Forest carbon accounting under the Paris Agreement:
the new EU Forest Reference Level approach and implications for bioenergy

Giacomo Grassi

European Commission, Joint Research Centre,
Bioeconomy Unit

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European Commission

OUTLINE

1. The forest mitigation opportunity under the Paris Agreement
2. The KP approach on forest accounting and consequences on bioenergy
3. The EU climate framework and new EU Forest Reference Level (FRL)
4. Conclusions

nature climate change

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†]

Carbon Balance and Management

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

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

Forest Policy and Economics

Wrong premises mislead the conclusions by Kallio et al. on forest reference levels in the EU

G. Grassi[a,*], A. Camia[a], G. Fiorese[a], J. House[b], R. Jonsson[a], W.A. Kurz[c], R. Matthews[d], R. Pilli[a], N. Robert[a], M. Vizzarri[a]

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1. The forest mitigation opportunity under the Paris Agreement

The Global Carbon Budget (2007-2017 average from **Global Carbon Project 2017**)

34.4 $GtCO_2$/yr **88%**

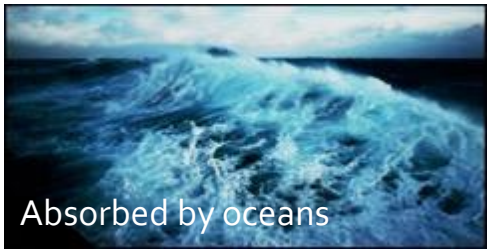
+

4.8 $GtCO_2$/yr **12%**

17.2 $GtCO_2$/yr
46%

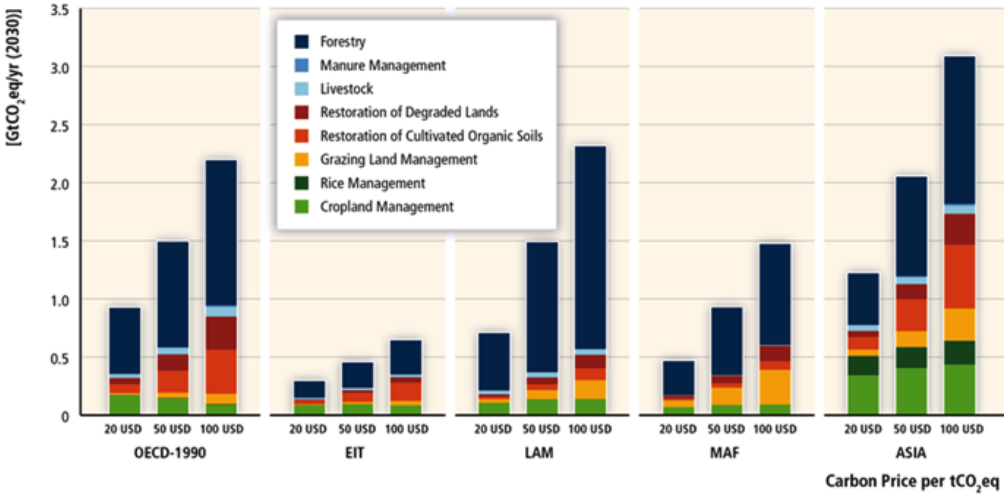
11.0 $GtCO_2$/yr
30%

24%
8.8 $GtCO_2$/yr



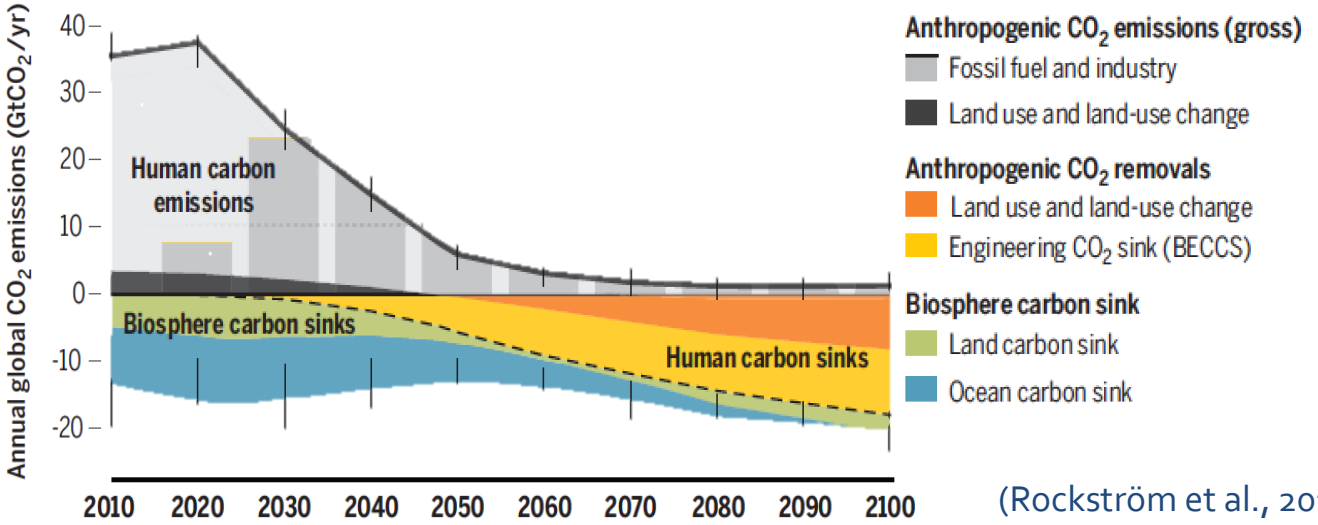
The management of forests is part of the **problem** and part of the **solution**

