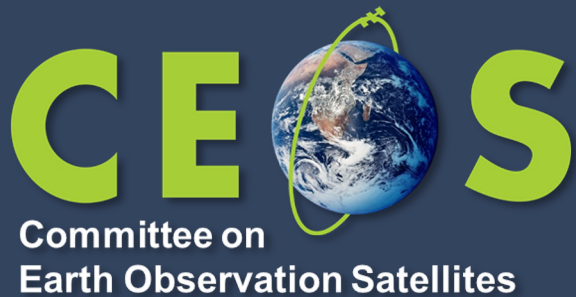


# SIT-39 2024

## *Space-based Earth Observation Community's Role in the Policy Process*



**Giacomo Grassi,**

**Joana Melo**

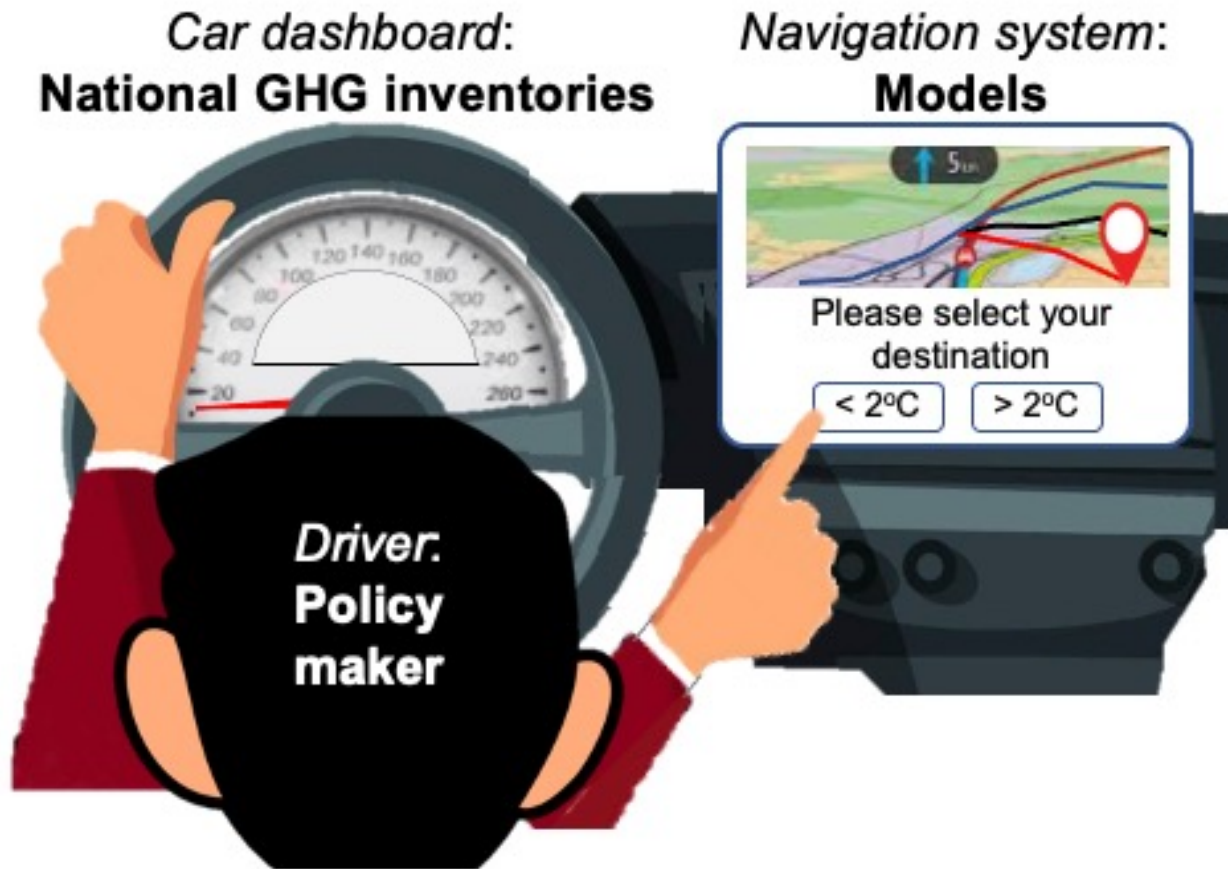
**European Commission**

**Agenda Item #4.3b**

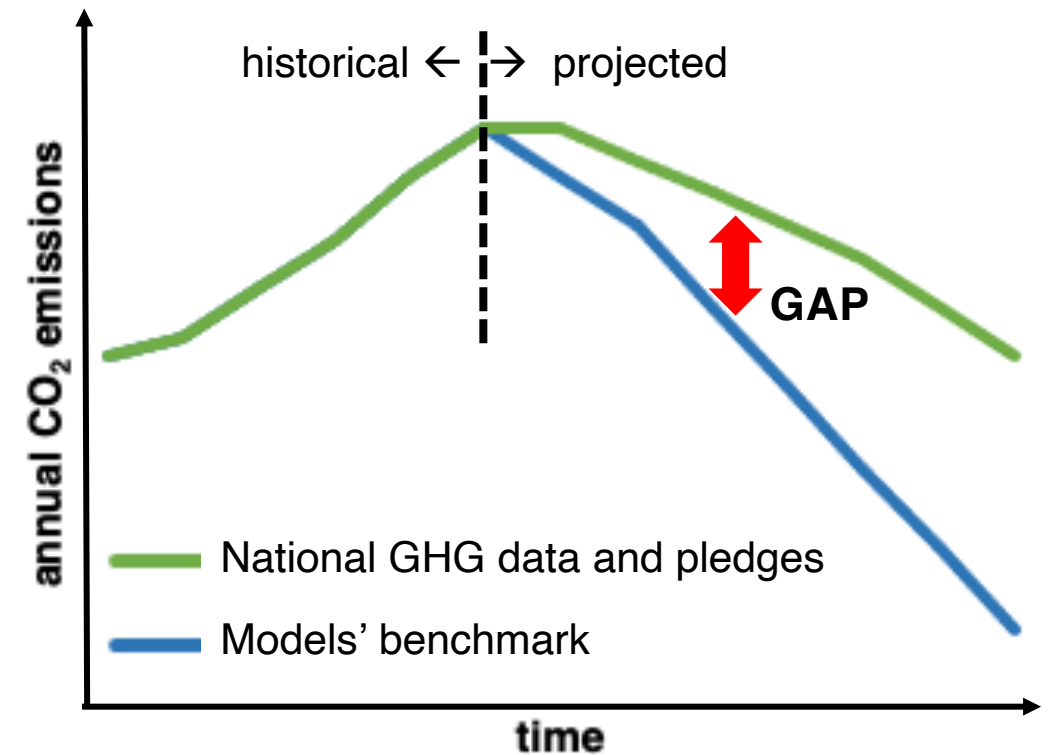
