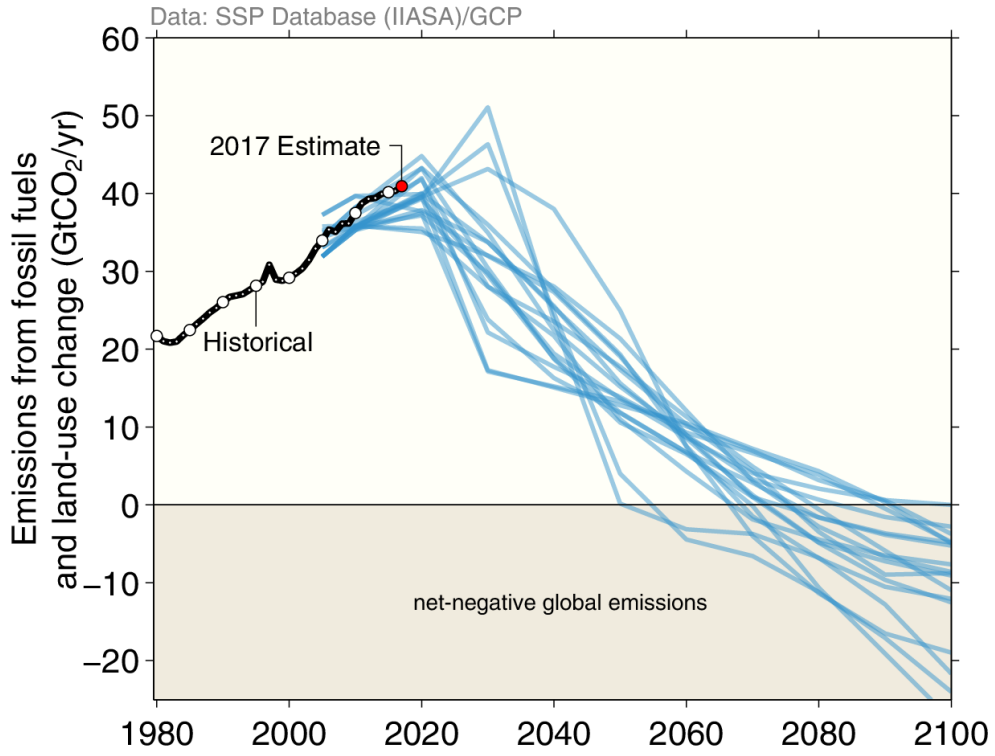
- 1.5 days expert workshop
- Half day for summary and discussion of outcome (extended audience)
- Conference outcome report + article in high-impact journal
- Presentation of results and key messages at selected events

Some starting points for this conference



Picture source: http://www.globalcarbonproject.org/

*Need to promote **drastic systems transformation** and govern development in agriculture and forestry towards a future where these sectors provide **food**, **biomaterials** and **bioenergy** (with and without CCS)*