The large mitigation potential by forest in reflected in many studies (IPCC AR5, Griscom et al. 2017) and decarbonization scenarios (e.g. Rockstrom et al. 2017)



IPCC AR5

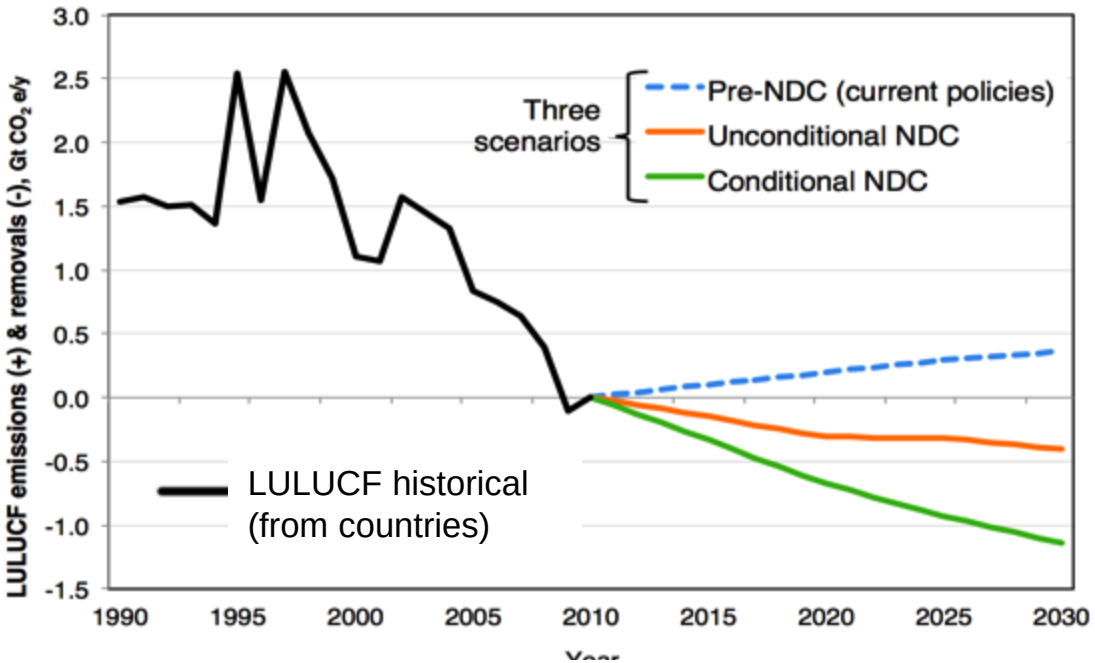
Decarbonization pathway consistent with the Paris agreement



(Rockström et al., 2017)

Despite this potential, till recently forests have been often been ignored by climate policy

like Cinderella excluded from the ball…



(Grassi et al. Role of forests in the PA, NatureCC, 2017)

Paris Agreement game changer: according to countries' Nationally Determined Contributions (**NDCs**), **forests expected to provide 25% of *planned* global emission reductions by 2030**

≈ 0.8 $GtCO_2e/yr$

≈ 0.7 $GtCO_2e/yr$

→ **apparently Cinderella shined at the Paris ball…**

Science it's clear: the PA can't be reached without forest-based mitigation

However, something is still missing…

Improvements needed:

- More **confidence in estimates**
- **Transparent and credible accounting for the forest sink**

The Paris Agreement and the challenge of forest carbon accounting

The **Paris Agreement (PA)** calls for **economy-wide targets** (Art 4.4) → cost-effective, no displacement of emissions → implies **fungibility** across sectors → **mitigation must be consistent / comparable across GHG sectors**

The PA explicitly calls for forest-based mitigation, including actions to **conserve and enhance sinks** (Art 5.1)

When "accounting" the mitigation actions towards their NDCs, countries shall promote environmental integrity and avoid double counting → **accounting should reflect genuine deviations from the 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**

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% (only 1% "accounted" under KP in 2008-2012)	<<
	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 emissions saving highly depends on the context, assumptions and time frame.

