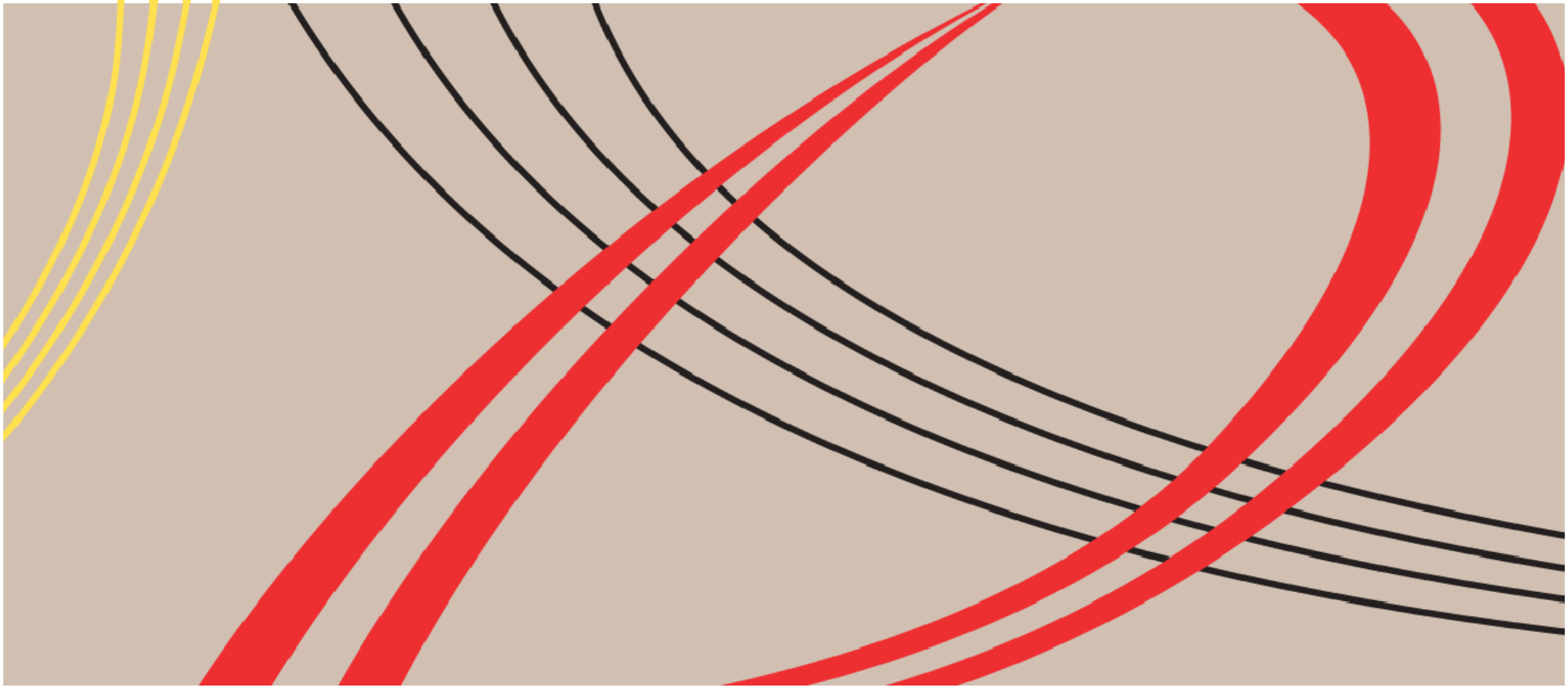
EU Reference levels for Forest Management

UNFCCC pre-sessional workshop on Forest Management
July 30, 2010



Outline of the EU presentation

- Part 1: Elements used in the calculation of reference levels
- Part 2: Information on projections and reference levels by EU Member States

Part 1 – Elements used in the calculation of reference levels

Introduction

- Previous EU submissions on forest management: Bangkok (September 2009), Barcelona (November 2009), Copenhagen (December 2009)
- Latest submission: 23th of July 2010
- Since December 2009, updates to the methodologies used in national GHG inventories and revisions of information have become available that lead to modifications of the reference levels proposed for some EU Member States
- Through the submission the EU is anwering requests for additional information received since Copenhagen.
- BAU projections up to 2020

Main elements used in the calculation

(1) Coverage of Carbon Pools and Gases

- In general, all carbon pools and gases reported to the Kyoto Protocol or the UNFCCC were included in the calculation of reference levels.
- The EU will maintain consistency in accounting between pools included in the reference level and reported in GHG inventories.