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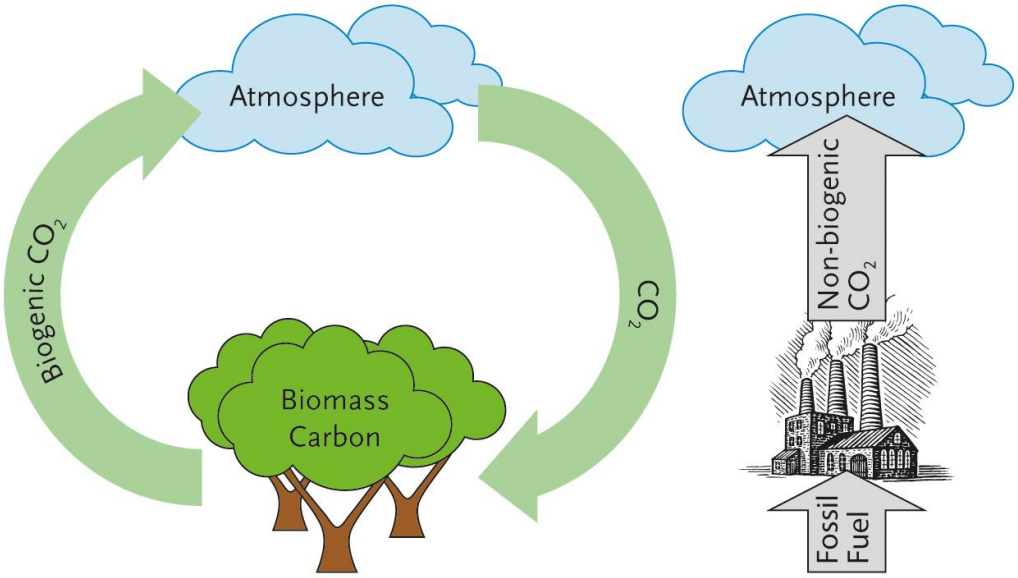
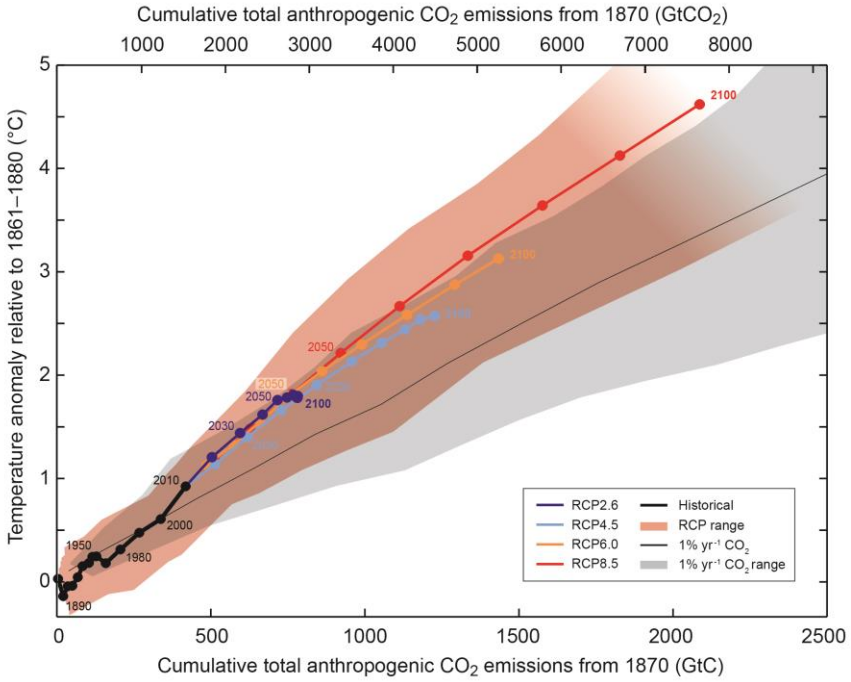
CO2 emissions associated with land use and LUC (biogenic C emissions) are fundamentally different from fossil-fuel emissions. The latter **add a new supply** of CO2 to the atmosphere–land–oceans, whereas land-use emissions merely **relocate** carbon from one component to another within this system



