Bridging gaps between science and policy making: the case of forest carbon fluxes

Giacomo Grassi (with inputs from the whole JRC LULUCF group)

Joint Research Centre

The European Commission's
science and knowledge service

JRC Science Lecture, Bruxelles, January 2018

European Commission

OUTLINE

1. Introduction
2. The forest mitigation opportunity under the Paris Agreement
3. Bridging gaps between science and policy:
   a. Comparability between aggregated country estimates and IPCC
   b. Credible accounting of forest mitigation in the EU
4. Conclusions



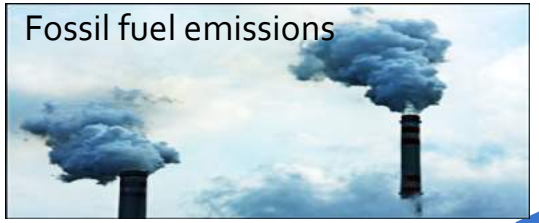
European Commission

1. Introduction to land-related greenhouse gas (GHG) emissions

The Global Carbon Budget

(average 2007 - 2016 from Global Carbon Project 2017)

34.4 $GtCO_2/y$ **87%**

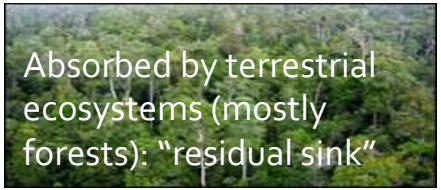


+

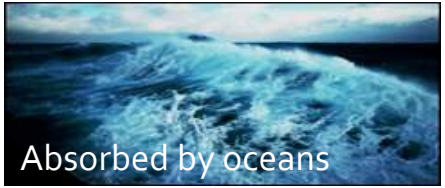
4.8 $GtCO_2/y$ **12%**

17.2 $GtCO_2/y$ **46%**

11.0 $GtCO_2/y$ **30%**



24% 8.8 $GtCO_2/y$



Land use change and forest management: part of the **problem** and part of the **solution**

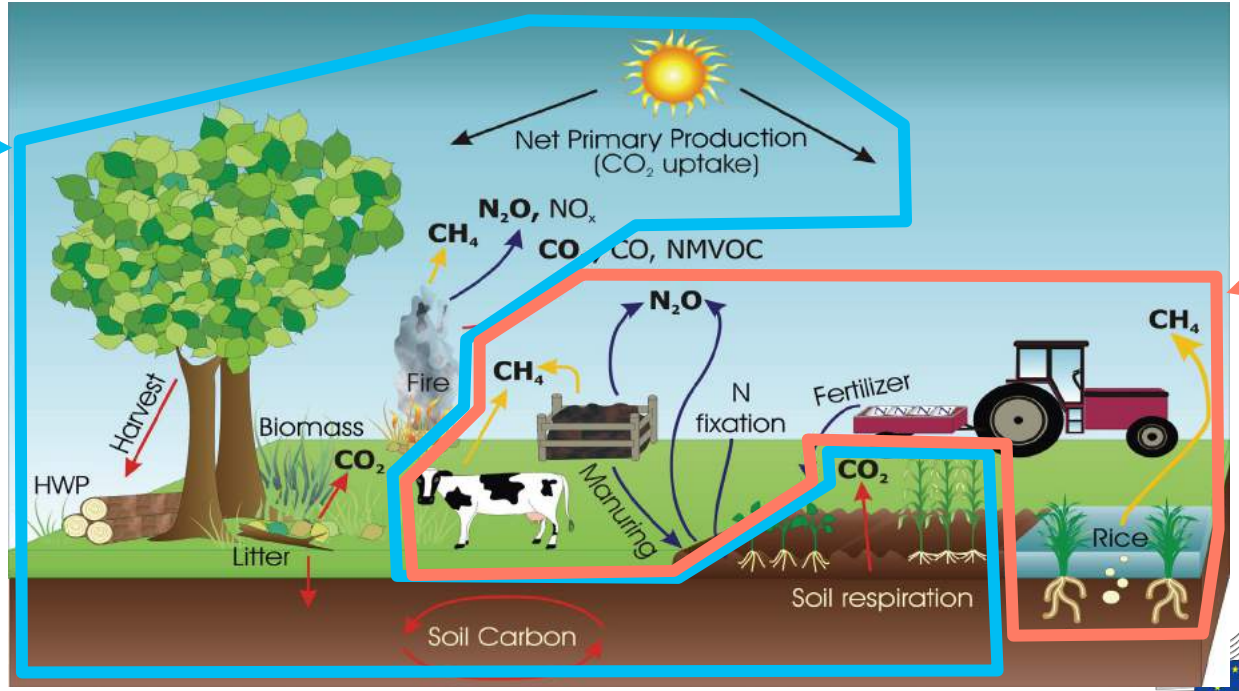
European Commission

Land use emissions under the UNFCCC

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

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

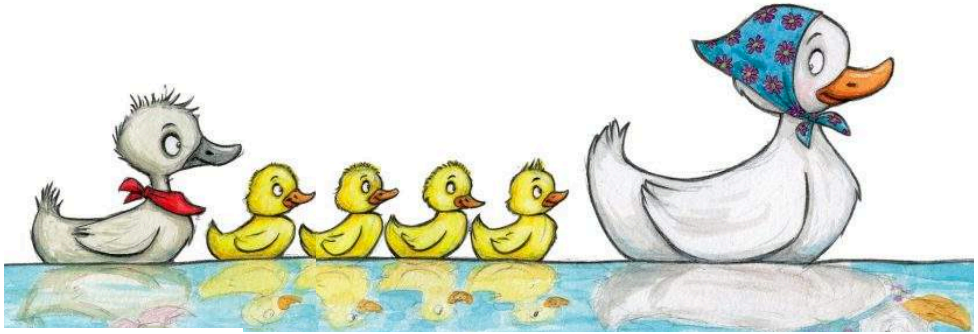
Partly human induced (linked to natural carbon cycle): **how to assess anthropogenic "mitigation"?**



All human-induced

European Commission

Despite a large mitigation potential, till recently land use and forests have 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

European Commission

2. The forest mitigation opportunity under the Paris Agreement

The Paris Agreement (PA): a game changer for forests

- The PA asks countries to reduce **deforestation** and **conserve enhance sinks**
- According to countries' pledges (Nationally Determined Contribution, NDCs), **LULUCF** expected to **provide 25% of planned global emission reductions by 2030.**

nature climate change

ARTICLES

PUBLISHED ONLINE: 27 FEBRUARY 2017 | DOI: 10.1038/NCLIMATE3227

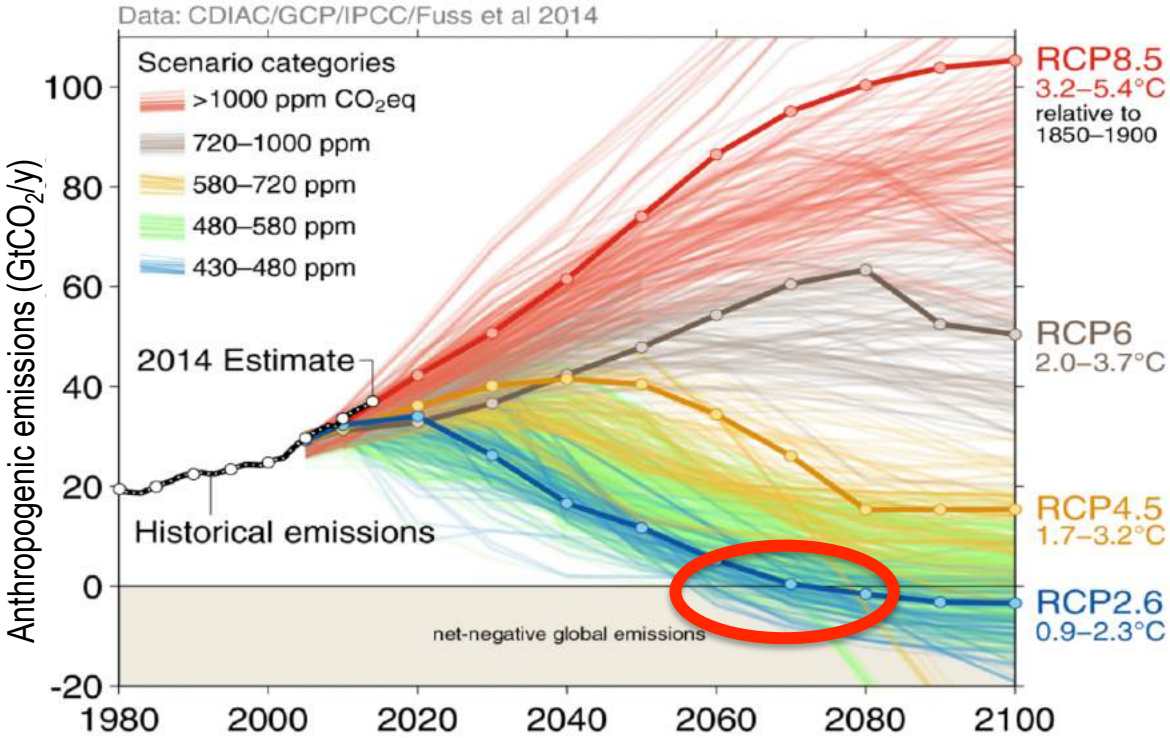
The key role of forests in meeting climate targets requires science for credible mitigation