**SIT-39 2024, Tokyo, Japan**

**10th - 11th April 2024**

# How the Paris Agreement works



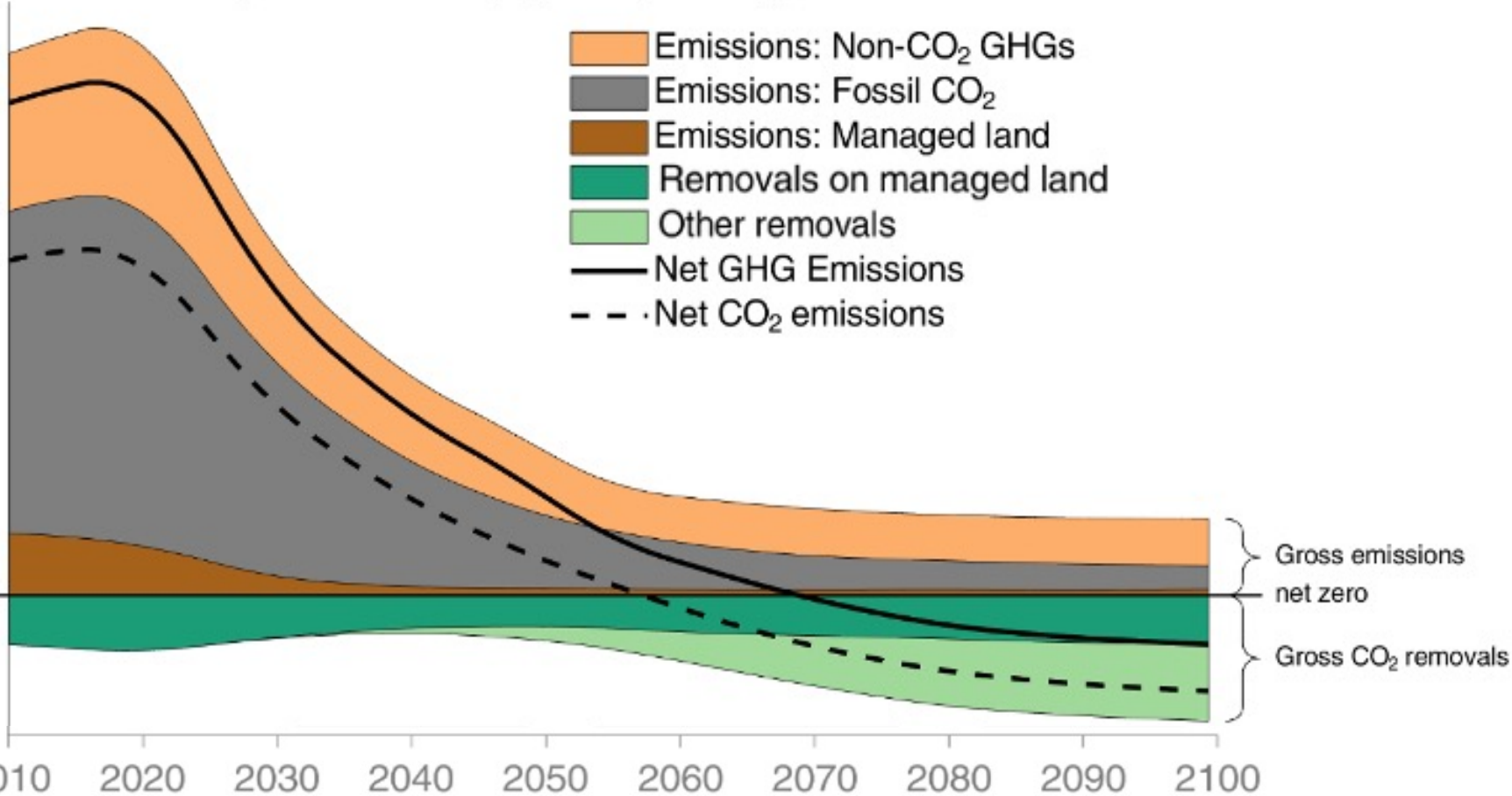
## Global Stocktake



# Land use & forests matter: do we know enough?



Greenhouse gas emissions (stylised pathway)



The relative importance of land CO<sub>2</sub> sink will increase with time: **are we confident on data?**