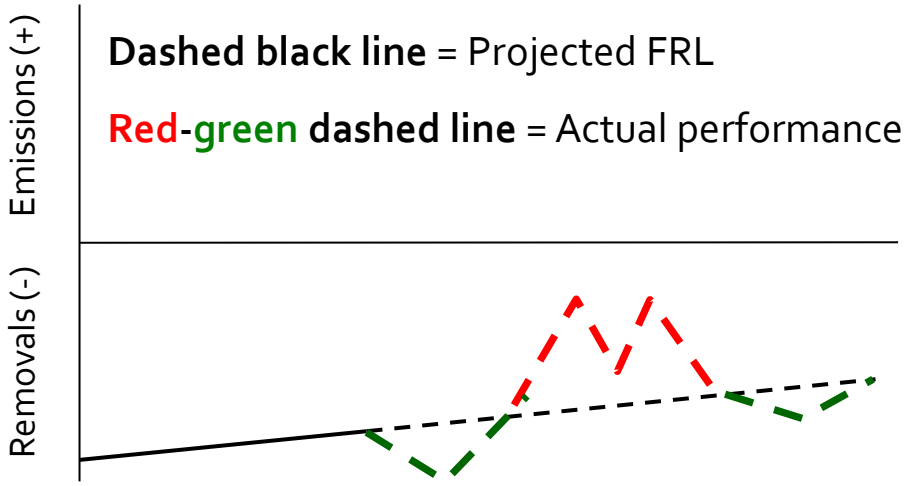
Trade-offs exist between options, each with its temporal dynamics of emissions.

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

The optimal mix is very much country-specific!

2. The Kyoto Protocol approach on forest accounting and consequences on bioenergy

To factor out age-related dynamics effects from the accounting, the idea of projected "**Forest Reference Level**" (**FRL**) was developed under the Kyoto Procol. Credit and Debits are accounted as deviation from the FRL.



Less removals than FRL = **Debits**

More removals than FRL = Credits

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

Annex 1 countries submitted FMRLs in 2011, including **age-related dynamics** and (in many cases) the **assumed impact of future implementation of pre-2009 policies.**

The conundrum of Bioenergy accounting

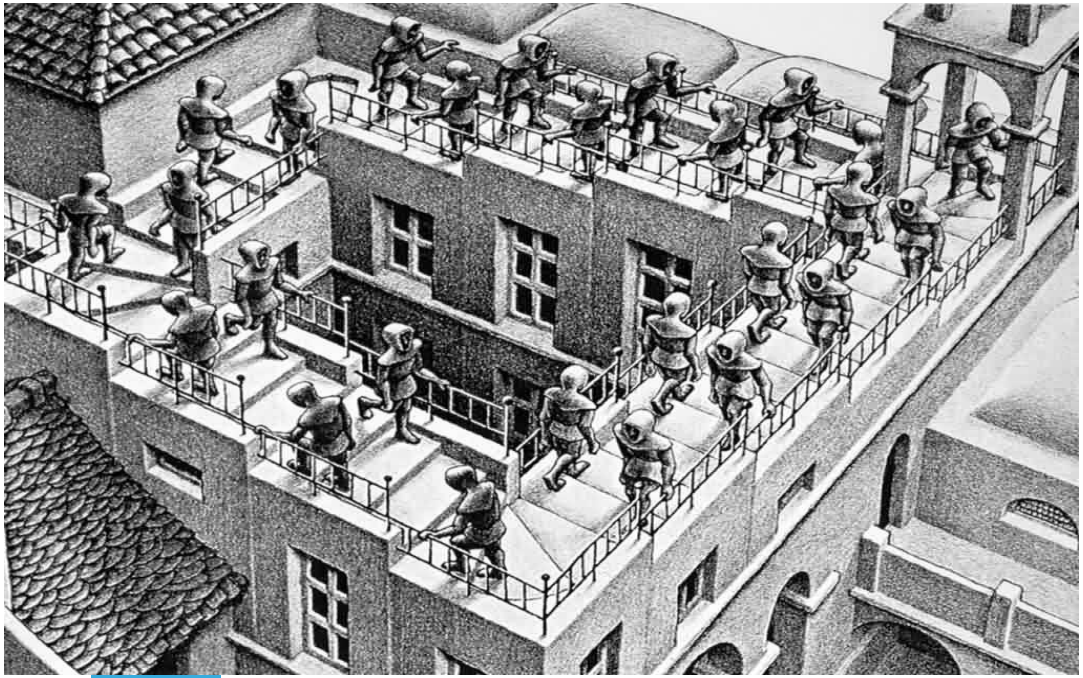
Bioenergy (emissions of biomass burning) is not accounted in the Energy sector because it is (assumed to be) accounted within LULUCF, as decrease in C stock

Which is the link between FRL and bioenergy?

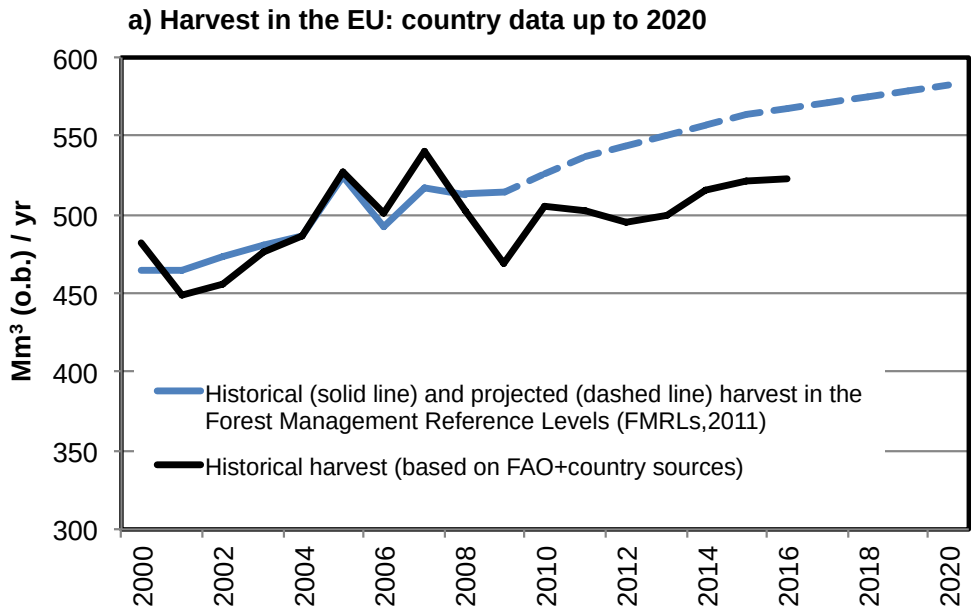
If an increase of harvest for bioenergy is *incorporated* in the FRL, the associated emissions *would be embedded in FRL (and NOT accounted against the FRL)*