Giacomo Grassi[1]*, Jo House[2], Frank Dentener[1], Sandro Federici[3], Michel den Elzen[4] and Jim Penman[5]†

Forest-based climate mitigation may occur through conserving and enhancing the carbon sink and through reducing greenhouse gas emissions from deforestation. Yet the inclusion of forests in international climate agreements has been complex, often considered a secondary mitigation option. In the context of the Paris Climate Agreement, countries submitted their (Intended) Nationally Determined Contributions ((I)NDCs), including climate mitigation targets. Assuming full implementation of (I)NDCs, we show that land use, and forests in particular, emerge as a key component of the Paris Agreement: turning globally from a net anthropogenic source during 1990–2010 (1.3 ± 1.1 $GtCO_2e\ yr^{-1}$) to a net sink of carbon by 2030 (up to -1.1 ± 0.5 $GtCO_2e\ yr^{-1}$), and providing a quarter of emission reductions planned by countries. Realizing and tracking this mitigation potential requires more transparency in countries' pledges and enhanced science-policy cooperation to increase confidence in numbers, including reconciling the ≈ 3 $GtCO_2e\ yr^{-1}$ difference in estimates between country reports and scientific studies.

European Commission

- The PA's long-term goal (well-below 2°C) requires reaching a **balance** between **anthropogenic emissions and removals** of GHG in the second half of this century

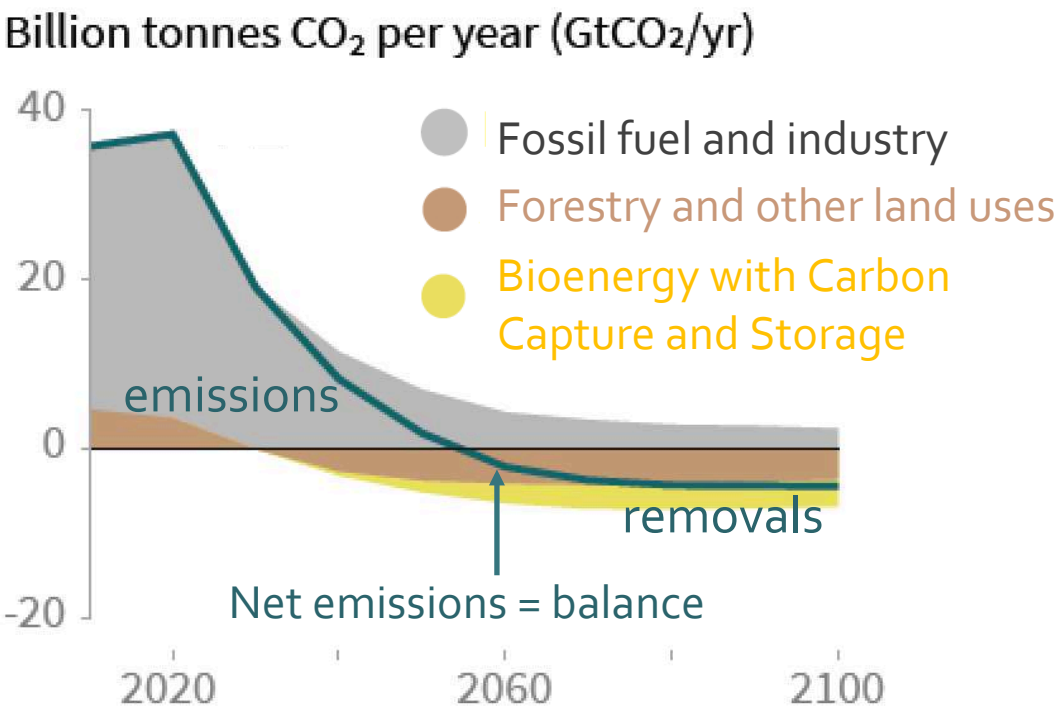


At present, **forests are the most important CO_2 sink that humans can manage**

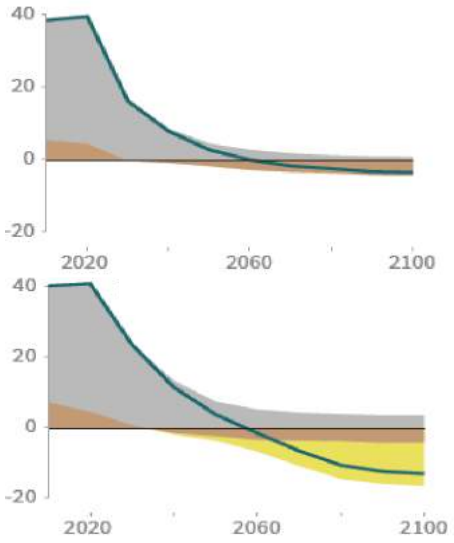
European Commission

Role of forests in emission pathways consistent with 1.5C warming

(from IPCC Special Report 1.5C)

