LULUCF sector
UNFCCC / IPCC / EU perspective

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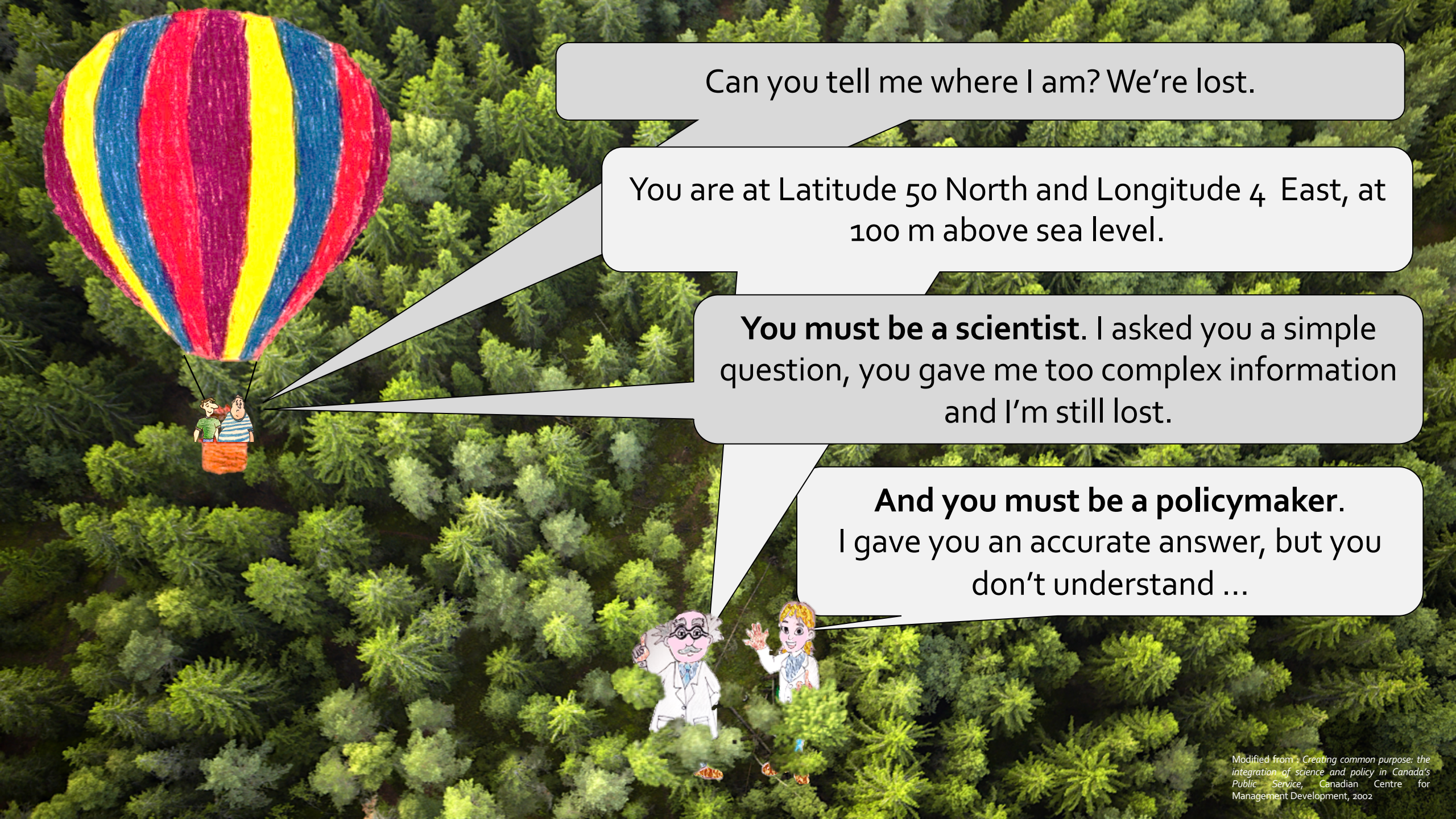
Joint Research Centre

The European Commission's
science and knowledge service

CHE AFOLU workshop - 25 November 2020

European Commission



Modified from : *Creating common purpose: the integration of science and policy in Canada's Public Service*, Canadian Centre for Management Development, 2002

The Global Carbon Budget

(average 2009-2018 from Global Carbon Project 2019)

34.8 $GtCO_2/y$ **86%**

+

5.5 $GtCO_2/y$ **14%**

Energy, transport, etc.

17.9 $GtCO_2/y$ **46%**

9.2 $GtCO_2/y$ **24%**

11.7 $GtCO_2/y$ **30%**

Land Use, Land-Use Change and Forestry (LULUCF)