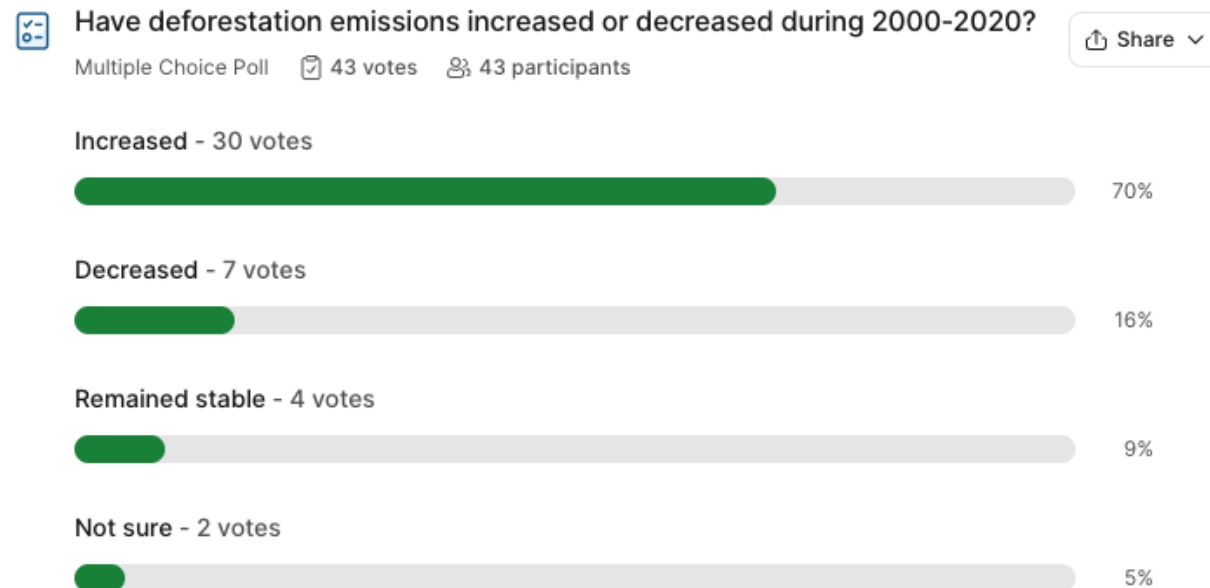
event code #1759435



## Have deforestation emissions increased or decreased during 2000-2020?

- Increased
- Decreased
- Remained stable
- Not sure

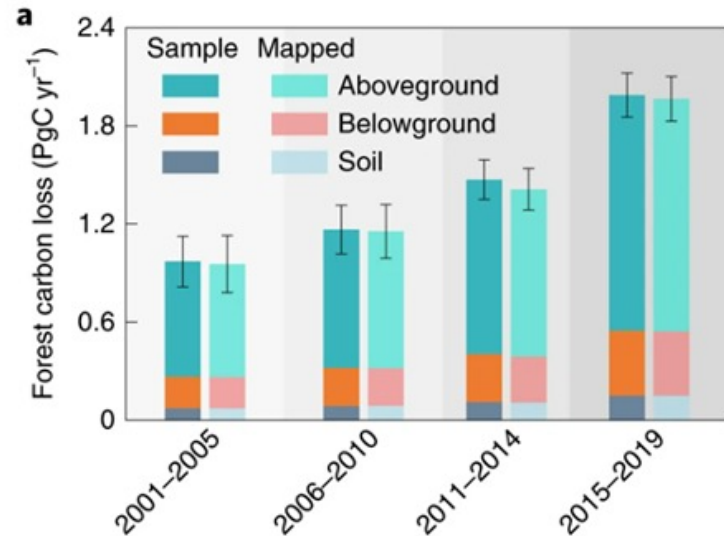
### Results





Slido poll reflects results from the EO community (deforestation increasing - left)  
 ... but National GHG inventories provide the opposite message (right)

independent estimates using EO datasets



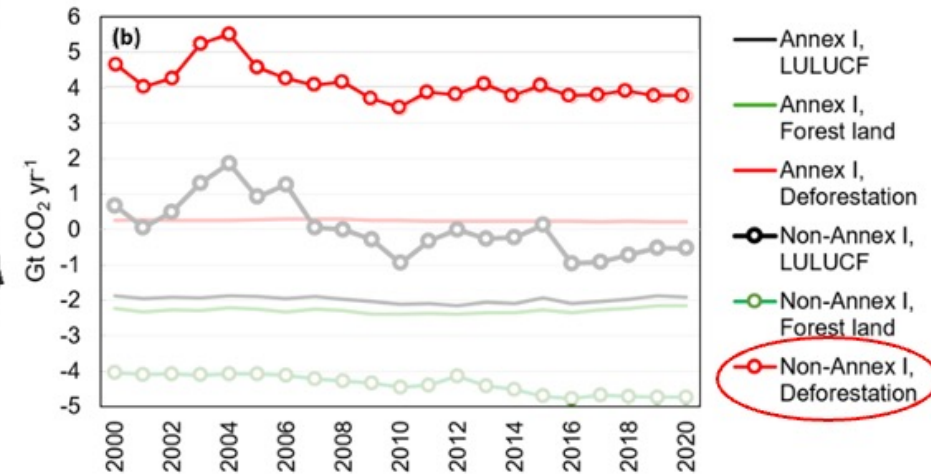
**ANALYSIS**  
<https://doi.org/10.1038/s41561-022-0384-2>

**nature sustainability**

**OPEN**  
 Doubling of annual forest carbon loss over the tropics during the early twenty-first century

Feng et al 2022 Nat Sustain [5, 444-451](https://doi.org/10.1038/s41561-022-0384-2)

aggregation of national GHG inventories



Earth Syst. Sci. Data, 15, 1093-1114, 2023  
<https://doi.org/10.5194/essd-15-1093-2023>  
 © Author(s) 2023. This work is distributed under the Creative Commons Attribution 4.0 License.