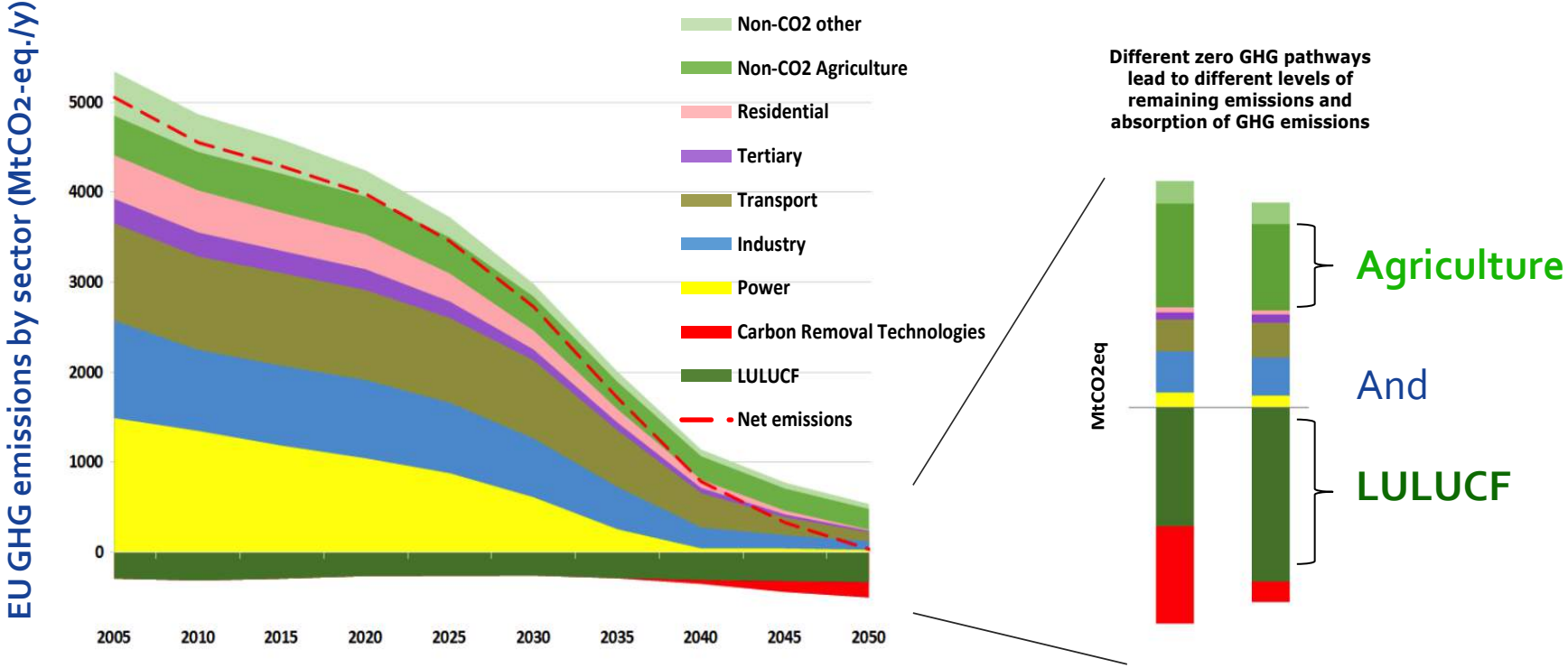


There are different pathways that can limit warming to 1.5 °C



European Commission

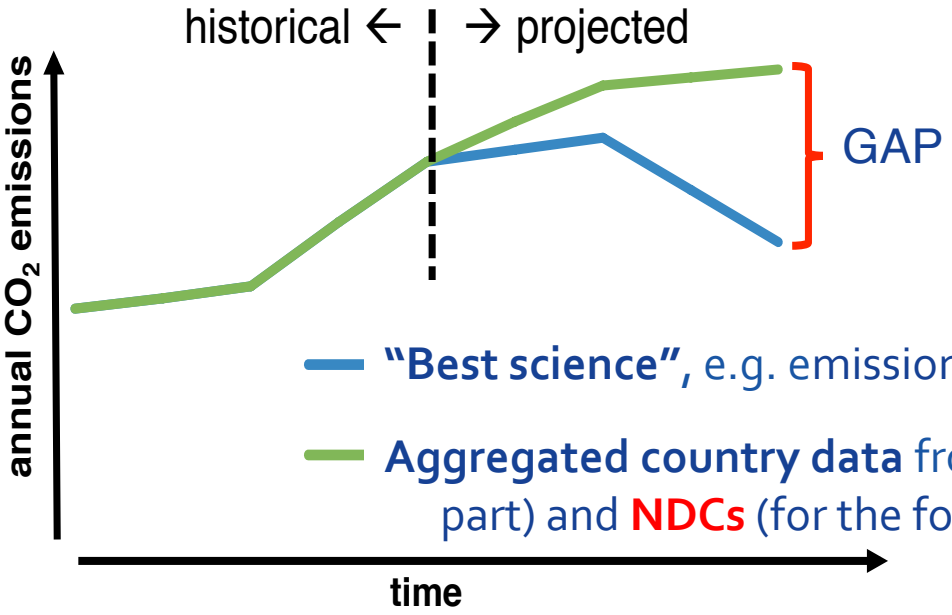
Role of forests in the EU long-term GHG strategy



European Commission

The Global Stocktake

Under the Paris Agreement, the **Global Stocktake** will periodically assess the **countries' collective progress** towards the long-term goals, in light of the "**best available science**".



"Best science", e.g. emission pathways from **IPCC AR6**

Aggregated country data from **GHG inventories** (for the historical part) and **NDCs** (for the forward-looking part)

European Commission

These two men want to fly together in the balloon

(Countries)

PA long-term goal
(< 2°C)

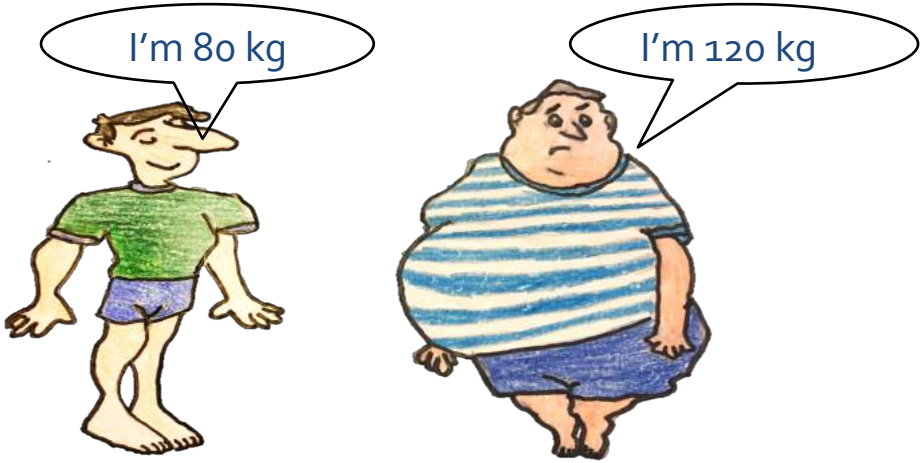
(IPCC)

The scientists estimates that the max weight allowed in the balloon is 150 kg

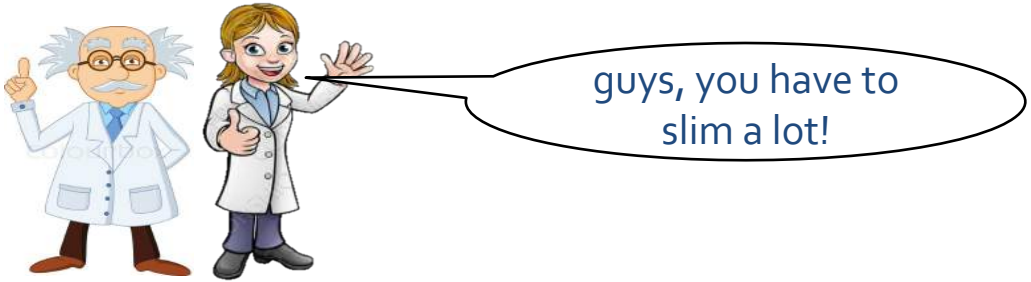
"Balance"
(i.e. < 2°C trajectory):
What is needed to reach the goal