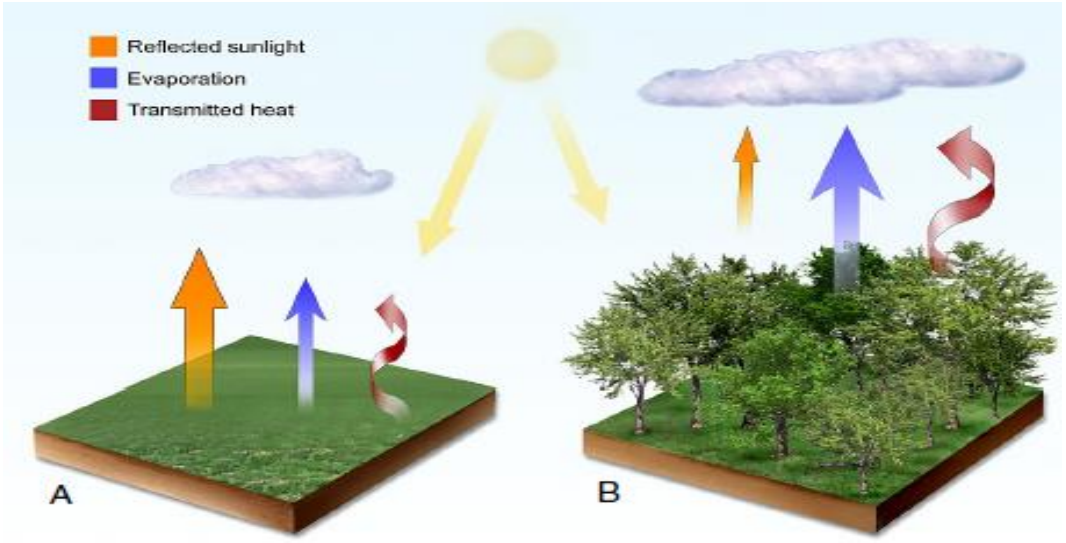
Picture source: National Council for Air and Stream Improvement.

It is the **cumulative emissions** of CO2 that largely determine global warming by the late 21st century and beyond.
The exact **timing** of CO2 emissions is not so important in relation to **temperature targets**, but influences the **rate of warming.**



Picture source: IPCC AR5 WG1 SPM

Changes in land management may **influence other climate forcers than GHG -> can have equal magnitude of influence**



Biochemical:
- Biogenic VOCs

Biophysical:
- Surface albedo
- Evapotranspiration
- Surface roughness

Picture source: Jackson et al., *Env. Res. Lett.*, (2008)

Possible points of agreement/discussion

Apparent **trade-off** maximising forest carbon storage vs maximizing annual removal of atmospheric carbon by forests

A forest which is not being harvested will provide a **reduced sink capacity over time** because carbon sequestration diminishes as forests approach maturity.

Old forests are increasingly **vulnerable** to disturbances such as storms, insect attack and fires