Earth System  
 Science  
 Data

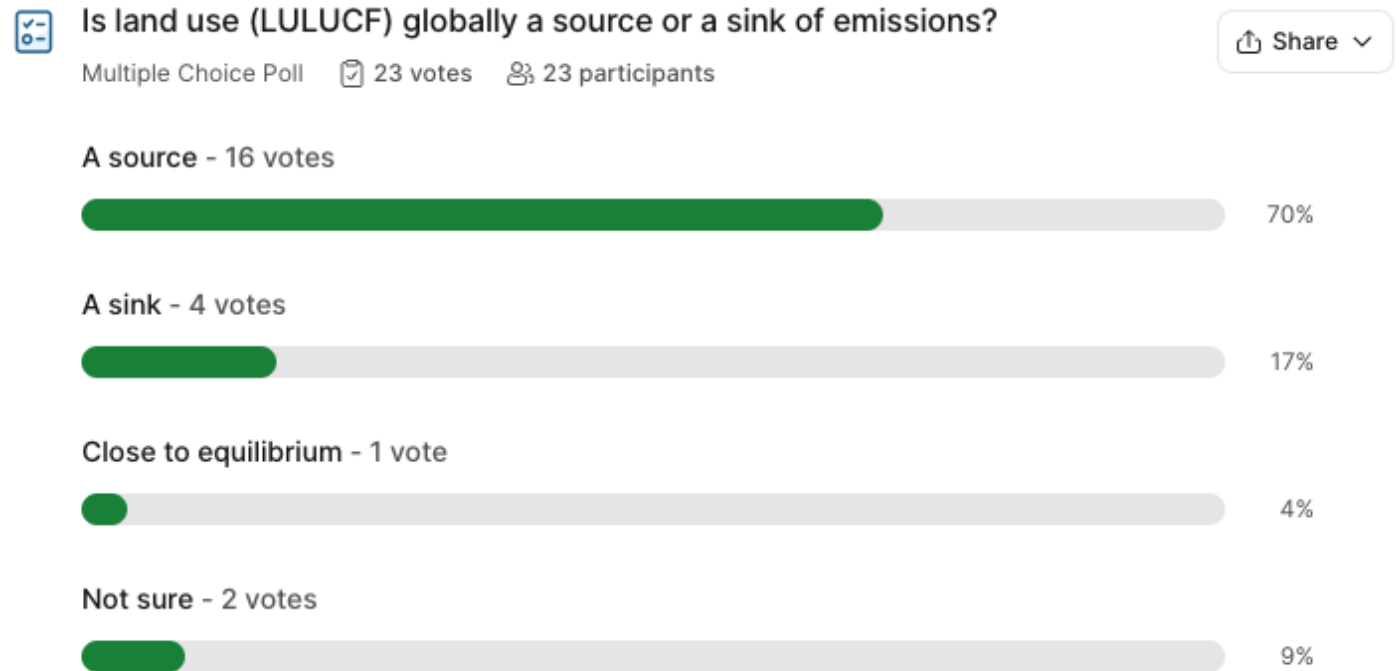
**Harmonising the land-use flux estimates of global models and national inventories for 2000-2020**

Grassi et al 2023 Earth Syst. Sci. Data, [15, 1093-1114](https://doi.org/10.5194/essd-15-1093-2023)

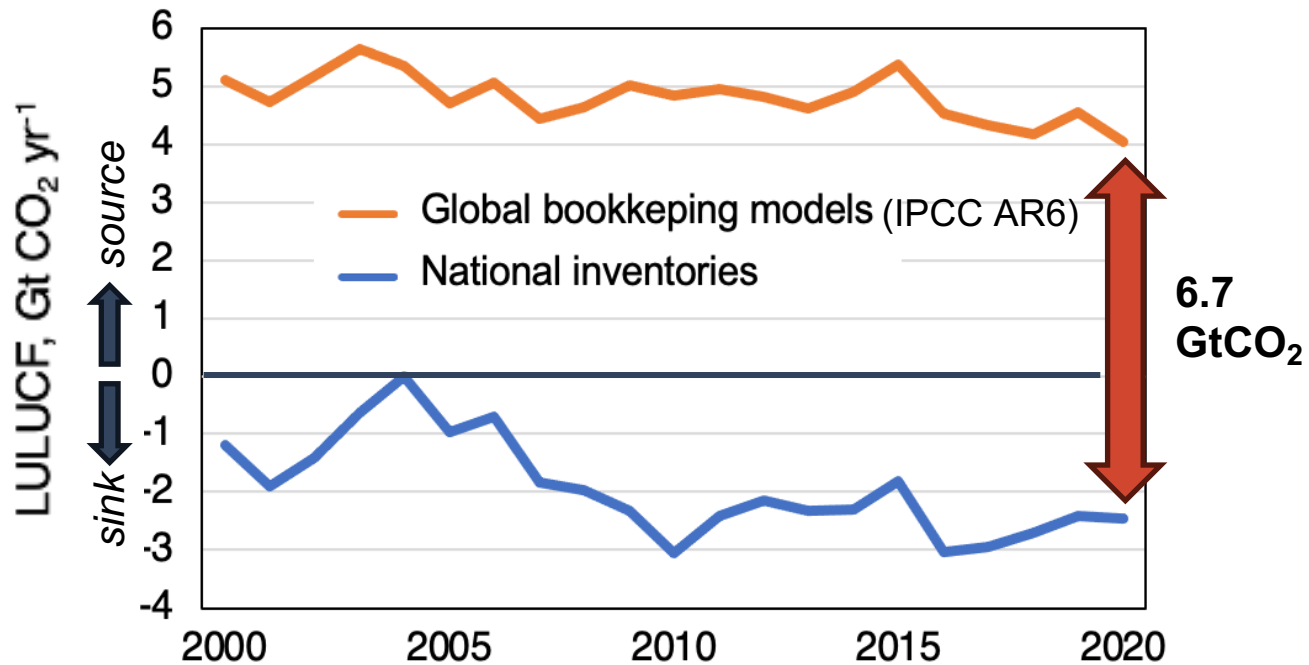
## Is land use (LULUCF) globally a source or a sink of emissions?