Drawing of fat and slim men by Anna Chiara Grassi

Country GHG inventories

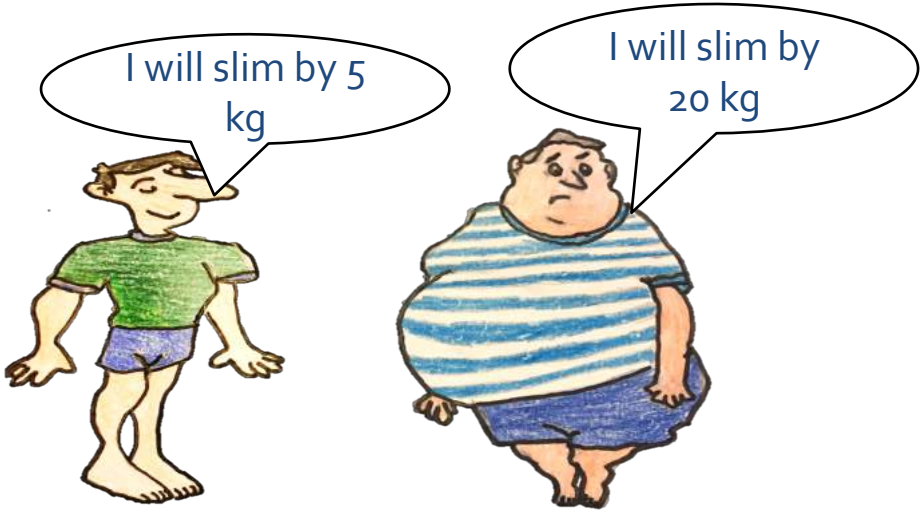


IPCC

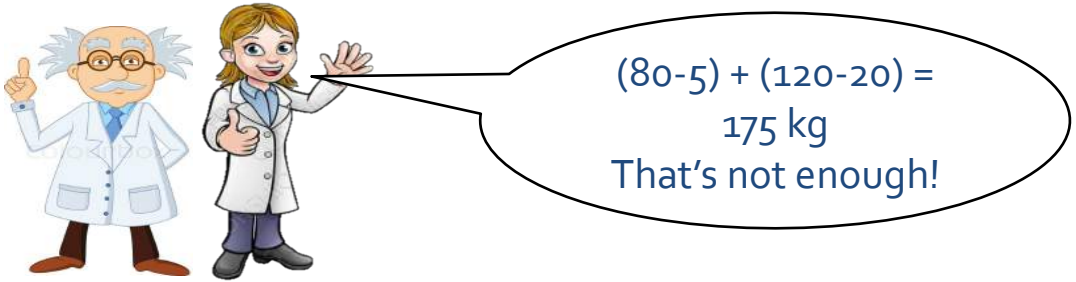


European Commission

1st Nationally Determined Contribution

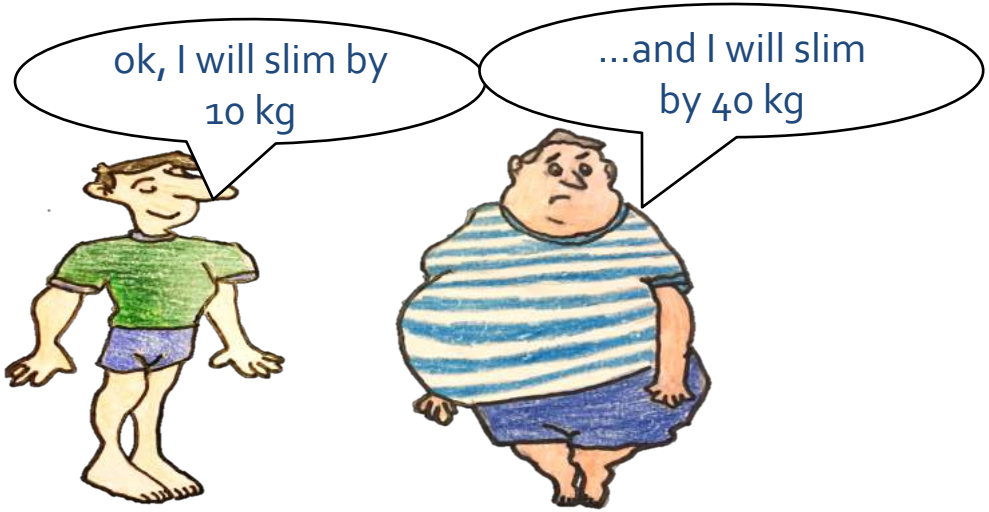


1st Global Stocktake

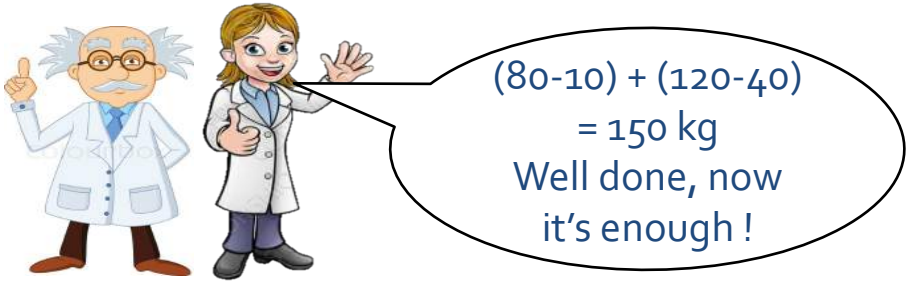


European Commission

2nd Nationally Determined Contribution



2nd Global Stocktake



European Commission

What's next?

1)

NO: Paris goals can't be met without forest mitigation

2)

→ Forests become *one of* the key climate solutions

European Commission

What is still missing to seize the forest mitigation opportunity?

(and how the scientific community may help)

Where are we? → More **confidence in country forest estimates,** including **comparability with IPCC**

Where do we want to go? → **Potential of forest sinks in all scenarios**

How do we get there? → Identifying **the best forest mitigation strategies, ensuring a credible accounting for the forest sink**

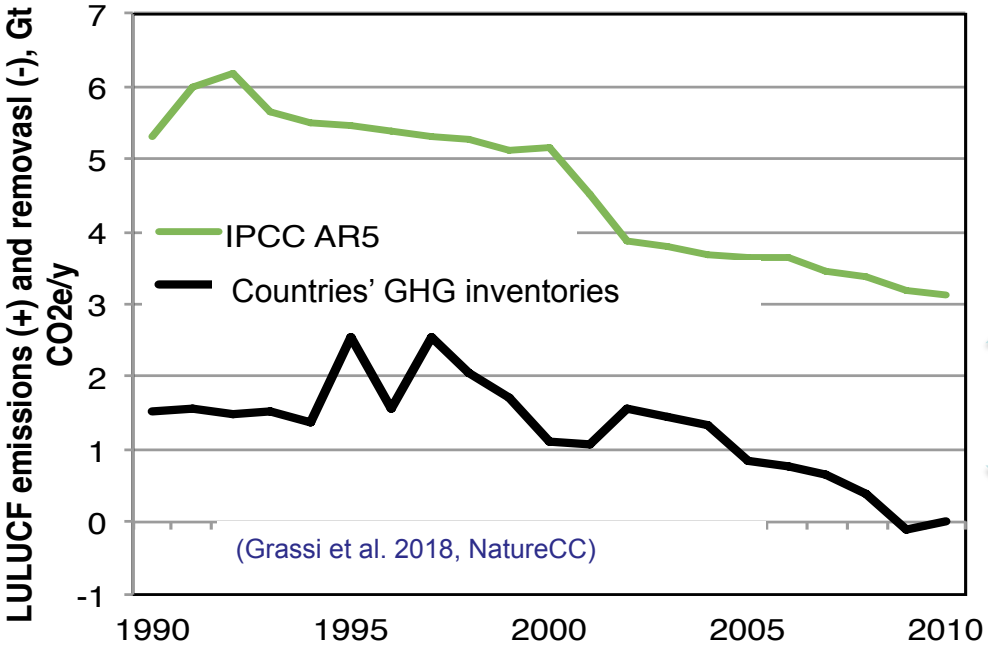
3. Bridging gaps between science and policy:

a. Comparability between aggregated country estimates and IPCC

IPCC AR5, WG3, tab. 11.1

	1990–1999			2000–2009		
	$GtCO_2/yr$			$GtCO_2/yr$		
Net land use CO_2 flux (anthropogenic)	5.87	±	2.93	4.03	±	2.93
Residual sink (non anthropogenic)	−9.90	±	4.40	−9.53	±	4.40

How does it compare with countries' LULUCF data?

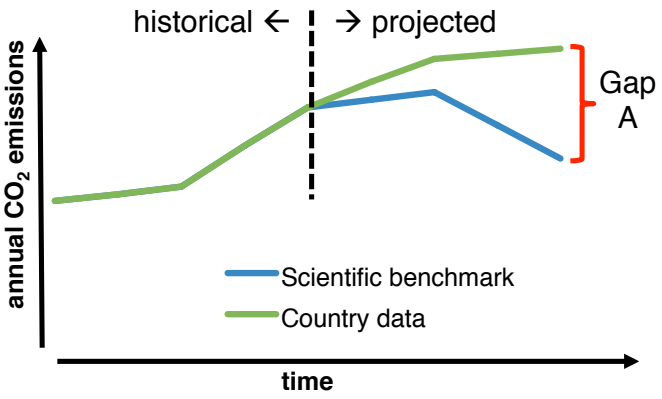


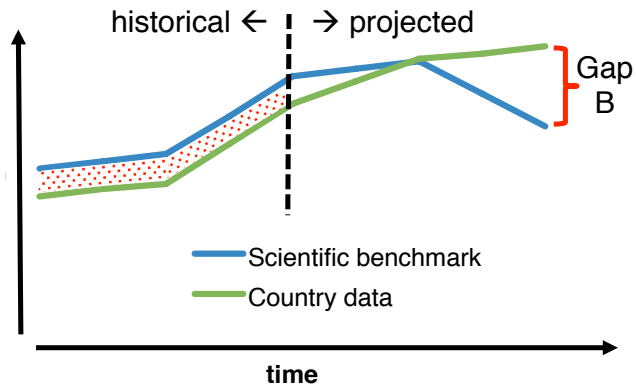
≈ 4 GtCO2/y gap

WHY such big difference?