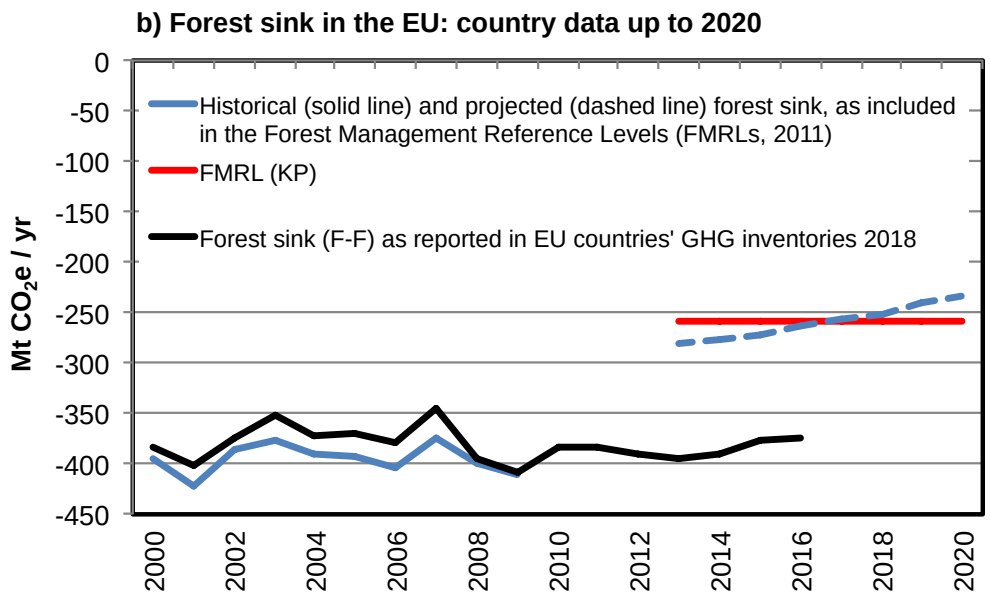
Increase relative to what?

What is the most transparent, comparable, defensible counterfactual?



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





Why reality so different from projections?

(impact of policies deviating from business-as-usual?

impact of economic crisis underestimated by models?

projections inflated with harvest?)

Which are the potential consequence of this approach?

→ would lead to credits of **110–120** Mt CO_2 /year (capped at 70–80 Mt CO_2 /year, equivalent to 1.3% of 1990 EU total emissions).

Possible impact of including policies in FRL: the case of bioenergy

Assume that an existing policy plans to build 8 new biomass plants → extra harvest in the FRL. In reality, it may happen that:

(a) Only 2 plants built → risk of **"windfall credits"**, i.e. credits for no activity, due to a deviation from assumed (and not reviewable) high harvest rates → FRL becomes a *"baseline set so low that success is guaranteed"*

(b) All 8 plants built → risk of "**hiding emissions**", i.e. policy-driven increases in emissions are "seen by the atmosphere" but not in the accounts → bioenergy NOT counted in LULUCF

Note that:

- For the atmosphere, **reducing the forest sink is = to increasing emissions** → true even if the extra harvest is "*sustainable*" and well justifiable for adaptation or bioeconomy.