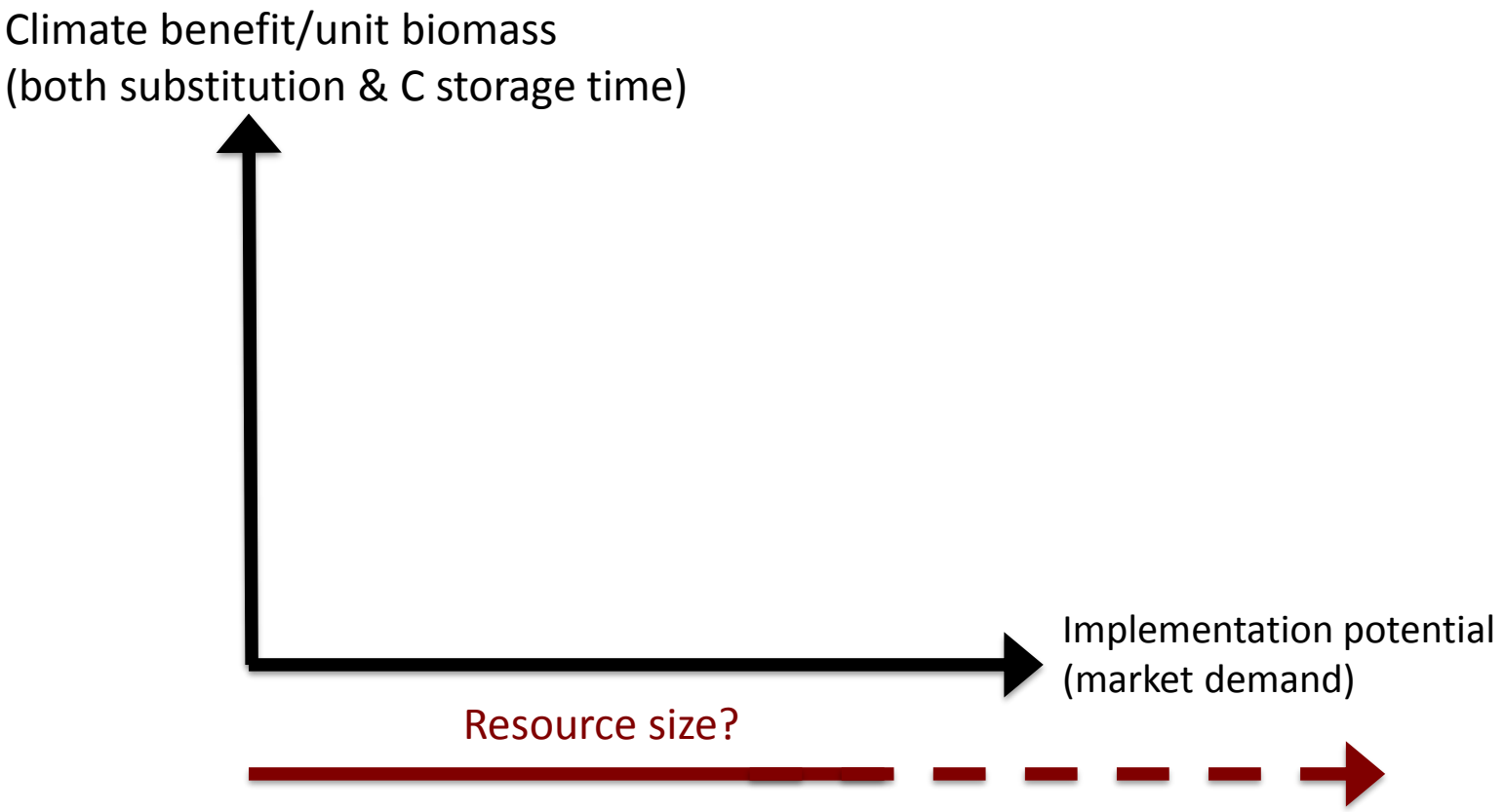
Possible points of agreement/discussion

In the longer term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre or energy from the forest, will generate the largest sustained mitigation benefit.

In the shorter term, carbon sequestration in unharvested forests can provide higher mitigation benefits than management and harvest.
However, the downsides are:
- conserving forests as carbon stores will not help the needed systems transformation
- the stored carbon may be lost to the atmosphere due to storms, insects and fire
- leakage: if wood production ceases in one region, it will increase in other regions to meet demand. Increasing wood prices may also lead to that some wood products will be substituted by products made from non-renewable and more carbon intensive raw materials such as steel and concrete

Possible points of agreement/discussion

The use of wood in products with a **long lifetime**, which displaces other **GHG-intensive** products **(e.g., concrete, steel, petroleum)**, is ideal since the biogenic carbon is kept out of the atmosphere for a long time



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1) Strong incentives for bioenergy may steer away from such “best” use of wood

2) Conversely, applying a strict cascading principle that specifies the use of forest biomass for wood products ahead of energy, may prevent obtaining the optimal use of the biomass resource available

3) Using wood for energy displaces fossil fuels and can contribute to the phasing out of technologies and infrastructures associated with fossil fuels, which is necessary for keeping fossil sources secured underground

Possible points of agreement/discussion

In the tropics, avoided deforestation, forest restoration, and afforestation provide climate benefits, because carbon storage and biophysical factors (reflectivity, evapotranspiration, and surface roughness) align to cool the Earth. But the climate benefits of afforestation are counteracted in boreal and other snow-covered regions, where darker trees trap more heat than snow does.

The cooling effect of secondary organic aerosols may change the net balance of afforestation towards cooling also under temperate and boreal conditions

The climate effects of non-GHG forcers are uncertain, but results so far motivate that these forcers be considered in assessments of land-based activities aiming at climate change mitigation

Possible points of agreement/discussion

While selective forest management practices may have advantages from the point of view of biodiversity and recreational values, there is no evidence to date that a move to selective forest management would be beneficial from the point of view of carbon sequestration.