- A source
- A sink
- Close to equilibrium
- Not sure

### Results



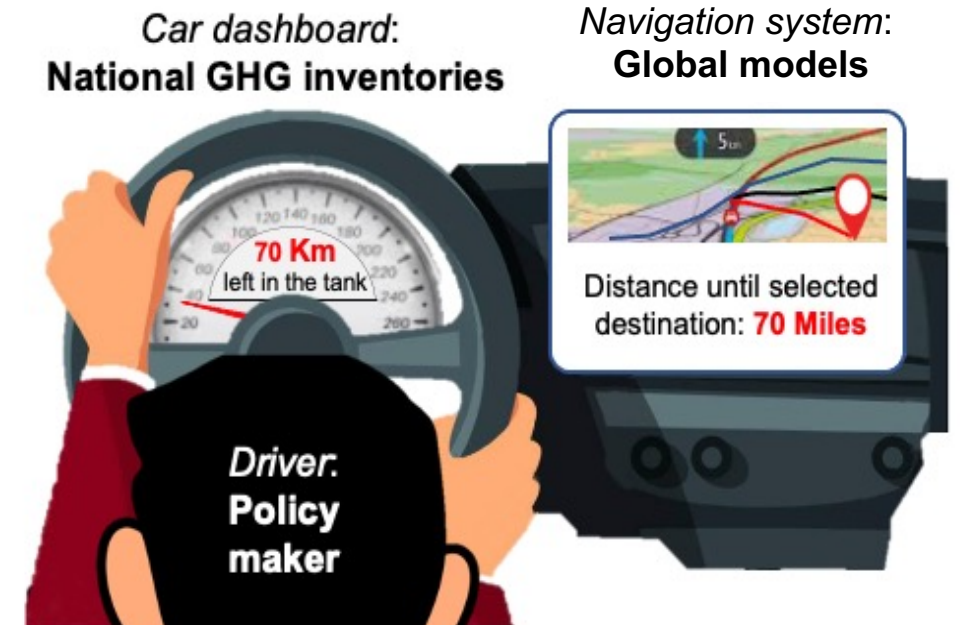
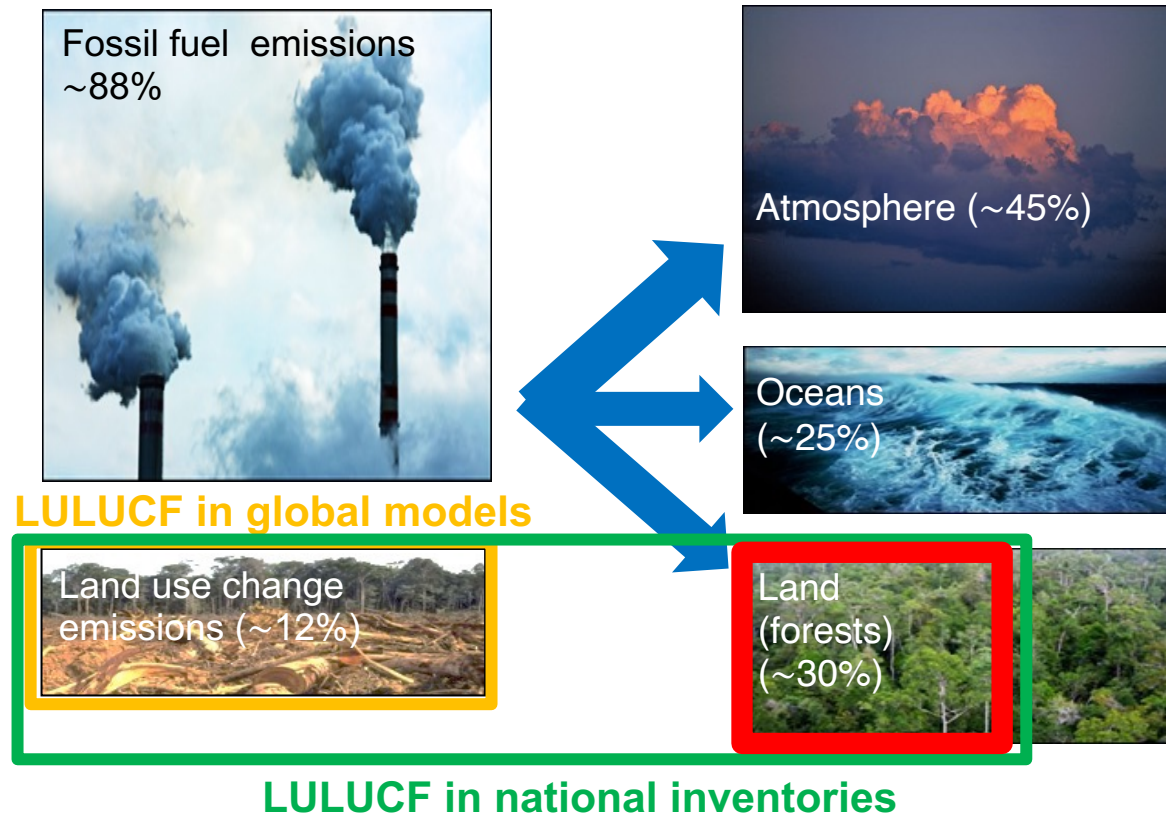
Results reflect results from the global C modelling community (LULUCF a source)  
 ... but National GHG inventories provide the opposite message (LULUCF a sink)



This large gap is confusing policy makers:

- Why do we have this gap?
- Can we trust country LULUCF data?
- How to reconcile the difference?