The forest sink is complex to measure and only <u>partly</u> anthropogenic

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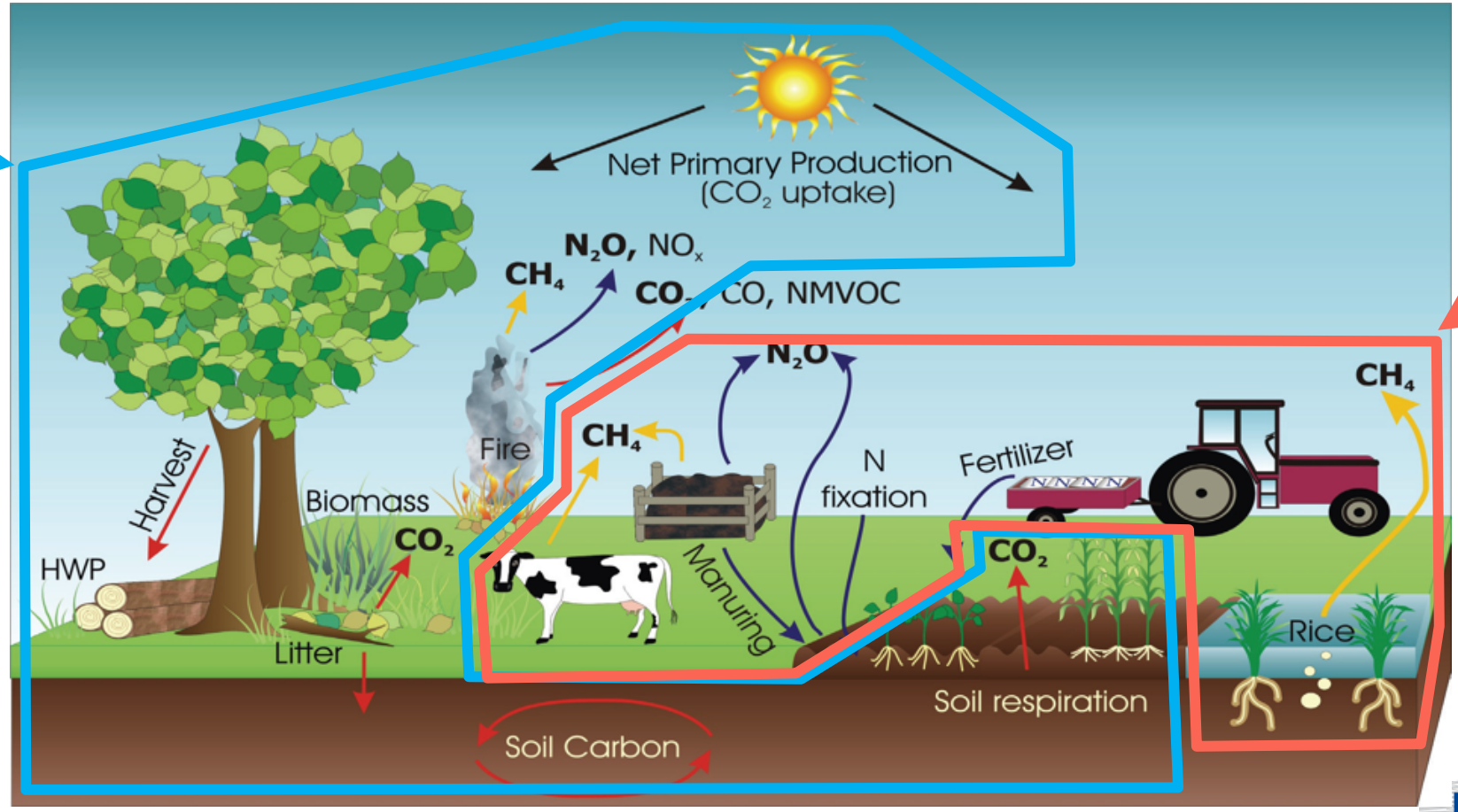
How land emissions are included in GHG reporting frameworks ?

Land Use, Land Use Change and Forestry (**LULUCF**): mainly CO_2

AGRICULTURE: *non-*CO_2 (CH_4, N_2O)

Partly human induced (linked to global natural carbon cycle)

Uncertainties?
Additionality?



All human-induced

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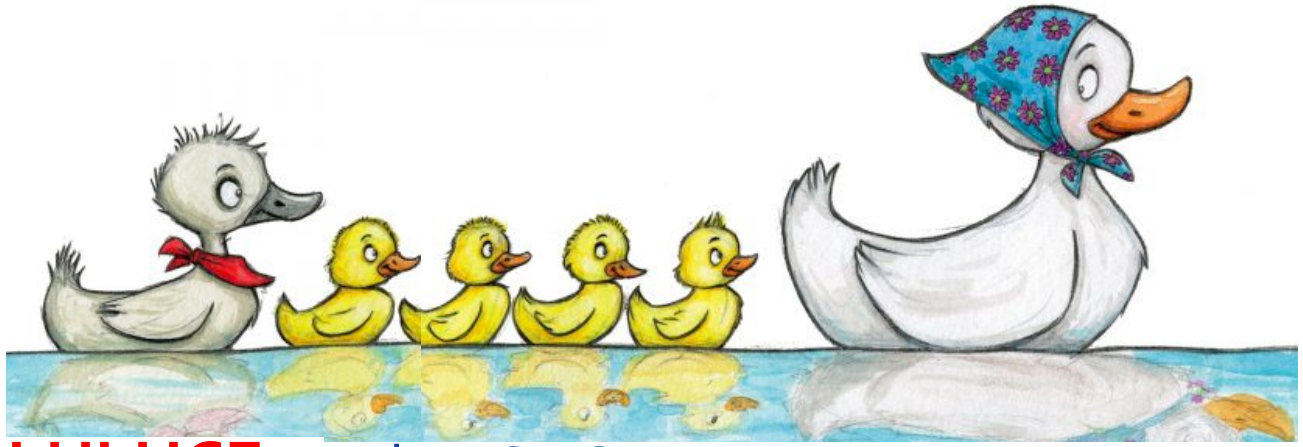
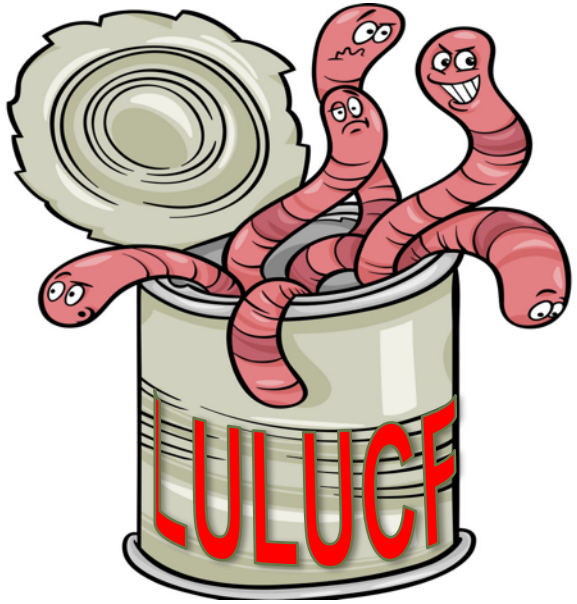
Despite a large mitigation potential, till recently LULUCF has been often seen as a secondary mitigation option by climate policy