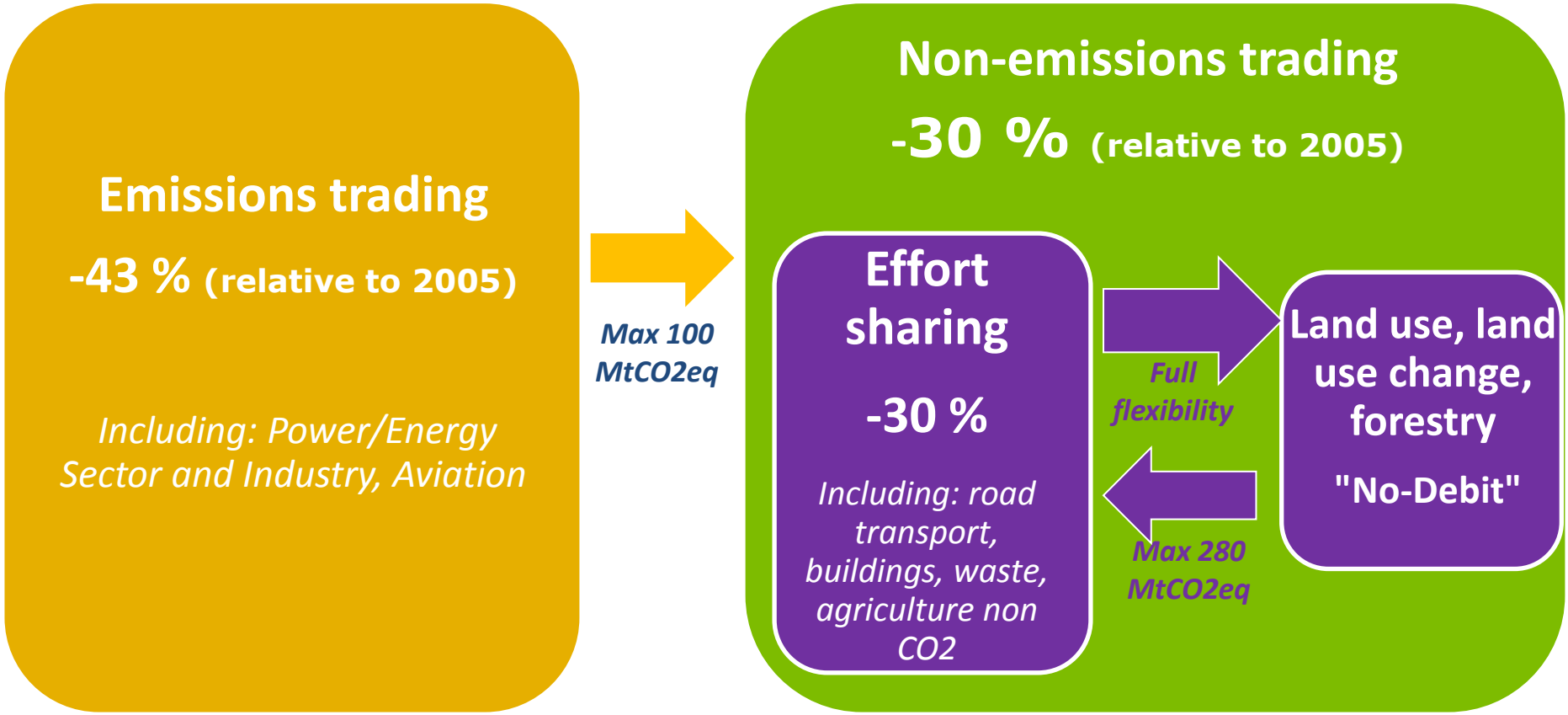
No other GHG sector is allowed to hide policy-driven emissions.

- Higher harvest → < sink, but **> reductions in other sectors, fully counted**.

Lessons learnt: policy assumptions in the FRL hamper the comparability with other sectors, where the impact of any policy after the base year is fully reflected in the accounts

3. The EU climate framework and new EU Forest Reference Level (FRL)

The pillars of EU 2030 climate framework (-40% in 2030 relative to 1990)



The **LULUCF Regulation** brings LULUCF in the climate framework as *a **stand-alone policy pillar**, with **flexibility** toward Effort Sharing. **Additional flexibilities** within LULUCF*

***No debit rule:** LULUCF accounted emissions to be entirely compensated by removals*

Principles behind the new EU Forest Reference Level approach

The **accounting of forest mitigation should reflect fully the atmospheric impact of changes in forest management practice relative to a historical period (2000-2009)** → comparable with other sectors (e.g. Agriculture).

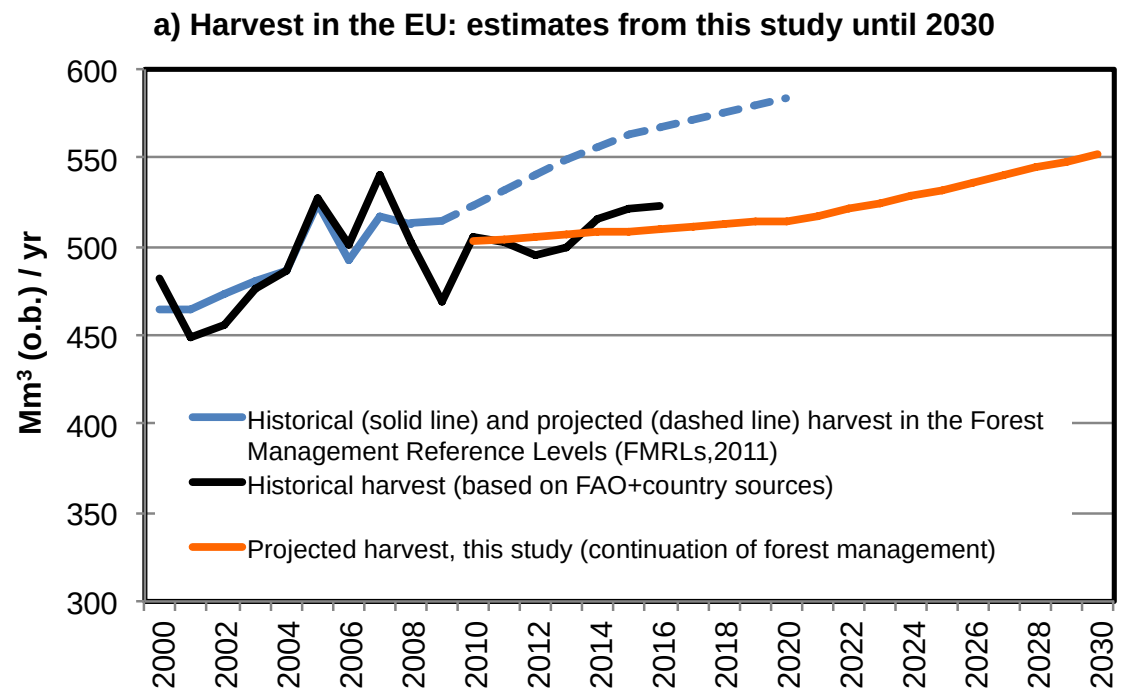
To this aim, the projected FRL is estimated assuming the "**continuation of documented historical forest management practice**", based on few key concepts:

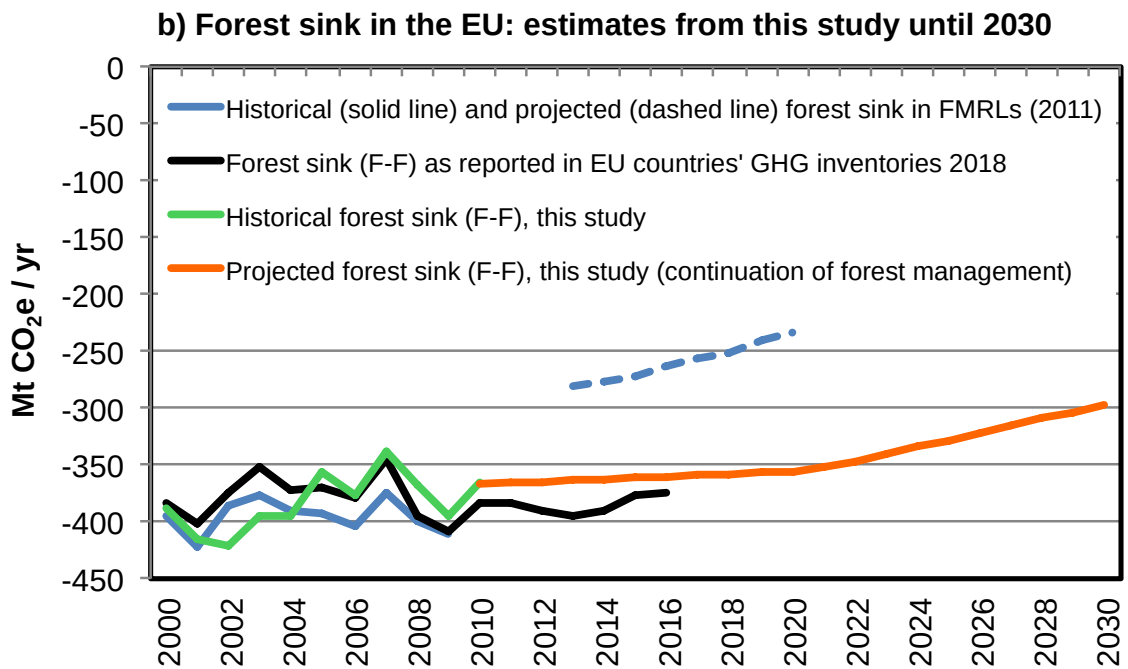
1) The historical forest management (FM) practice is defined by the country based on best-available, documentable, quantifiable and reviewable information
2) The continuation of FM practice is combined with the age-related expected changes in forest characteristics (e.g., biomass, net increment, etc.)
3) The projection does not include the assumed impact that policies and markets (i.e. demand-side dynamics) may have on future FM practices.

Technical Guidance on FRL: Forsell et al. 2018. https://publications.europa.eu/en/publication-detail/-/publication/5ef89b70-8fba-11e8-8bc1-01aa75ed71a1/language-en