European Commission

Is this difference a problem?



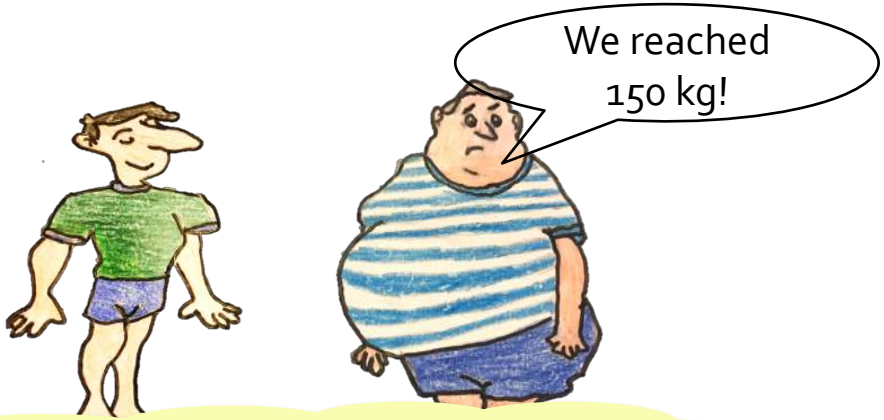


The **Global Stocktake** will assess the GAP between **countries' collective progress** and the long-term goals

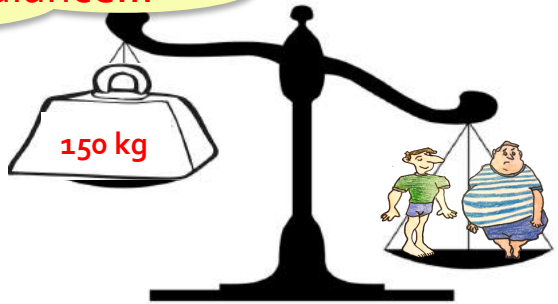
An accurate quantification of this gap requires **comparability/consistency** between scientific data and countries

European Commission

Are the men and the scientist using the <u>same</u> balance?



..oops, maybe we are not
using a comparable balance...



European Commission

Why global forest carbon estimates differ between IPCC and countries?

How to reconcile this gap?

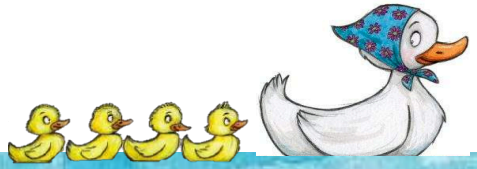
nature climate change

ARTICLES

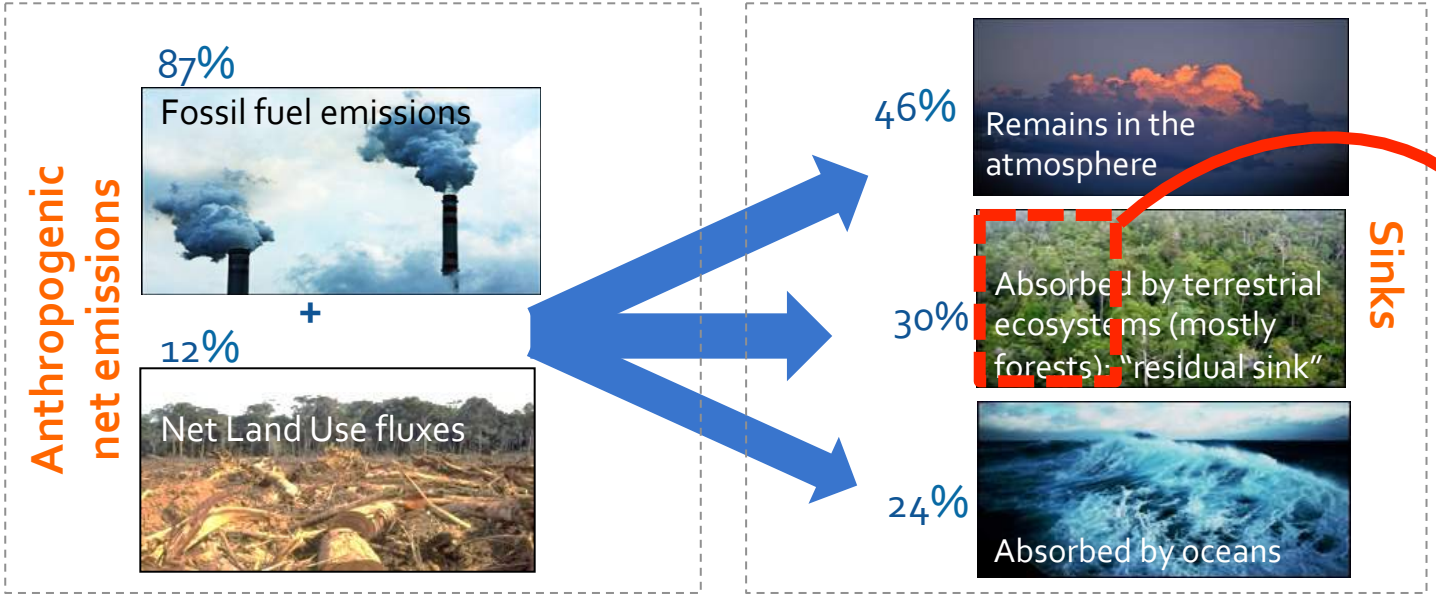
https://doi.org/10.1038/s41558-018-0283-x

Reconciling global-model estimates and country reporting of anthropogenic forest CO_2 sinks

Giacomo Grassi[1*], Jo House[2], Werner A. Kurz[3], Alessandro Cescatti[1], Richard A. Houghton[4], Glen P. Peters[5], Maria J. Sanz[6], Raul Abad Viñas[1], Ramdane Alkama[1], Almut Arneth[7], Alberte Bondeau[8], Frank Dentener[1], Marianela Fader[9], Sandro Federici[10], Pierre Friedlingstein[11], Atul K. Jain[12], Etsushi Kato[13], Charles D. Koven[14], Donna Lee[15], Julia E. M. S. Nabel[16], Alexander A. Nassikas[4], Lucia Perugini[17], Simone Rossi[1], Stephen Sitch[18], Nicolas Viovy[19], Andy Wiltshire[20] and Sönke Zaehle[21]