LULUCF other GHG sectors



"LULUCF is a can of worms": too complex and not comparable to other GHG sectors

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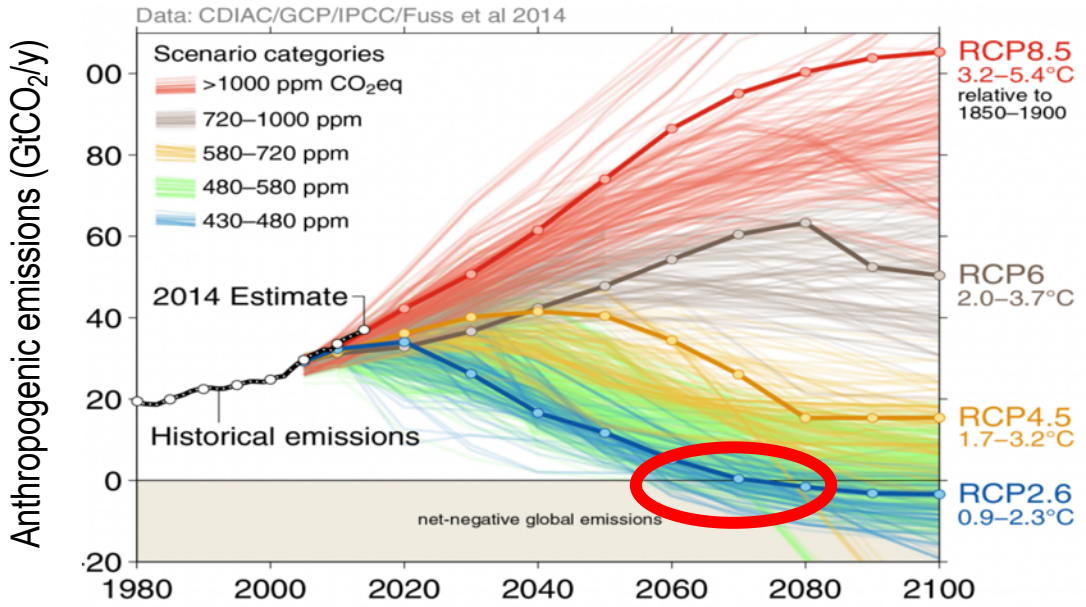
The Paris Agreement: a game changer for forests

- LULUCF expected to provide 25% of countries' planned global mitigation by 2030
- Countries asked reduce deforestation and **conserve/enhance sinks**

- <2°C requires a ***balance*** between GHG **anthropogenic emissions and removals**