	Changes in carbon pools included in the reference level						GHG sources included in the reference level					
	Above-ground biomass	Below-ground biomass	Litter	Dead wood	Soil		Fertilization	Drainage of soils	Liming	Biomass burning		
					mineral	organic	N_2O	N_2O	CO_2	CO_2	CH_4	N_2O
Austria	yes	yes	yes	yes	no	no	no	no	no	yes	no	no
Belgium	yes	yes	yes	yes	yes	no	no	no	no	no	no	no
Bulgaria	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Cyprus	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Czech Republic	yes	yes	no	no	no	yes	no	no	yes	yes	yes	yes
Denmark	yes	yes	no	yes	no	no	no	no	no	no	no	no
Estonia	yes	yes	no	no	no	yes	no	no	no	yes	yes	yes
Finland	yes	yes	yes	yes	yes	yes	no	yes	no	no	no	no
France	yes	yes	yes	yes	yes	no	no	no	no	yes	yes	yes
Germany	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes
Greece	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Hungary	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Ireland	yes	yes	yes	yes	no	yes	no	no	no	yes	yes	yes
Italy[(1)]	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Latvia	yes	yes	no	no	no	yes	no	yes	no	yes	yes	yes
Lithuania	yes	yes	yes	no	no	yes	no	yes	no	yes	yes	yes
Luxembourg	yes	yes	no	no	no	no	no	no	no	no	no	no
Malta	yes	yes	no	no	no	no	no	no	no	no	no	no
Netherlands	yes	yes	yes	yes	no	no	no	no	no	no	no	no
Poland	yes	yes	no	no	yes	no	no	no	no	no	yes	yes
Portugal	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Romania	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Slovakia	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Slovenia	yes	yes	no	yes	no	no	no	no	no	yes	yes	yes
Spain	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Sweden	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes
UK	yes	yes	yes	yes	yes	yes	no	no	no	yes	yes	yes

Yes/No indicate if the pool or gas is included or not in the projections used to set the reference level.

(1) Non-biomass pools were excluded from the historical time series used to set the reference level. Consistency in the coverage of carbon pools will be mantained for accounting purposes.

Main elements used in the calculation

(2) Area under forest management

- Based on areas reported under “Forest Management” (if elected) or under the category 'Forest Land remaining Forest Land'.
- The area reported under 'managed forest' under the UNFCCC generally corresponds to the area reported under 'forest management' under the Kyoto Protocol.

(3) Time series

- The historical national time series covering the period 1990/2008 was used.
- Consistency with underlying historical data in GHG inventories was ensured.

Main elements used in the calculation

(4) Age class structure, species composition, increments

- Latest available national forest inventories data on age class structure, species composition and increments.

(5) Harvesting rates and wood consumption

- Harvest rates up to 2007/2008 come from country statistics or submissions to UNFCCC.
- Estimated from Members States business as usual (BAU) harvest rates, assuming only on policies and measures enacted up to July 2009.

Main elements used in the calculation

(6) Natural disturbances

- Some Member States included the average level of natural disturbances in the proposed reference level.
- Emissions from force majeure events should not be included in the calculation of the reference level.

(7) Factoring out according to para 1(h) Decision 16/CMP.1

- Not specifically included.
- No need to separate indirect effect when using the projected reference level approach as these effects cancel out when subtracting the reference level from net emissions/removals occurred during the commitment period.

Main elements used in the calculation

(8) Harvested Wood Products

- Included on the basis of instantaneous oxidation.
- Technical adjustments of the reference level may be necessary to include HWP as described in option 2 of the draft decision text.