Moreover, in countries like Sweden and Finland a move to selective management practices would take many decades to achieve and with unclear implications for the economy as well as for carbon sequestration.

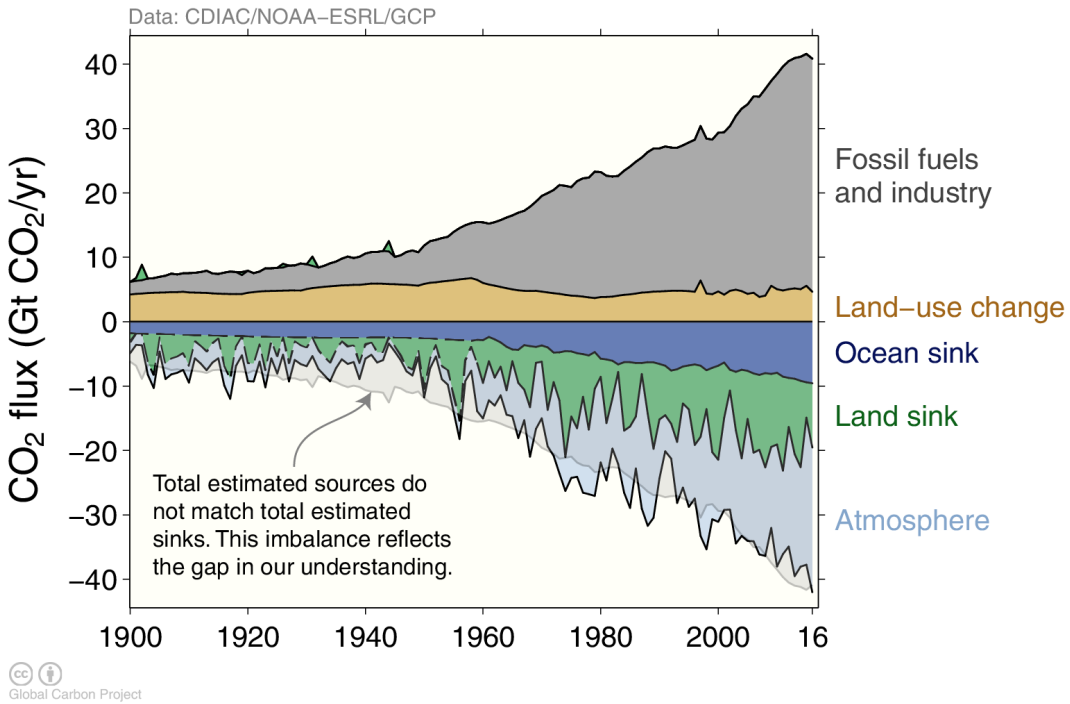
Possible points of agreement/discussion

There are many reasons for the lack of consensus on climate effects of bioenergy: (i) bioenergy systems differ concerning characteristics that influence the climate effects; and (ii) different analytical approaches are used in assessments.

Involving policymakers and stakeholders in defining policy-relevant research questions (e.g., in defining objectives, scope and selecting reference scenarios) increases the likelihood that results are relevant, interpreted correctly, and useful in the policy development process.

Possible points of agreement/discussion

Development towards a future where more biomass is used to produce fuels and other biobased products can lead to increases or reductions in biospheric carbon stocks