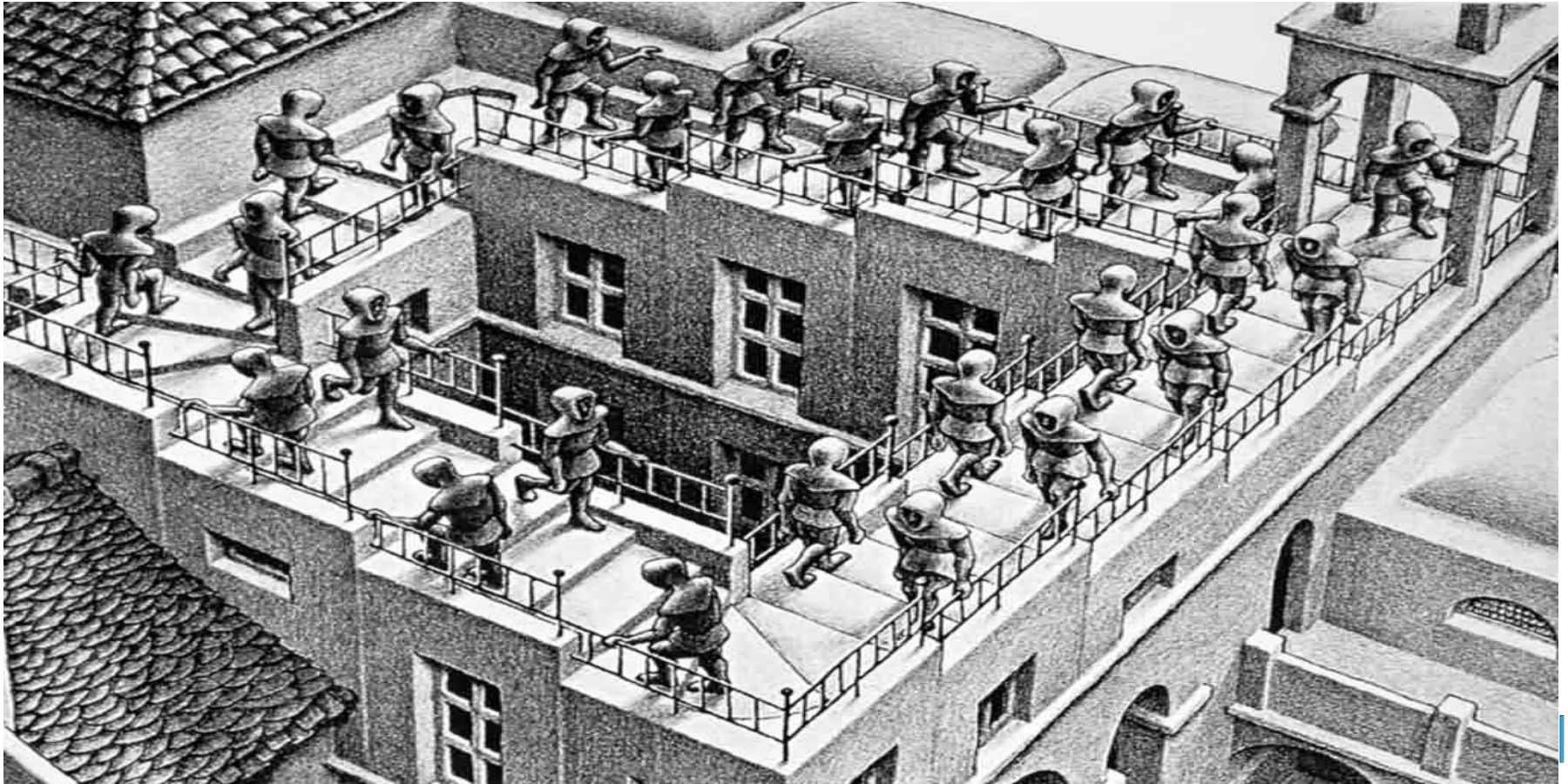
Why global forest carbon estimates differ between IPCC and countries?



Part of this sink occurs on "managed" land and is considered "anthropogenic" by countries

IPCC and countries have developed a **different approach to what is "anthropogenic"**: countries include more area of "managed" forests and the impact of "*indirect human-induced effects*" (change in T°, length of growing season, atmospheric CO_2 fertilisation, etc.)

Are stairs going up or down?



How to reconcile this gap?

WORK IN PROGRESS
(IPCC Methodological Refinement, 2019)

COUNTRIES should provide more **information** on the "managed" area and methods used in their GHG inventories

The **IPCC** should:

1) **Acknowledge the issue**

IPCC *Summary for Policymakers* GLOBAL WARMING OF 1.5 °C

DONE

AFOLU estimates reported here are not necessarily comparable with countries' estimates.

2) **Disaggregate estimates** to make them more **comparable with countries**

Grassi et al. 2018 → a different disaggregation of existing models results helps reconciling models vs. country **historical** estimates

WORK IN PROGRESS
(IPCC SRCCL, 2019)

A similar work needs to be done for **future** emission pathways

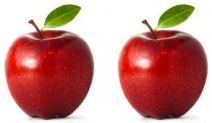
TO BE DONE
(IPCC AR6, 2022)

3. Bridging gaps between science and policy:

b. Ensuring a credible accounting of forest mitigation in the EU

The Paris Agreement and the challenge of accounting the mitigation impact of forest activities

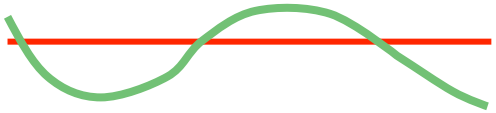
The **Paris Agreement (PA)** calls for **economy-wide climate targets** → no displacement of emissions, fungibility across sectors → **mitigation comparable**



The "**accounting**" of mitigation actions toward the targets **shall reflect genuine deviations from past activities**

This is **challenging for the forestry sector**, as the future net emissions can change irrespective of actual management activities, **because of age-related dynamics**

Trend in emissions over time with NO deviation from past activities:



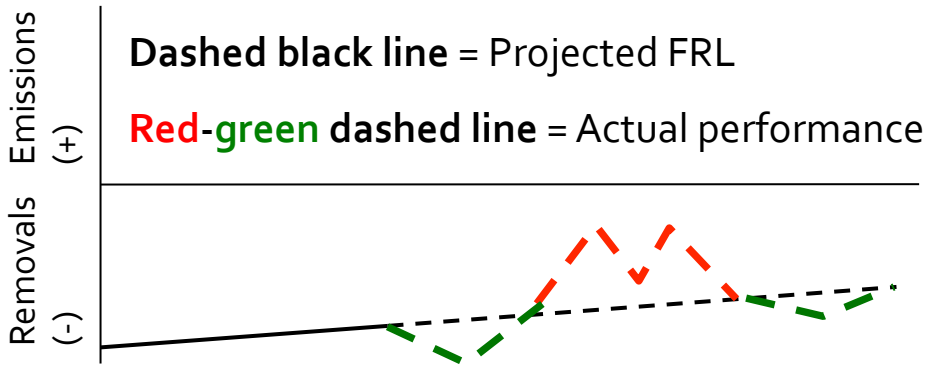
Most GHG sectors (e.g. Agriculture)

Forests

European Commission

The Kyoto Protocol approach to accounting forest mitigation

To address the challenge of forest C accounting, the idea of "**forest reference level**" (**FRL**) was developed, a country-level projection of business-as-usual forest emissions/removals, which represents the benchmark for future accounting of mitigation



Less removals than FRL = **Debits**

More removals than FRL = **Credits**

The credibility of this approach depends on HOW the FRL is set

The EU Forest Reference Level under Kyoto (2013-2020), including assumed impact of pre-2009 policies

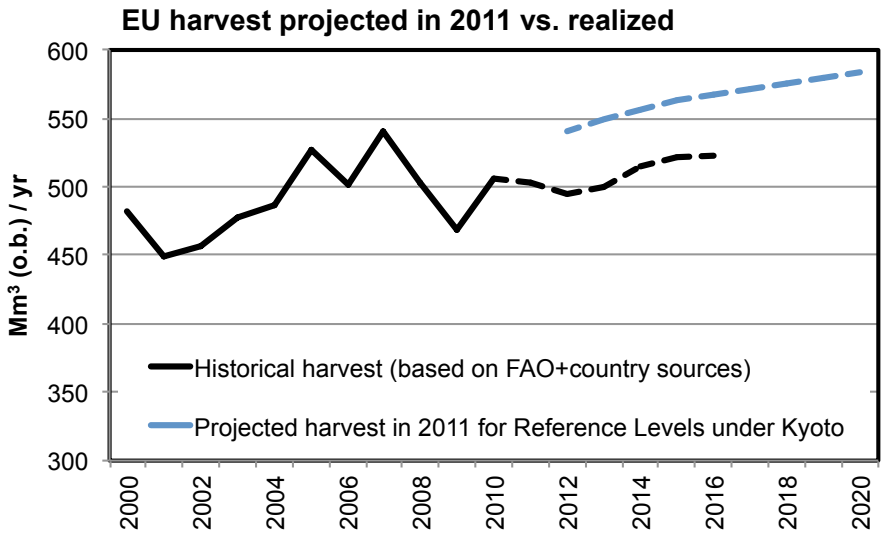
Why reality so different from projections?