Forests are the most important CO_2 sink that humans can manage

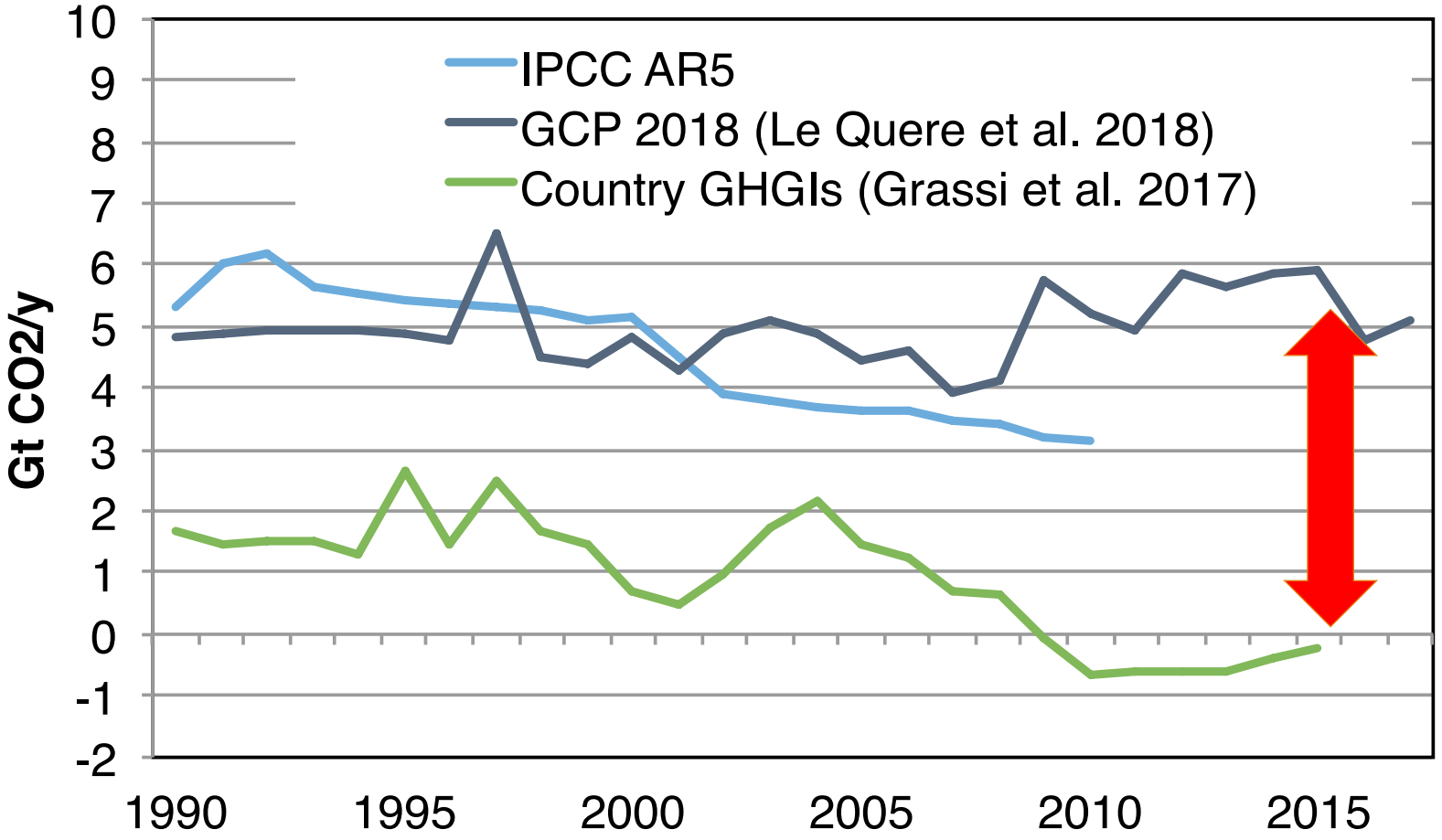


The **Global Stocktake** will assess periodically the **countries' collective progress** towards the long-term goals of the PA in light of the "best available science"

Can we trust country land GHG estimates?

How to they compare globally with scientific estimates ?

Net land-related global anthropogenic CO2 fluxes



≈ 5 GtCO2/y gap

WHY such big GAP?

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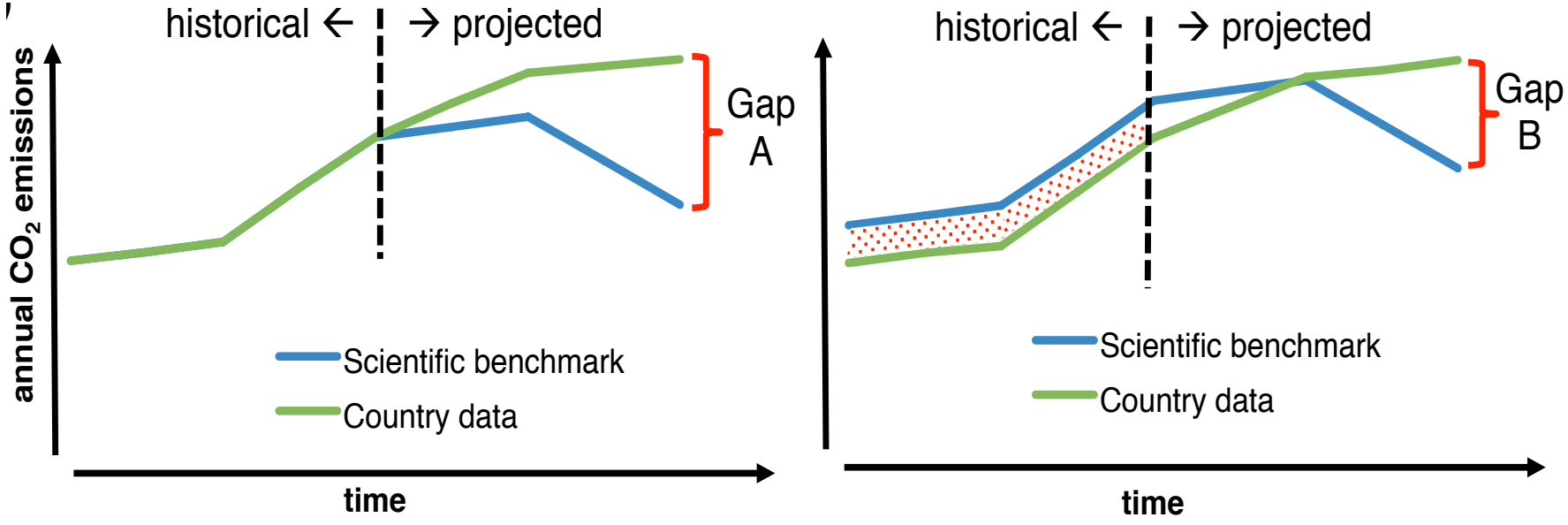
Inputs to the Global Stocktake (GST):

a) Aggregated countries' GHG data, including GHG inventories (for the historical part) and NDCs (for the forward-looking part)

b) IPCC AR6 and other scientific data

These inputs will be compared to assess the "gap" toward the 2°C trajectory:



The GST requires **comparability**

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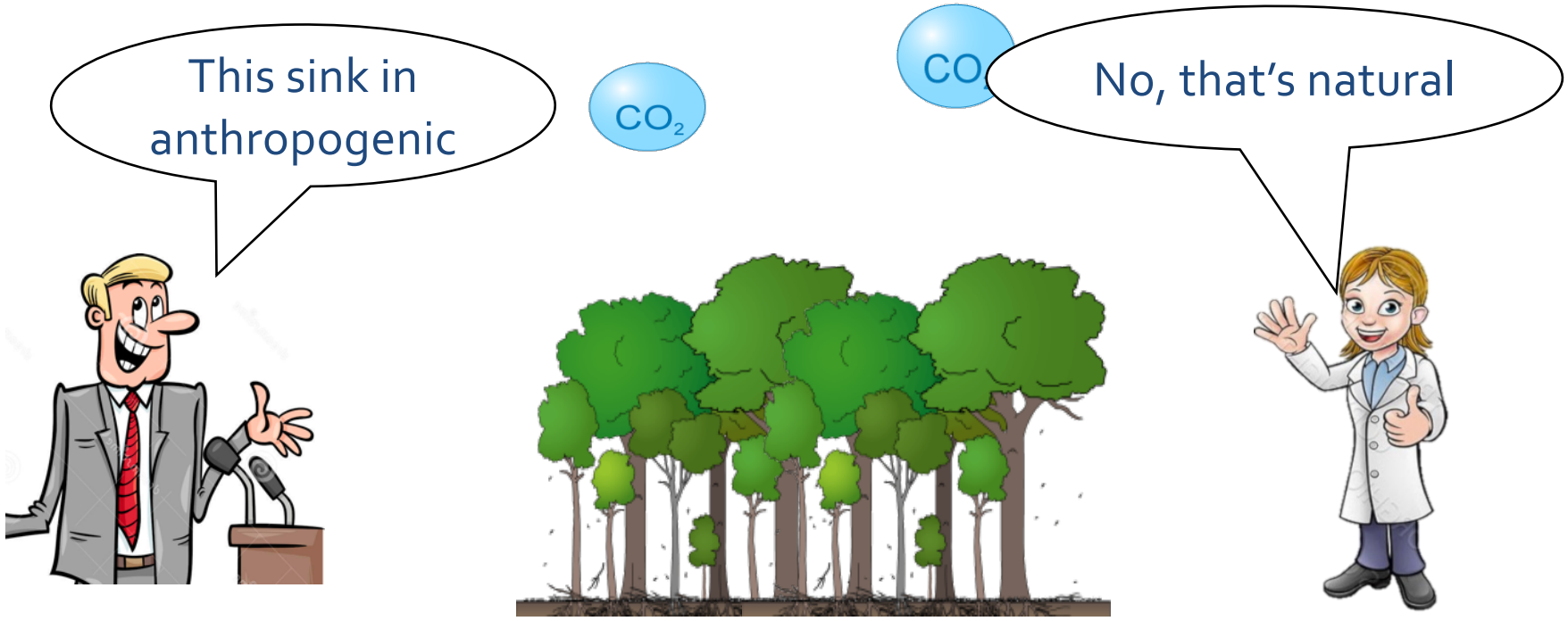
Different approaches to what is "anthropogenic forest sink"