# How to reconcile the difference?

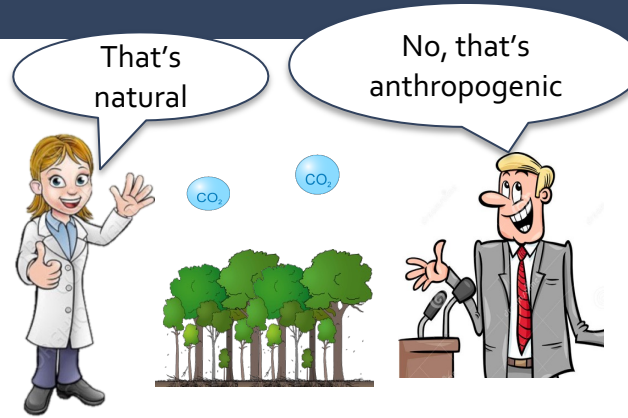
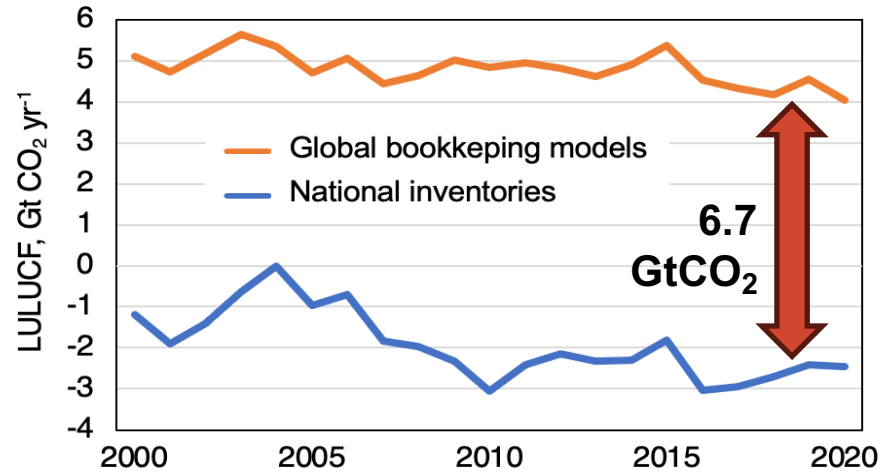


Approach to **reconcile the gap**: add the CO<sub>2</sub> sink considered 'natural' by 16 DGVMs and 'anthropogenic' by countries to the anthropogenic forest flux by 3 bookkeeping models

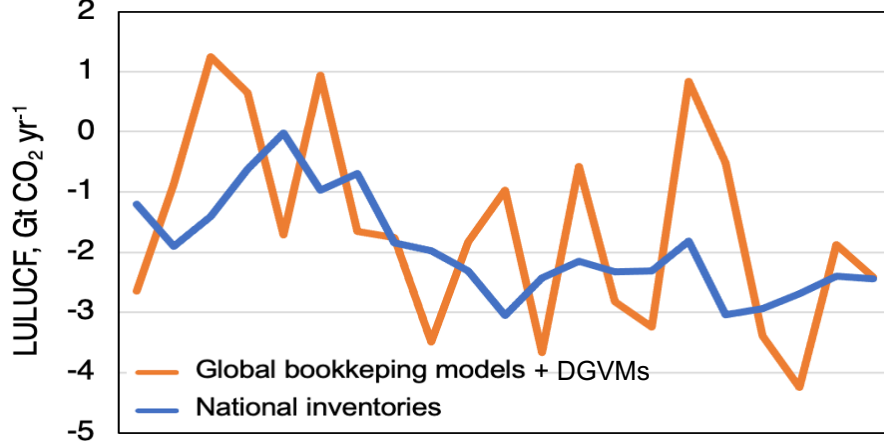


# Does it work to reconcile historical data?

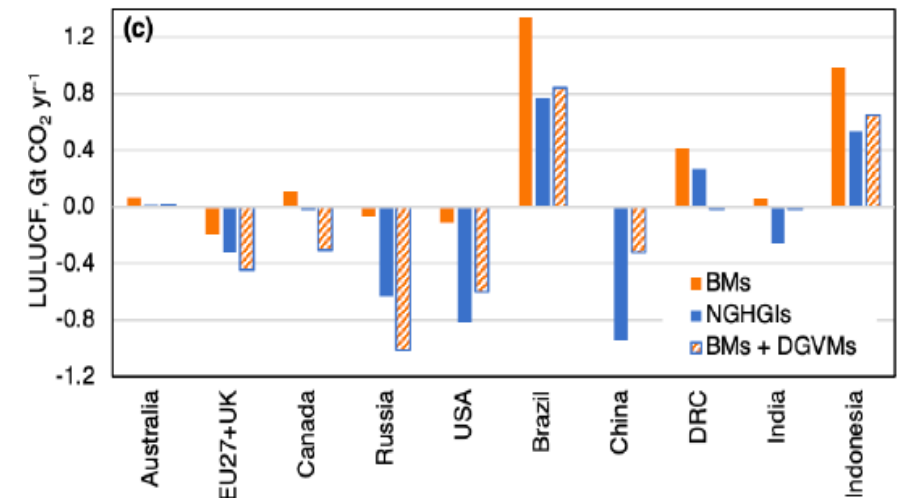
## before reconciliation



## after reconciliation



## Blueprint for comparing anthropogenic land-use fluxes at country level



# Issue well acknowledged



**IPCC AR6 SPM Synthesis report (2023):** *“Global databases make different choices about which emissions and removals occurring on land are considered anthropogenic. Most countries report their anthropogenic land CO<sub>2</sub> fluxes including fluxes due to human-caused environmental change (e.g., CO<sub>2</sub> fertilisation) on ‘managed’ land in their national GHG inventories. Using emissions estimates based on these inventories, the remaining carbon budgets must be correspondingly reduced.”*