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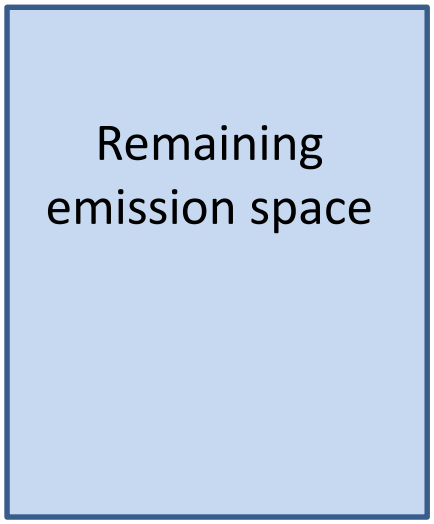
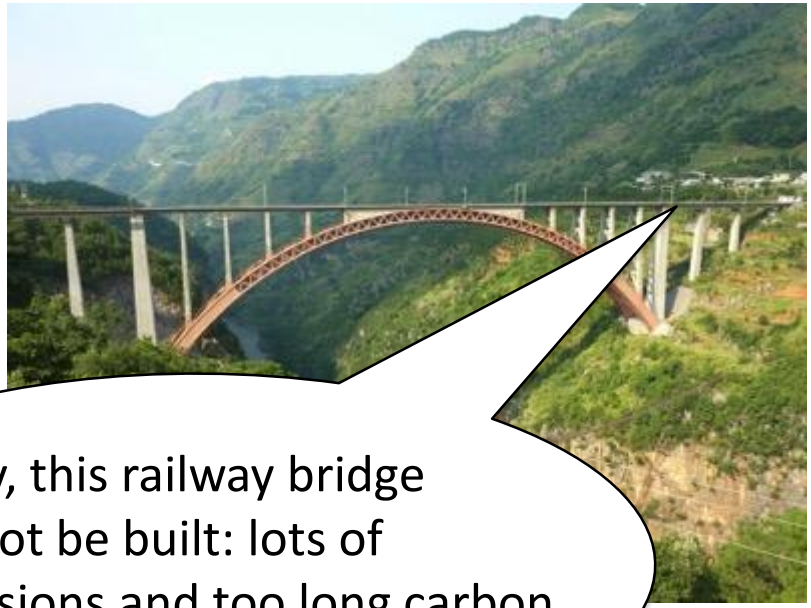
Temperature targets and carbon budgets

From the perspective of the temperature targets, scientists have estimated a concentration of atmospheric GHGs that should not be exceeded. The resulting emission space (or carbon budget) is however characterised by significant uncertainties.

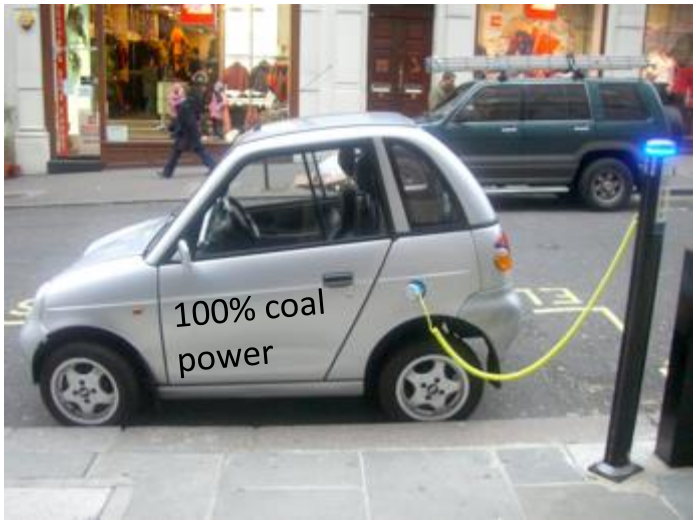


Perspective

The transformation of the energy and transport system to a low carbon system will take time and the transformation itself will be associated with GHG emissions



Sorry, this railway bridge cannot be built: lots of emissions and too long carbon payback time....