When compared to global models, GHG inventories include more "managed" area and the impact of "environmental change" such as CO2 fertilization, etc. (Grassi et al. 2018)



For tracking countries' progress toward the Paris' targets, this difference needs to be reconciled.

a ‘ANTHROPOGENIC CO_2 FLUX’ CONCEPTUAL INCONSISTENCY PROBLEM

Bookkeeping, IAMs, DGVMs

“Land use”
Anthropogenic CO_2 flux defined as arising from land use change, harvest and regrowth

	Managed land	Unman-aged land
Direct human-induced effects		
Indirect human-induced effects		
Natural effects		

≠

NGHGIs

“LULUCF”
Anthropogenic CO_2 flux defined as occurring in areas defined as ‘managed’

Managed land	Unman-aged land

”Rosetta-stone” solution

b RECONCILIATION VIA DISAGGREGATION OF DGVM RESULTS

Bookkeeping, IAMs, DGVMs “Land use”

	Managed land	Unman-aged land
Direct human-induced effects		
Indirect human-induced effects		
Natural effects		

\+

DGVMs

“Land sink”
CO_2 flux associated to the natural response of any land to environmental change

Non-intact forest, used a proxy of countries’ managed forest

=

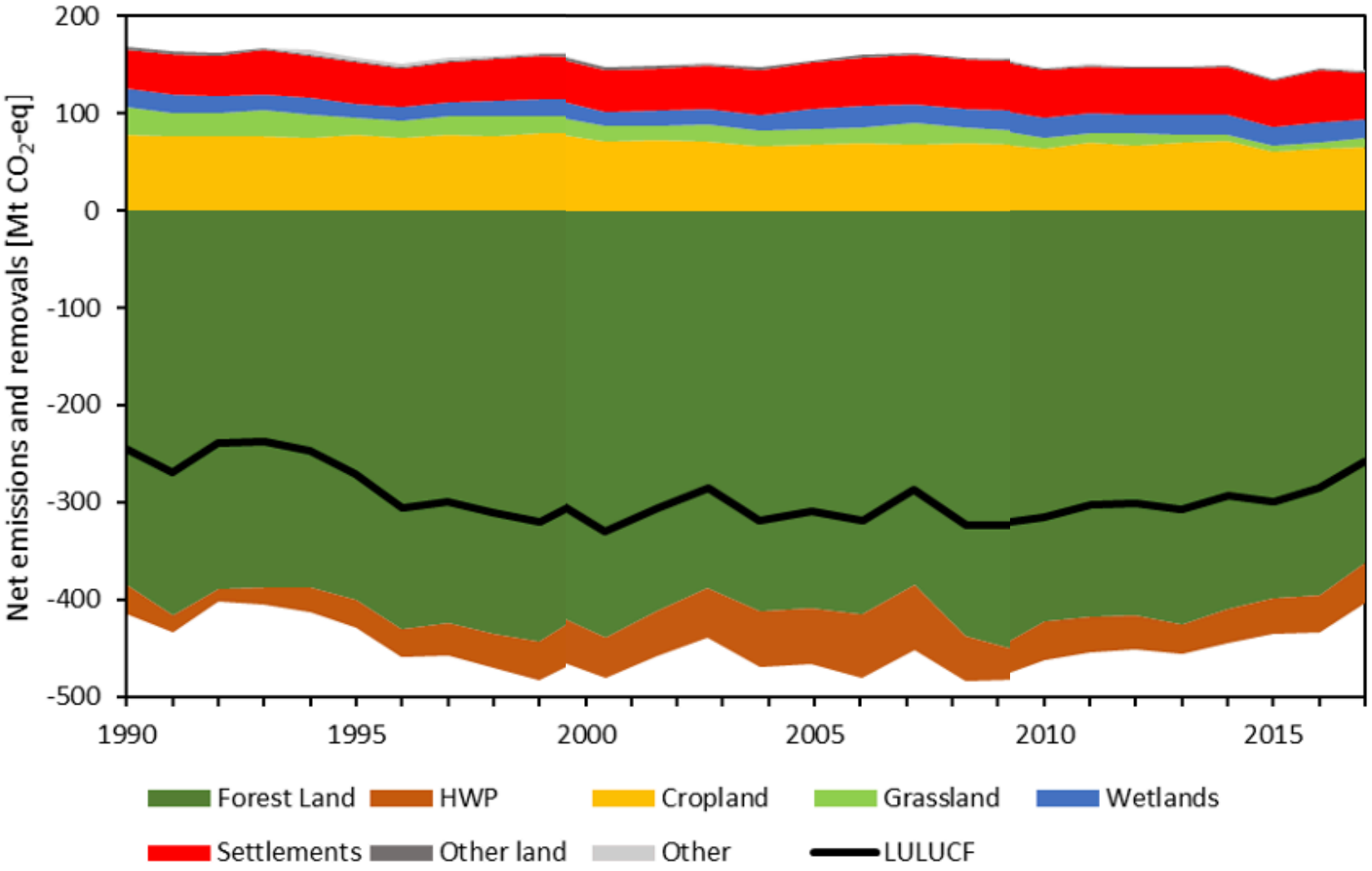
Adjusted global models’ flux (NGHGI-comparable)