**UNFCCC’s synthesis report for the Global Stocktake (2023):** *“Adjustments should be made where any comparison between LULUCF data reported by countries and the global emission estimates of the IPCC is attempted.”*

# IPCC work in the 7<sup>th</sup> Assessment Cycle



## Working Groups I, II and III

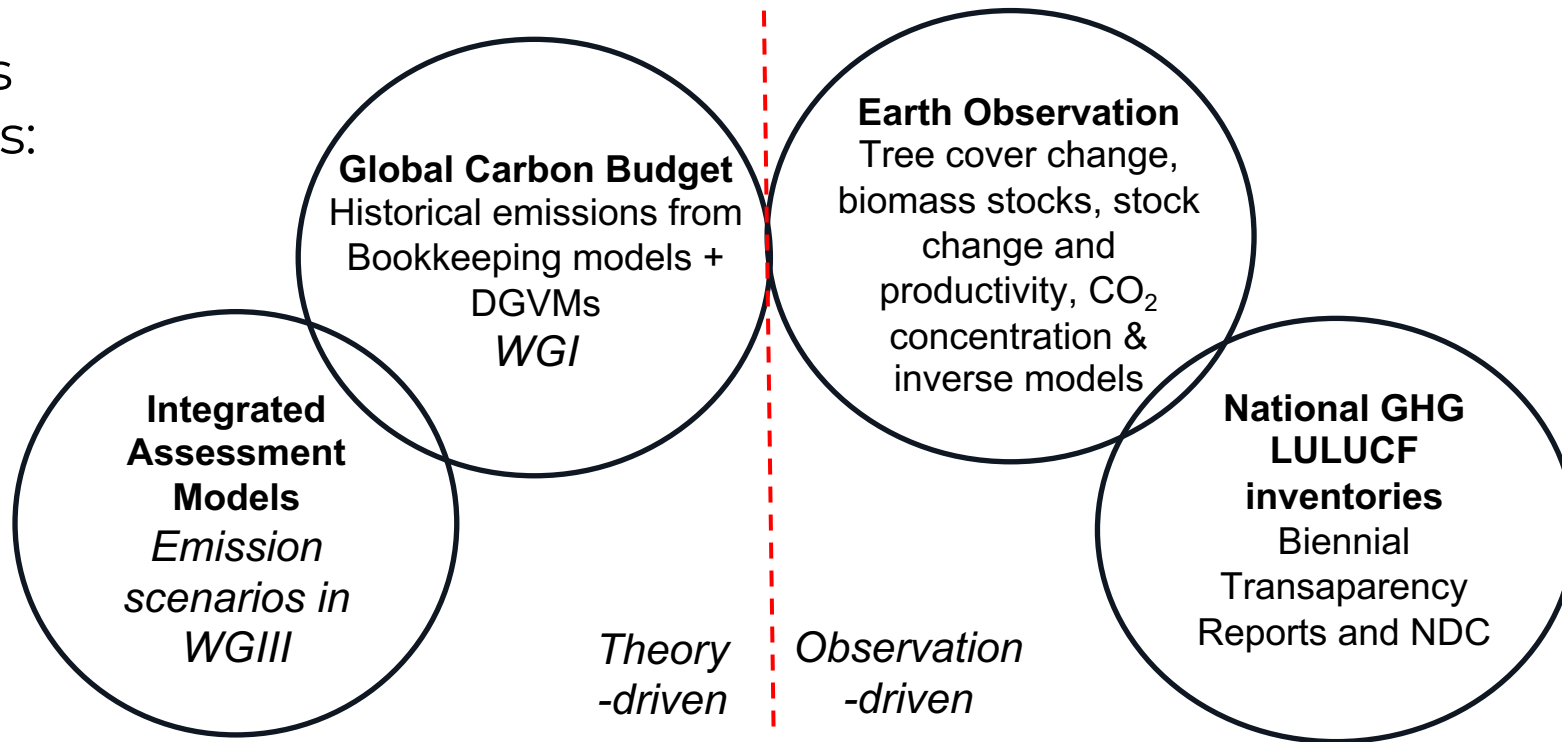
- Special Report on Climate Change and Cities by early 2027
- Synthesis Report (SYR) by late 2029
- Working Groups reports (not clear yet if on time for 2<sup>nd</sup> GST!)