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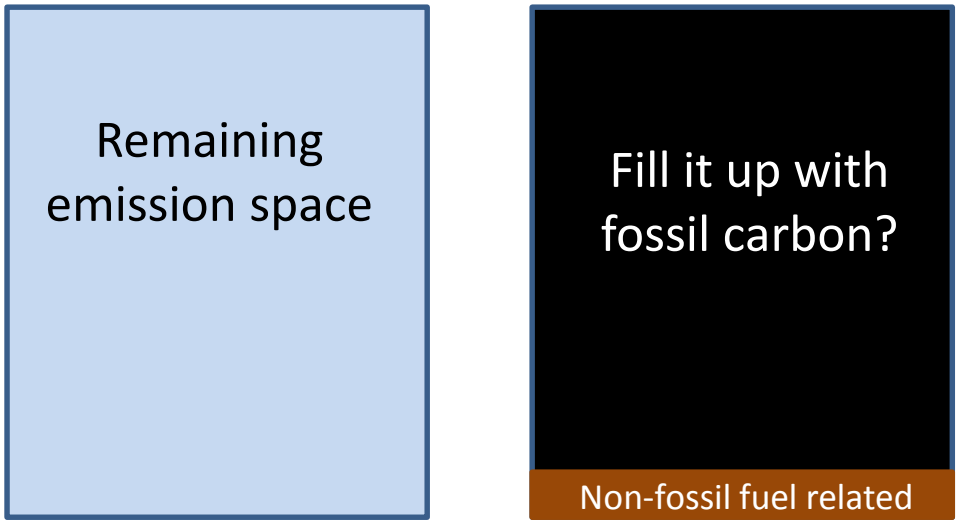
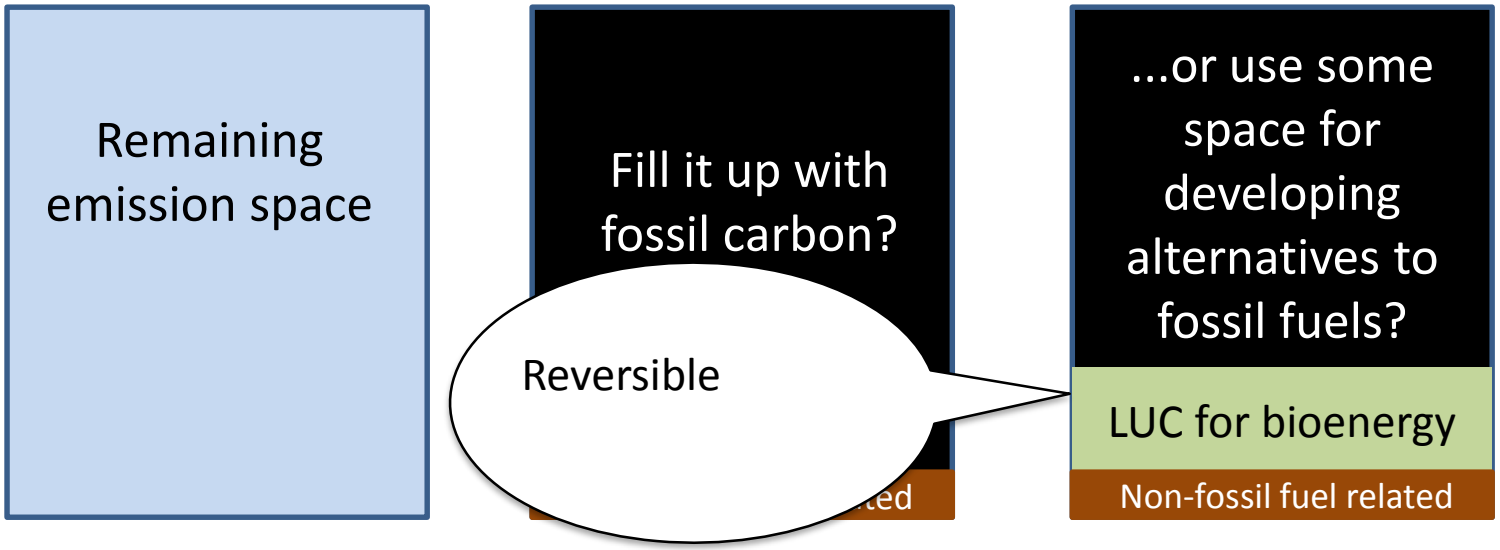


Perspective

If biospheric carbon stock reductions occur as a consequence of increased biomass use, the drawback of such reductions needs to be weighted against benefits of moving away from coal, oil and gas



Perspective

If biospheric carbon stock increases occur, this enhances the climate benefits obtained when biobased products displace fossil fuels and other products that would otherwise cause GHG emissions