Managed land	Unman-aged land

= Anthropogenic fluxes corresponding to the text in the grey box

= Non-anthropogenic fluxes

Historic emissions and removals from LULUCF in EU



Hotspots: land use changes, fires, cultivation of organic soils

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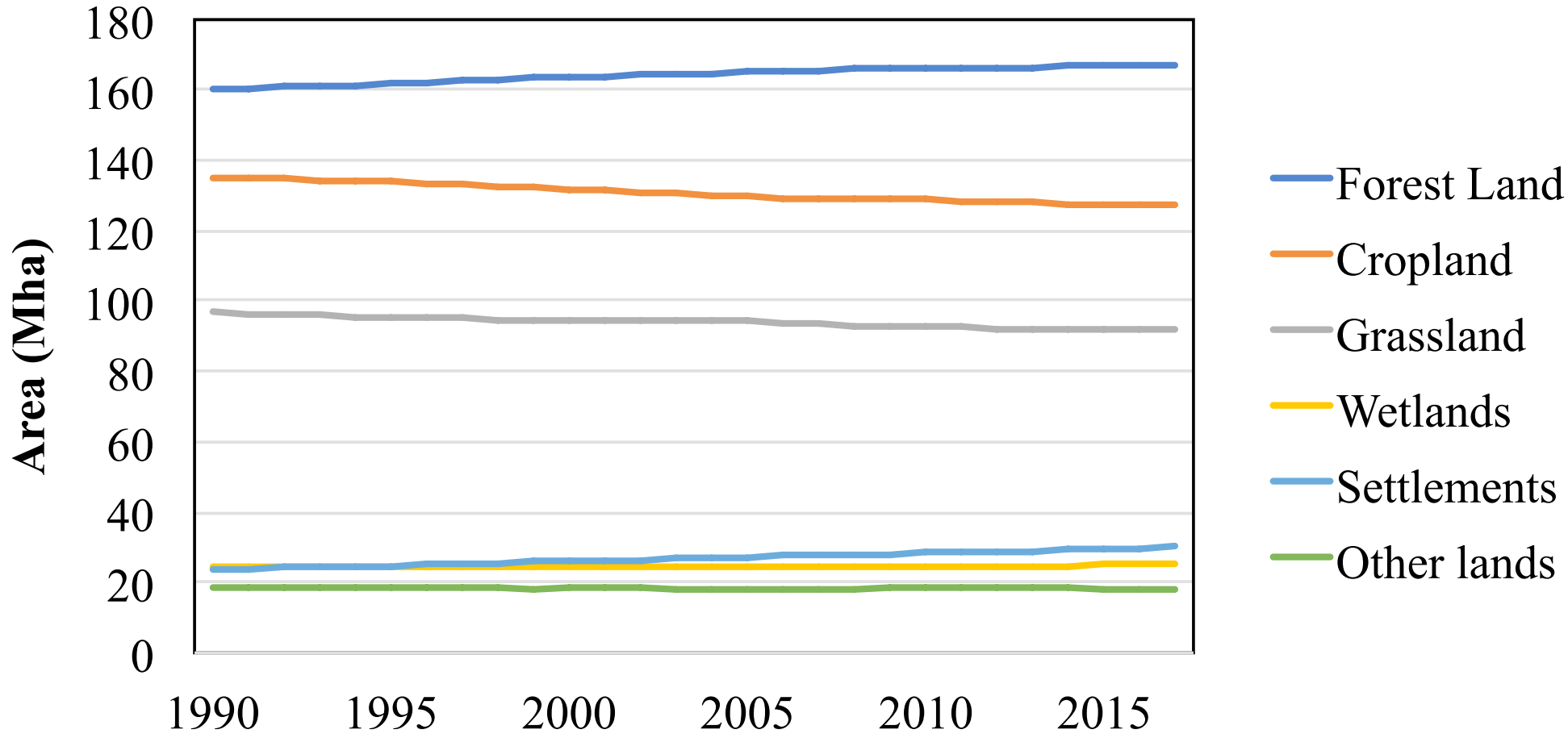
Area trends in the EU



The total reported area in 2017 by EU is about 450 Mha

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Completeness of reporting of land uses (UNFCCC)

Land Use	Subcategory	Carbon pool		
		Living biomass	Dead organic matter	SOC mineral
Forest Land	FL-FL	97%	36%	34%
	L-FL	97%	72%	90%
Cropland	CL-CL	93%	10%	79%
	L-CL	90%	55%	90%
Grassland	GL-GL	52%	14%	52%
	L-GL	52%	14%	52%
Wetlands	WL-WL	14%	7%	7%
	L-WL	52%	45%	45%

Completeness: FL > CL > GL > WL

= estimate not mandatory under tier 1

Completeness of land use conversions > land use remaining the same

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Uncertainties in the LULUCF sector