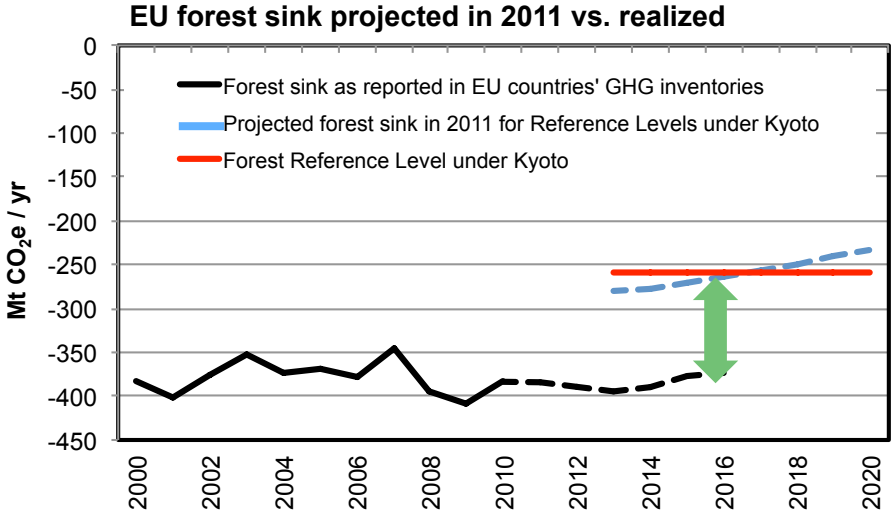
impact of new policies?

wrong modelling?

projections inflated with harvest?

Preliminary data suggests a large amount of potential **credits**

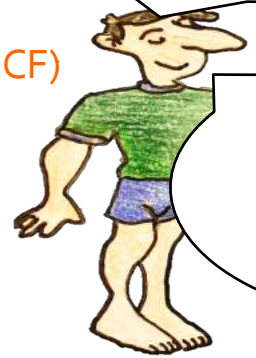




(from Grassi et al. 2018, *Carbon balance and Management*)

GHG sectors within a country

(LULUCF)



I slimmed by 10 kg, <u>from 80 to 90 kg</u>

...yes, because I **<u>wanted</u> to eat more** and reach **100 kg**!

(Agriculture)

I slimmed by 20 kg, from 120 to 100 kg

Scientist

LULUCF, you did not slim!

..but this is NOT comparable to other sectors!

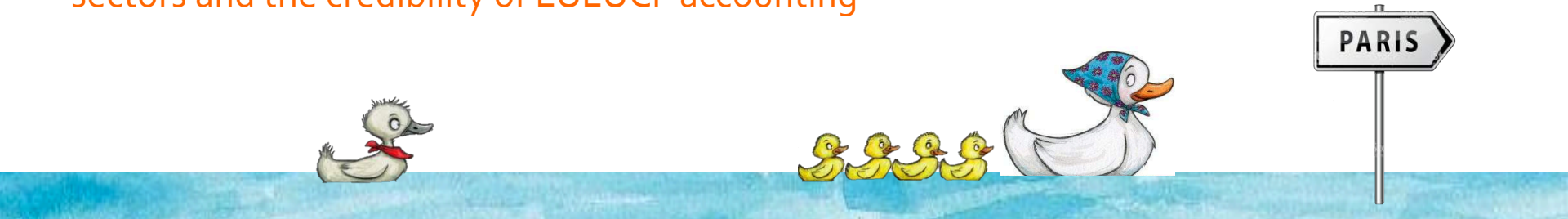
Possible impact of including policies in Forest Reference Levels (FRL)

Example on **bioenergy** [*biomass burning emissions not counted under energy, assumed to be counted in LULUCF*]. An existing policy plans to build 8 new biomass plants → extra harvest in the FRL. In reality, it may happen that:

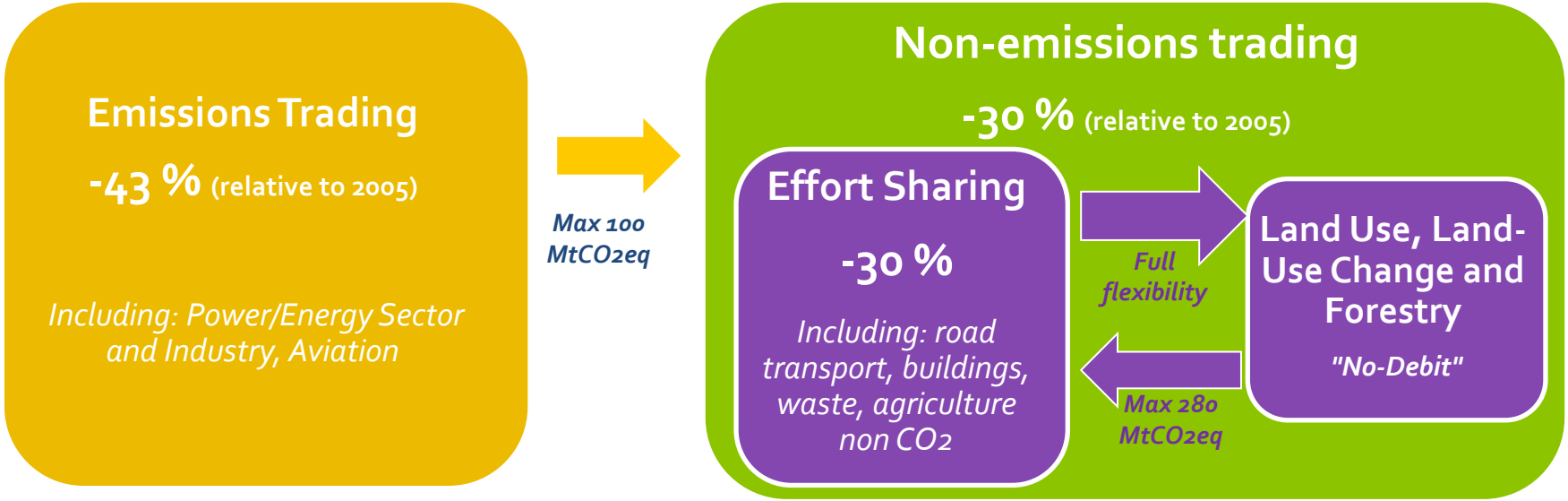
(a) 2 plants built → less harvest than expected: **credits for no activity,** due to a deviation from un-reviewable assumptions;

(b) 8 plants built → a policy-driven, real-world decrease in the sink (= **increase of emissions**) is included in the FRL and **disappears from the accounts** → bioenergy NOT counted in LULUCF. **No other GHG sector is allowed to hide new emissions.**

Lessons learnt: policy assumptions in the FRL jeopardize comparability with other sectors and the credibility of LULUCF accounting



LULUCF in the EU 2030 climate policy (-40% emissions in 2030 relative to 1990)



The **Regulation 2018/841** brings LULUCF in the EU climate framework, including:

- Specific **LULUCF accounting rules to reflect the impact of mitigation actions**
- **"No-debit" rule:** LULUCF accounted emissions to be entirely compensated by removals
- **Flexibility** with Effort Sharing.

Among the **LULUCF accounting rules**, those for forests were the most important.

The **JRC has been the technical architect** of a **science-based approach** for setting **credible Forest Reference Levels (FRL)**, defending it in all the steps of the policy development, **in close coordination with DG CLIMA**. Huge modelling effort.

→ More than 30 official presentations to the Council, the EP (including a public hearing), Ministers, Commissioners, and a large number of stakeholders.

→ Key publications:

- Grassi G, Pilli R (2017) Projecting the EU forest net emissions: the JRC method. JRC Tech Report
- Grassi G, et al. (2018) Science-based approach for credible accounting of forest mitigation. *Carb Bal Man* 13 (8)
- Grassi G., et al. (2018) Wrong premises mislead conclusions on FRLs. *Forest Policy and Econ* (95) 10–12
- Contribution to the Technical Guidance on FRL (Forsell et al. 2018)

After a fierce discussion, with wide echoes in the highest political levels, in the scientific community (> 7 papers, petitions) and the media (>15 pieces in Euractiv, headlines in national newspapers and TV), the "JRC approach" entered in Regulation 2018/841.