Expected impact

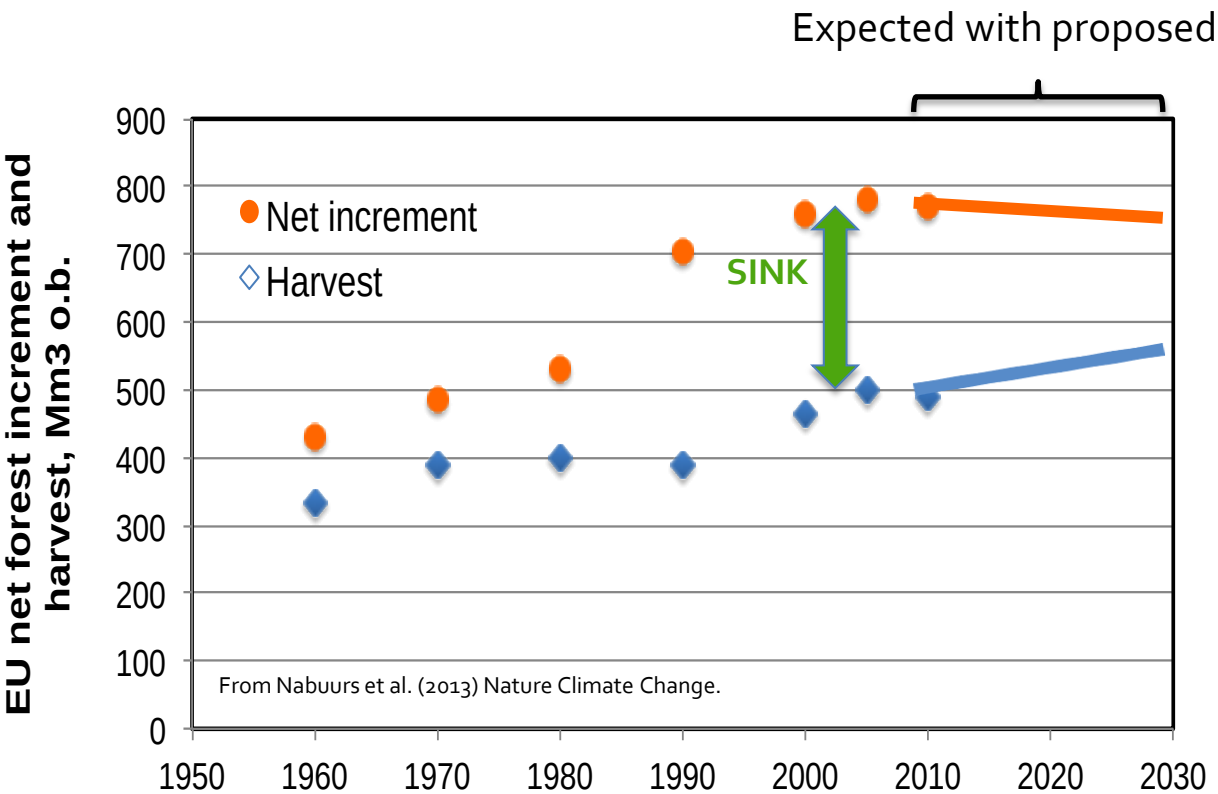
Due to age-related dynamics, **harvest volumes expected to increase by 12% in 2030** relative to 2000-2009, and sink reduces by 15%.





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

FRL and EU long-term trends



- **The % of increment that is harvested increases**
- **More harvest in FRL generates GHG benefits in other sectors**
- **Extra harvest above FRL *do not necessarily* leads to LULUCF debits**: it may be compensated by extra increment → large opportunities exist to enhance forest growth (e.g. Nabuurs et al. 2017)

Nabuurs GJ et al. By 2050 the mitigation effects of EU forests could nearly double through climate smart forestry. Forests. 2017;8(12):1–14

Some common misunderstandings on FRL

1) The FRL is a maximum harvest constraints (i.e., a cap).

NO. The FRL EU MS are free to sustainably manage their forests as they wish. The FRL is not a limit that must be met, but just an accounting baseline ensuring that forest carbon management is accounted like in other GHG sectors.

Science should help policy makers to decide not based on perceptions, but on facts.

2) FRL is exclusively based on the historical harvest levels

NO. The FRL is determined by the interaction between the projected continuation of historical management practices and age-related dynamics.

3) Not meeting the FRL could harm the forest image of the MS.

NO. A FRL is not a sustainability benchmark, and thus should not be used to assess the quality of the forest management in a country.

(from Grassi et al. 2018, Forest Policy and Economics)

4. Conclusions

This new approach to set FRL:

- Acknowledges fully the country-specific forest dynamics
- Does not "penalize" countries if forests get older
- Is compatible with an active management

At the same time, the FRL approach **increases the credibility of forest sector carbon accounting**, including for the use of **forest bioenergy** → prerequisite for its fungibility with other GHG sectors and to increase allocation of climate-related investments in the forest sector.

Challenges and Opportunities

- Technical complexities of projected FRL and review process
- Recognize and communicate an holistic and cross-sectorial approach to forest C management: not only C sink, but also substitution effects

Forests have always been central in climate negotiations

Forests emerged as an <u>essential</u> element of the Paris Agreement, as long as the *credibility* of mitigation efforts is ensured (credibility is not a easily renewable resource)

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Extra slides

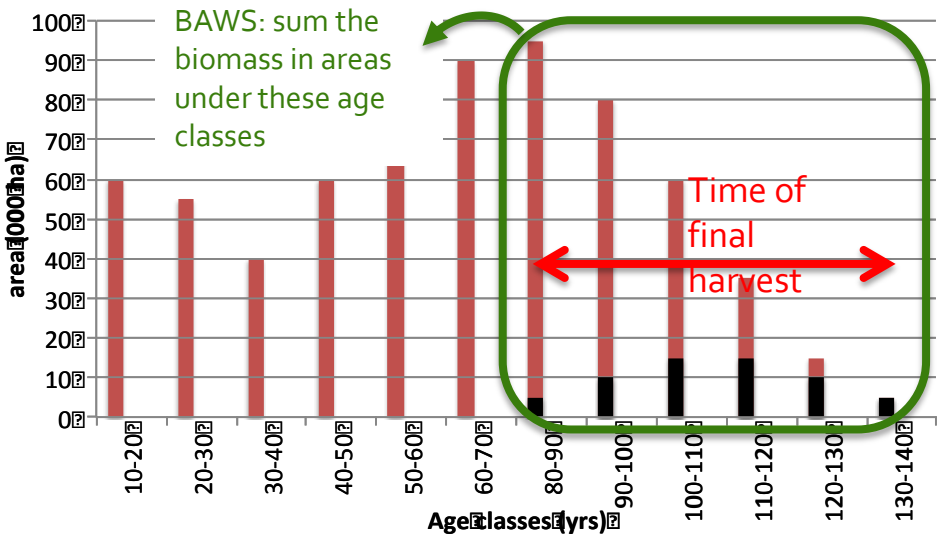
JRC method to project the "continuation of forest management practice"

(example to be applied per **forest strata**, and per management practice – other methods are possible!)