AFOLU		GHGs	Level uncertainty estimates based on MSs uncertainty estimates (2018)
LULUCF	Forest land	CO2	12.1%
	Cropland	CO2	37.8%
	Grassland	CO2	1018.6%
	Wetlands	CO2	56.5%
	Settlements	CO2	29.4%
	Other lands	CO2	143.7%
	HWP	CO2	42.3%

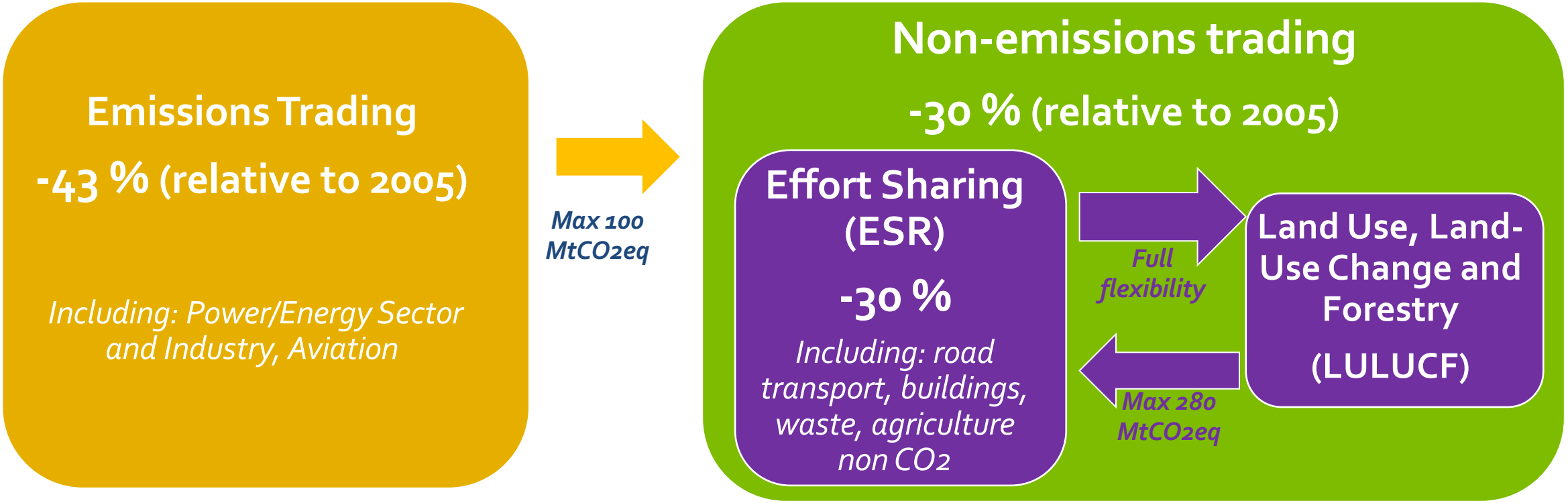
The aggregated level of uncertainty for the whole LULUCF sector is 22% (much less than the one reported in 2014: 41%)

After two decades of reporting, most of the GHGIs have achieved a reasonable level of accuracy and completeness.

Reasons of uncertainties include limited spatial and temporal resolution of activity data and emission factors.

Greater integration of remote sensing tools and closer collaboration with the scientific community could help reducing uncertainties.

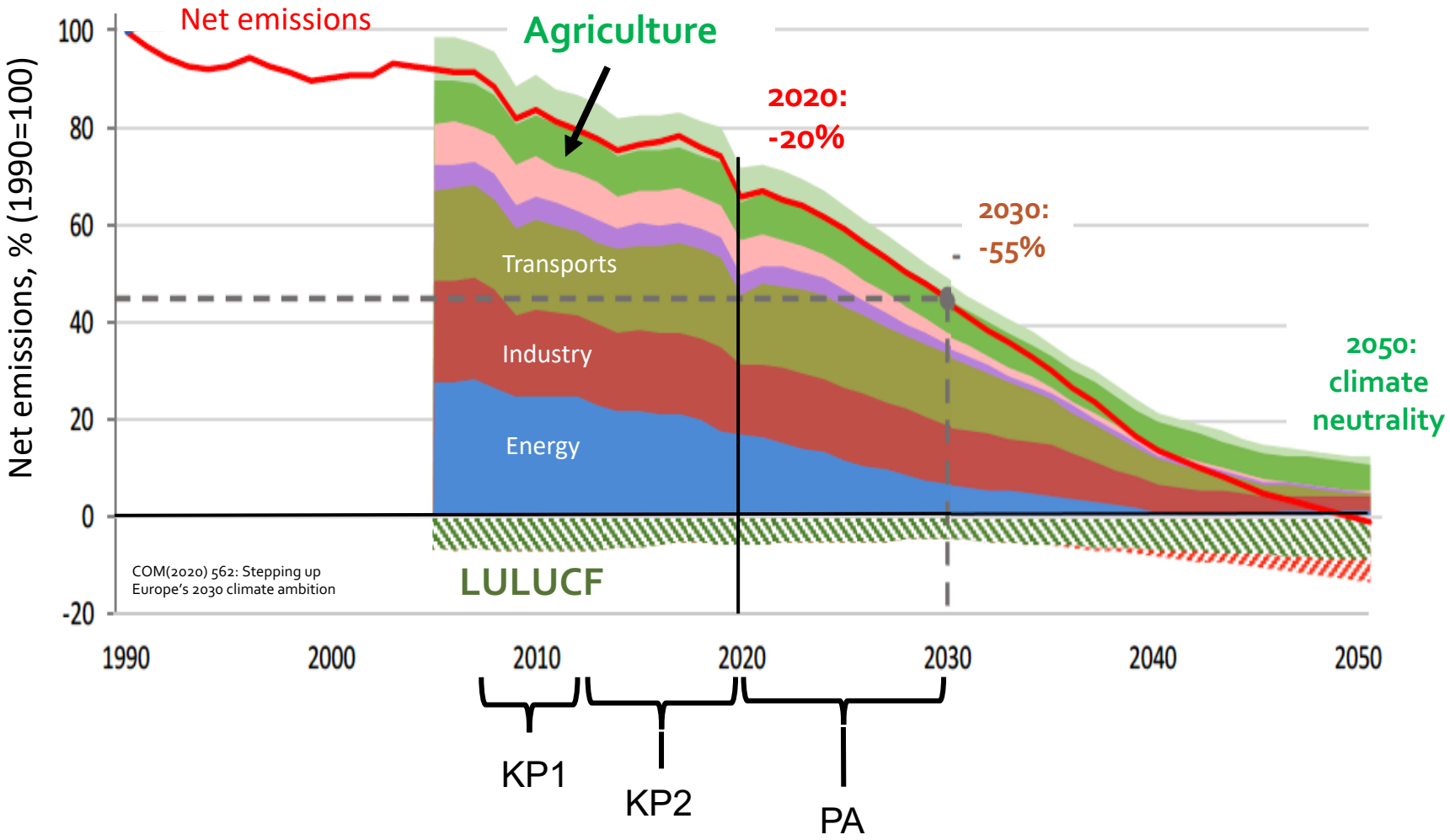
LULUCF in the EU 2030 climate policy (-40% emissions in 2030 vs. 1990)