28 FRLs were submitted by countries in Dec. 2018 and will be reviewed in 2019

Principles behind the new EU Forest Reference Level (FRL) approach

"Mitigation" should reflect the atmospheric impact of real deviations from past forest activities, like in other GHG sectors, and not deviations from un-reviewable assumptions

To this aim, the FRL is projected assuming the "**continuation of historical Forest Management practice"**:

- as documented by the country for 2000-2009 based using best-available data;
- in combination with the age-related forest dynamics→ avoids potentially "unfair" outcomes (if forests get older, more harvest is warranted without debits);

The FRL does not include the assumed impact of policies on future forest management

downloaded > 1900 times

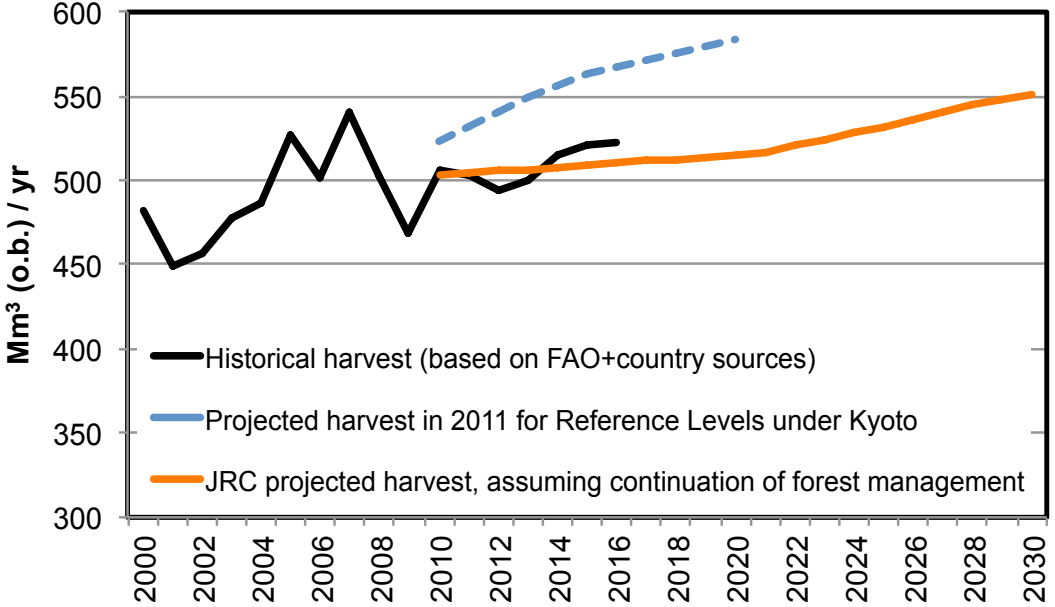
Carbon Balance and Management

Science-based approach for credible accounting of mitigation in managed forests

Giacomo Grassi[1*], Roberto Pilli[2], Jo House[3], Sandro Federici[4] and Werner A. Kurz[5]

Expected impact of the FRL approach at EU level: HARVEST

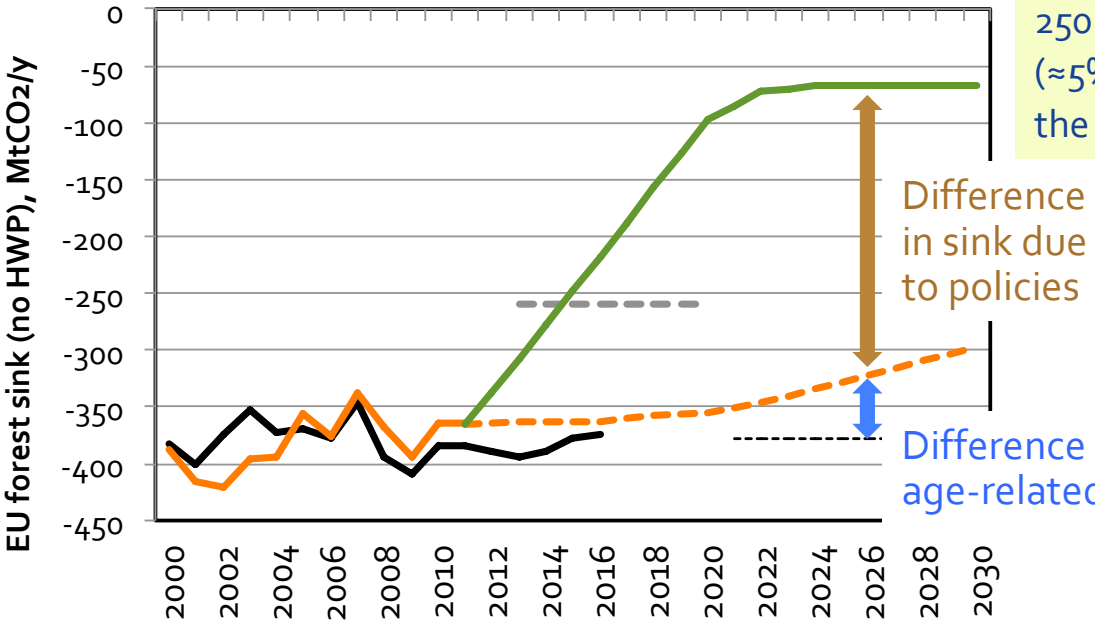
- Due to age-related dynamics, **harvest volumes expected to increase by 12% in 2030** relative to 2000-2009 → FRLs compatible with an **active management**
- More harvest in FRL generates benefits in other sectors (**material and energy substitution**)



(from Grassi et al. 2018, *Carbon balance and Management*)

European Commission

Expected impact of the FRL approach at EU level: carbon SINK



250 MtCO2/y of policy-driven increase in emissions (≈5% of 1990 EU emissions !) would be "seen by the atmosphere" but disappear in the accounts

→ even if harvest is sustainable, the accounting is NOT comparable to other sectors

→ Credible and comparable to other sectors

- Kyoto Forest Management Reference Level 2013-2020
- Countries' GHG inventories 2018: Managed Forest Land (solid) and extrapolated average 2000-2009 (dashed)
- JRC: Managed Forest Land historical, from Grassi et al. 2018
- JRC: Managed Forest Land historical projected with CONTINUATION FOREST MANAGEMENT PRACTICE, from Grassi et al. 2018
- JRC: HIGH WOOD MOBILIZATION SCENARIO (all growth in 'forests available for wood sypply' is harvested), from Jonsson et al. 2018

4. Conclusions

Paris goals can't be met without forest mitigation

However, some steps are still necessary, including:

- The Paris Agreement requires **comparability in estimates *countries vs. IPCC***
- **A credible accounting of forest mitigation is needed**

The JRC is really making the difference in **increasing cooperation between the scientific and the policy communities (at IPCC and UNFCCC level),** and **in bringing science and facts at the heart of policy making (at EU level)**

Can you tell me where I am? I'm lost.

You are at Latitude 50°47' North and Longitude 4°21' East, standing at 100 m above sea levels.

You must be a **scientist**. I ask you a simple question, you give me too complex information and I'm still lost.

And you must be a **policymaker**.
I give you the most accurate possible answer, but you didn't understand and you blame me!

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

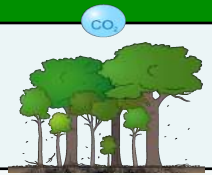
European Commission

Thank you!

European Commission

Additional slides

Options for climate mitigation through forest management

Option		current offset of total EU emissions (%)	Short-term *relative* impact of > harvest
Increase in C stock	in existing forests (CO_2 sink or "removal") 	≈ 10%	<<
	in wood products 	≈ 1%	>
Substitution effects by wood (approximate figures)	Material 	[≈ 1-2%]	>
	Fossil-fuel energy 	[≈ 4-5%]	*

Forest !

Reported/ accounted in:

LULUCF

Other GHG sectors

* While the emission saving by material substitution are immediate, when wood replaces fossil fuels the saving highly depends on the context

Trade-offs exist between options, each with its temporal dynamics of emissions.

The best mitigation strategy is the one that optimizes the sum of these options

The optimal mix is very much country-specific!

European Commission