## Task Force on GHG inventories:

- Methodology Report on Short-lived Climate Forcers by 2027
- Methodology Report on Carbon Dioxide Removal Technologies, Carbon Capture Utilization and Storage by 2027 (and Expert Meeting + Scoping Meeting in 2024)
- **Expert Meeting on Reconciling land use emissions** in 2024

The meeting will gather experts from the following communities:



Aims:

- Develop a **common understanding of the land emissions gap / different trends**
- Set the basis for **greater collaboration** between communities
- Outline concrete **steps forward to ensure a greater comparability** between future IPCC products during AR7 and national GHG data



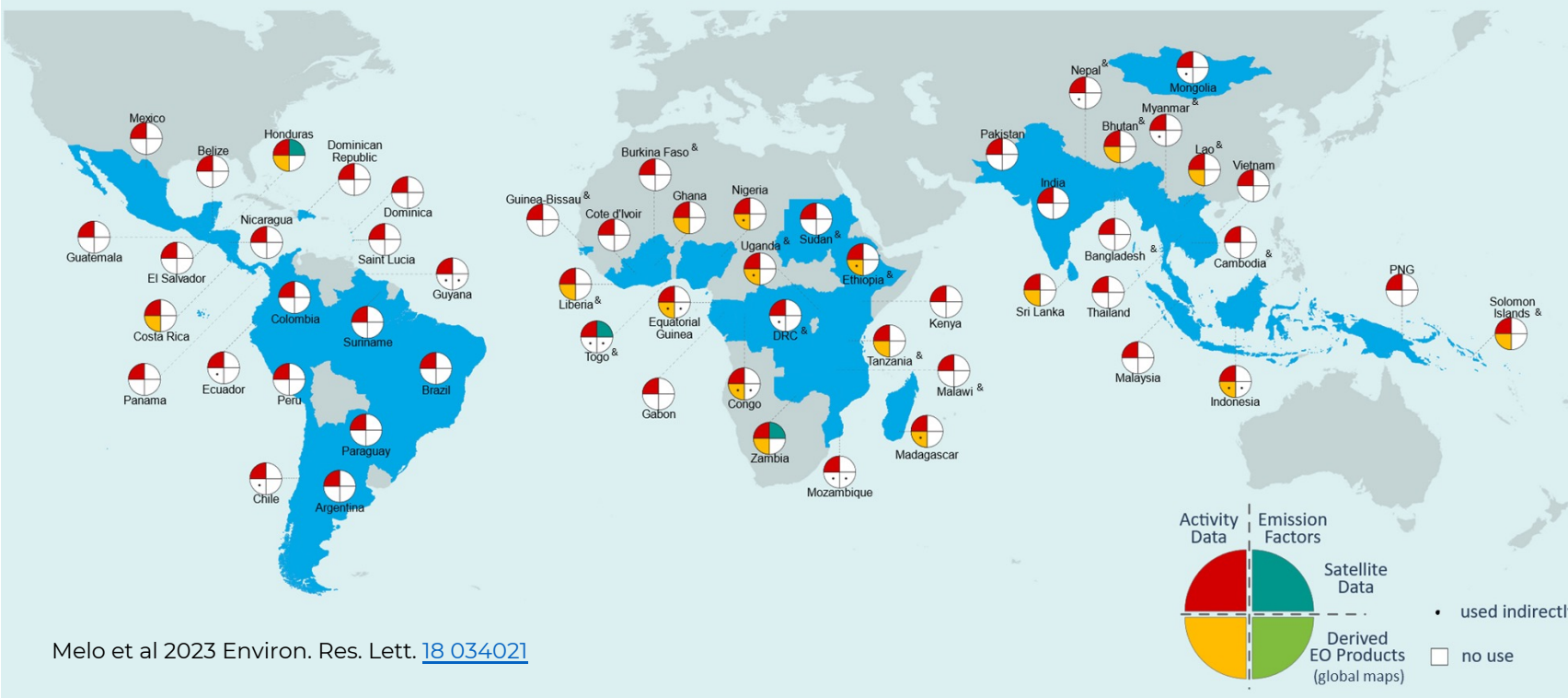
# Satellite-based global maps in support of the GST

Uptake in national GHG inventories



## Submissions to the UNFCCC from 56 countries covering 80% of tropical forests

(a subset of the 153 developing countries included in the JRC database)



Melo et al 2023 Environ. Res. Lett. [18 034021](https://doi.org/10.1088/1748-9322/ab8402)

- All developing countries use satellite imagery to quantify land extent and land dynamics (red quadrant)
- 30% use available global maps (only one, GFC; yellow quadrant)
- No use of biomass maps (green quadrant)

**Different ways of handling data renders different estimates**

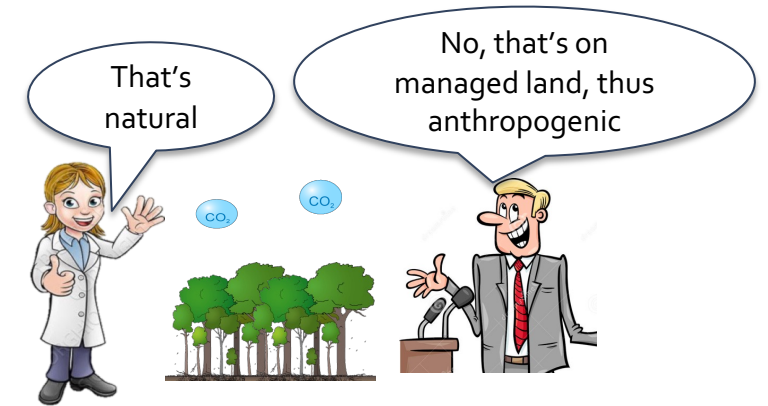
**High uptake of satellite imagery but still conflicting results with satellite-based global estimates!**

# Conclusions



Conflicting messages on land use emissions:

- 1) Large gap between *countries* and *global C models* → reasons broadly understood, can be largely reconciled.
- 2) Opposing land emission trends between *countries/global C models* and many *EO-based results* → reasons not fully clear.



Steps ahead of GST2:

- **Countries:** greater transparency/completeness of estimates, definitions/area of managed lands.
- **Global models:**
  - Enhance forest management/demography in the models, refine disaggregation
  - Enhance reconciliation with National GHGs → '*operational translation service*'
- **Earth Observation**
  - Provide more consolidated and temporally consistent results (tree cover change, C stocks & changes, inverse models),
  - Connect better with NGHGs (understand better the requirements/aggregation)