The **Regulation 2018/841** brings LULUCF as a separate pillar in the EU climate framework:

- **LULUCF accounting rules to reflect the impact of additional mitigation actions**
- **No-debit rule** once accounting rules are applied
- **Flexibilities**: within LULUCF, from/toward the ESR, among MS

LULUCF in the EU climate targets: a long and winding road



COM(2020) 562: "to track progress towards climate neutrality the full net LULUCF sink needs to be included".

- Further increase confidence in numbers
- Stop & reverse the current decline of LULUCF sink

Reporting	*	**	***
Accounting	*	**	***

→ The progressive inclusion of LULUCF in the climate targets follows the confidence on its numbers

Improvements expected under LULUCF Regulation 841

	Approach 1 National statistics	Approach 2 Land Use Change matrix	Approach 3 Geo-tracked
Tier 3 **High res. data (e.g. model)**	Not applicable	Modelled data combined with LUC matrix (not necessarily spatially dis-aggregated)	Geo-information at high-resolution, detailed time series, country-specific disaggregated data based on inventories and/or models
Tier 2 **Country specific values**	National area statistics, combined with country-specific values – typical 1st improvement	Annual LUC stats, combined with country-specific values	Geo-information, time series, country specific values – good coverage, detailed analysis
Tier 1 **IPCC default values**	National area statistics, combined with IPCC default values – basic entry level	Annual (or annualised) LUC stats presented as national matrix – applied using default IPCC values	Geo-information, time series, default values – weak, but better than App 1 and 2
	Total area of LU categories No information on LU conversions	**Information on LU conversions but no location.**	**Geographically-explicit information on LU conversions**

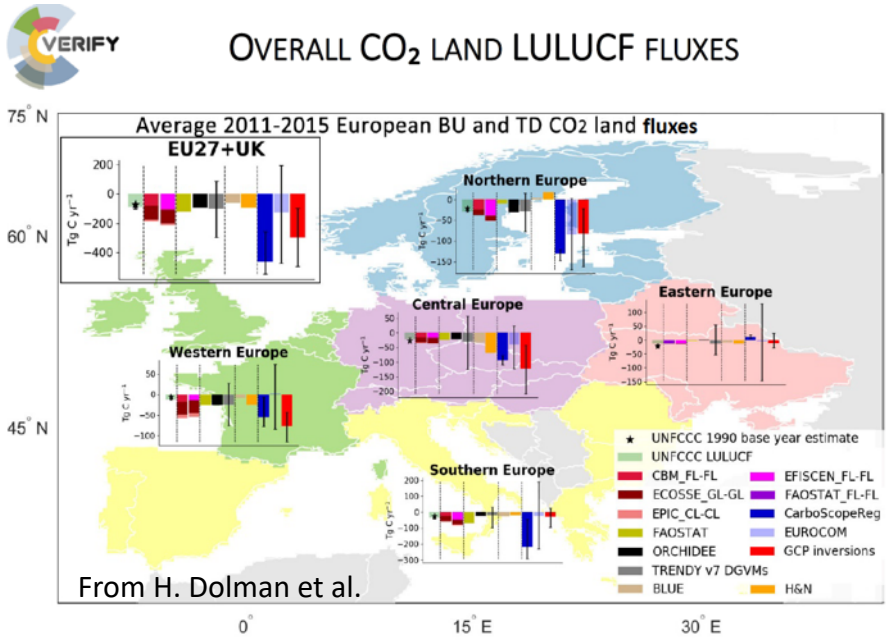
- **Use of IPCC Guidelines**

- **UNFCCC reporting principles** (transparency, accuracy, completeness, consistency and comparability)

- **Use "best available methods and data" , including**
  - Be geographically explicit → use Copernicus, remotely sensed data, etc.
  - Provide synergies with other policies (e.g. CAP/IACS/LPIS)

VERIFY - where are we?

- Good steps in bridging models and GHGI compilers, and in combining empirical/process based approaches (e.g. Orchidee)
- **Bottom Up** results promising (but closer look to details: land uses, AD and EF: more disaggregated analysis)
- Great potential from EO
- **Top Down** results show greater sinks and large uncertainty: can this help to unravel unknow uncertainties? Reconciliation efforts



Where models and EO may help most

Indipendent **verification**, greater spatial and temporal **resolution** of AD (eg. forest cover change) and EFs (eg. biomass maps); Hotspots (natural **distrubances** !); **completeness** (soils?); understand better **drivers**

Next challenges

Clarify system boundaries and definitions to find common grounds:

(i) Greater transparency by countries (what process is incuded, maps etc);

(ii) Flexibility / modularity by models → "*Rosetta stone*" solutions

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Thank you!