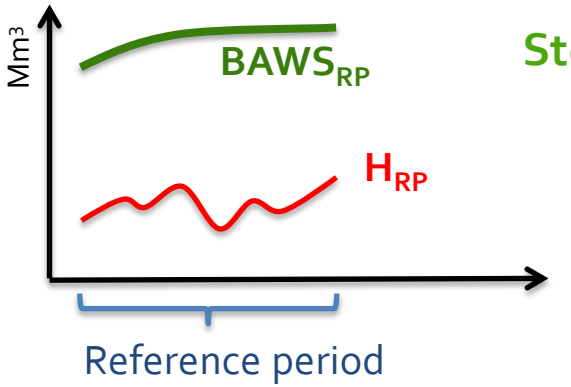
Define the Initial conditions during the Reference Period (RP, 2000-2009)

Step 1: document the current forest **management practices** for the historical RP (based on age, size, volume, etc., e.g. final harvest "expected to occur" between 80 and 140 yrs, or when trees reach 50-70 cm in diameter, or when 400-500 m³/ha are reached)

Step 2: assess the "*biomass available for wood supply*" in the RP (**$BAWS_{RP}$**) for the relevant age (or size, or volume) classes.



Step 3: document the **harvest amount** during the reference period (**H_{RP}**), from statistics.



Step 4: estimate the **Harvest Fraction** (**HF**) during RP as:

$$HF = H_{RP} / BAWS_{RP}$$

(ratio of average values)

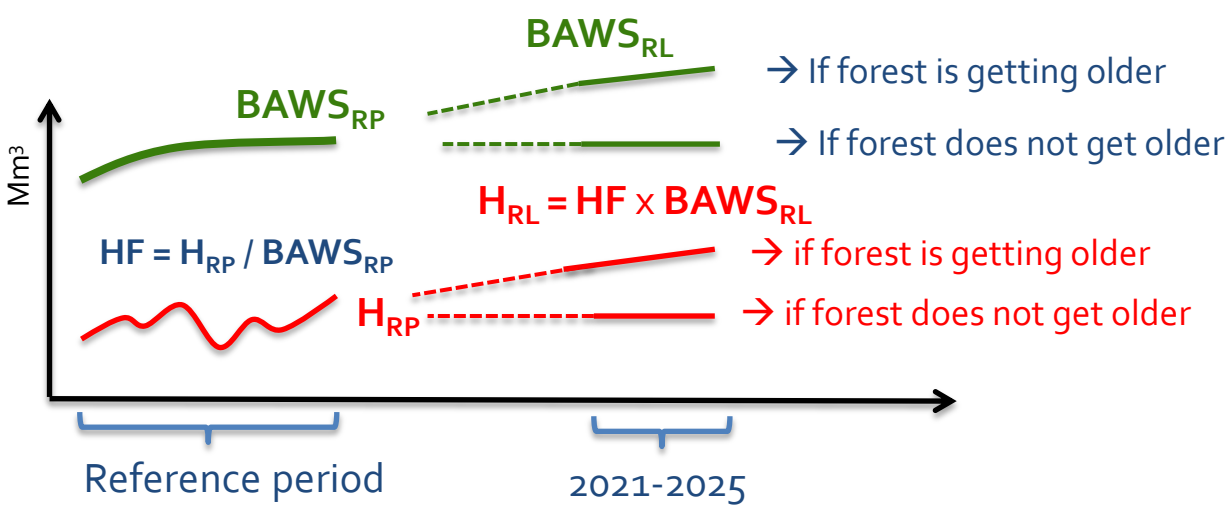
→ *proxy that expresses the impact of all constraints (markets, policies, owners' behavior, accessibility, etc.) on the harvest during RP.*

Model the net emissions in the Reference Level (RL) period 2021-2030

Step 5: model the *biomass available for wood supply in the RL period* (**$BAWS_{RL}$**) by using the same management practices used for $BAWS_{RP}$, but applied to the age structure (or size, or volume) expected during RL

Step 6: set harvest to be used for modeling the RL (**H_{RL}**) as: **HF x $BAWS_{RL}$**

Step 7: **set the FRL** (i.e. project the emissions/removals from managed forests) using **H_{RL}** combined with *the latest available info* on forest characteristics (spp., age/diameter/ increment)



Model simulations shows that, even when forest is getting older (increasing BAWS), this approach will lead, *sooner or later*, to a reduction of BAWS → forest will get younger

*More details in the **JRC report**:*
http://publications.jrc.ec.europa.eu/repository/handle/JRC106814