Entry data

	Entry data Net Removals (-) or Net Emissions (+) (1 000 tCO_2eq)								Sources	
	1990		Average 1990-2007 (1)		Projection 2008-2012 (1)		Projection 2013-2020 (1)			
	FM net-removals / net emissions	Emissions from natural disturbances in the year(2)	FM net-removals / net emissions	Emissions from natural disturbances in the period	FM net-removals / net emissions	Emissions from natural disturbances in the period	FM net-removals / net emissions	Emissions from natural disturbances in the period	Historical data (1990-2007)	Projections (2008-2012) (2013-2020)
Austria	-11511	nsq	-14061	nsq	**-4380**	nsq	**-2121**	nsq	Country data	Country data
Belgium	**-4463**	nsq	**-3990**	nsq	**-3420**	nsq	**-3402**	nsq	UNFCCC	JRC
Bulgaria	**-14038**	nsq	**-12784**	nsq	**-10416**	nsq	**-10077**	nsq	UNFCCC	JRC
Cyprus	**-154**	nsq	**-146**	nsq	**-162**	nsq	**-164**	nsq	EU Monitoring Mechanism	JRC
Czech Republic	**-4667**	nsq	**-6624**	nsq	**-4339**	nsq	**-3864**	nsq	UNFCCC	JRC
Denmark	**-884**	nsq	**-850**	nsq	**2**	nsq	**179**	nsq	Country data	Country data
Estonia	**-8032**	nsq	**-5966**	nsq	**-4968**	nsq	**-1970**	nsq	UNFCCC	JRC
Finland	-23933	nsq	-30530	nsq	-24712	nsq	-13700	nsq	Country data	Country data
France	-44729	nsq	-59196	nsq	**-75839**	nsq	**-66977**	nsq	UNFCCC	JRC
Germany	**-65424**	13	-54842	8	**-4890**	nsq	**-2067**	nsq	Country data	Country data
Greece	**-1296**	nsq	**-1879**	nsq	**-1893**	nsq	**-1383**	nsq	UNFCCC	JRC
Hungary	-3913	nsq	-4012	nsq	**-1765**	nsq	**-501**	nsq	Country data	Country data
Ireland	-1251	19	-974	18	**-639**	20	**-73**	20	Country data	Country data
Italy	**-17983**	nsq	**-25097**	nsq	**-23629**	nsq	**-15606**	nsq	Country data	JRC
Latvia	**-13463**	nsq	**-14922**	nsq	**-14346**	nsq	**-12929**	nsq	UNFCCC	JRC
Lithuania	**-14528**	nsq	**-12855**	nsq	**-11998**	nsq	**-11481**	nsq	UNFCCC modified	JRC
Luxembourg	205	nsq	-399	nsq	-376	nsq	-260	nsq	EU Monitoring Mechanism	Country data
Malta	-49	nsq	-49	nsq	-49	nsq	-49	nsq	EU Monitoring Mechanism	JRC
Netherlands	**-2317**	nsq	**-2450**	nsq	**-1985**	nsq	**-1687**	nsq	UNFCCC	JRC
Poland	**-36012**	nsq	**-39384**	nsq	**-39446**	nsq	**-34671**	nsq	UNFCCC	JRC
Portugal	**4533**	**3750**	**55**	**2970**	**-657**	**2198**	**-919**	**2077**	Country data	Country data
Romania	-35583	nsq	**-37784**	nsq	**-32883**	nsq	**-29428**	nsq	UNFCCC	JRC
Slovakia	-4436	nsq	-4098	nsq	**-1634**	nsq	**-506**	nsq	UNFCCC	JRC
Slovenia	-3186	**71**	-4810	**111**	**-4920**	**100**	**-2730**	**150**	UNFCCC	Country data
Spain	**-38995**	nsq	**-38971**	nsq	**-40474**	nsq	**-41535**	nsq	UNFCCC	JRC
Sweden	-35569	18	-33835	143	-20778	348	-21844	55	Country data	Country data
UK	-12178	nsq	-12907	nsq	-8326	nsq	-3438	nsq	Country data on FM	Country data
EU-27	-393854		-423358		-338922		-283203			

(1) All intervals are inclusive of start and end years

(2) Natural Disturbances: nsq = not separately quantified

EU Reference levels (*Mt CO_2-eq)*

Austria	**-2,121**
Belgium	**-3,402**
Bulgaria	**-10,077**
Cyprus	**-0,164**
Czech Republic	**-3,864**
Denmark	**0,179**
Estonia	**-1,970**
Finland	-13,700
France	**-66,977**
Germany	**-2,067**
Greece	**-1,383**
Hungary	**-0,501**
Ireland	**-0,073**

Italy	**-15,606**
Latvia	**-12,929**
Lithuania	**-11,481**
Luxembourg	-0,260
Malta	-0,049
Netherlands	**-1,687**
Poland	**-34,671**
Portugal	**-0,919**
Romania	**-29,428**
Slovakia	**-0,506**
Slovenia	**-2,730**
Spain	**-41,535**
Sweden	-21,844
UK	-3,438
EU-27	**-283,203**

*NB: numbers is **bold** indicate changes to the EU's submission in Dec.2009*

Comparison of the EU Reference Level

- The overall impact of the July 2010 update remains limited, but tends to slightly decrease the projected sink.

- EU submission December 2009 : -286 Mt CO_2-eq
- EU submission July 2010 : -283 Mt CO_2-eq

Part 2: Information on projections and reference levels by EU Member States

- National projections were available for some Member States
- Joint Research Center from the European Commission elaborated projections for 14 Member States. These countries cover about 50% of EU forest area, 75% of the forest sink and 42% of harvest in 2008.

Projections for Forest management elaborated by JRC based on modeling work of IIASA and EFI

Slides were prepared by
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Thanks for the intense work to:
Hannes Bottcher and **Mykola Gusti** (IIASA),
Hans Verkerk (EFI), **Roberto Pilli** (JRC)
and all the others involved in this modelling work

JRC projections

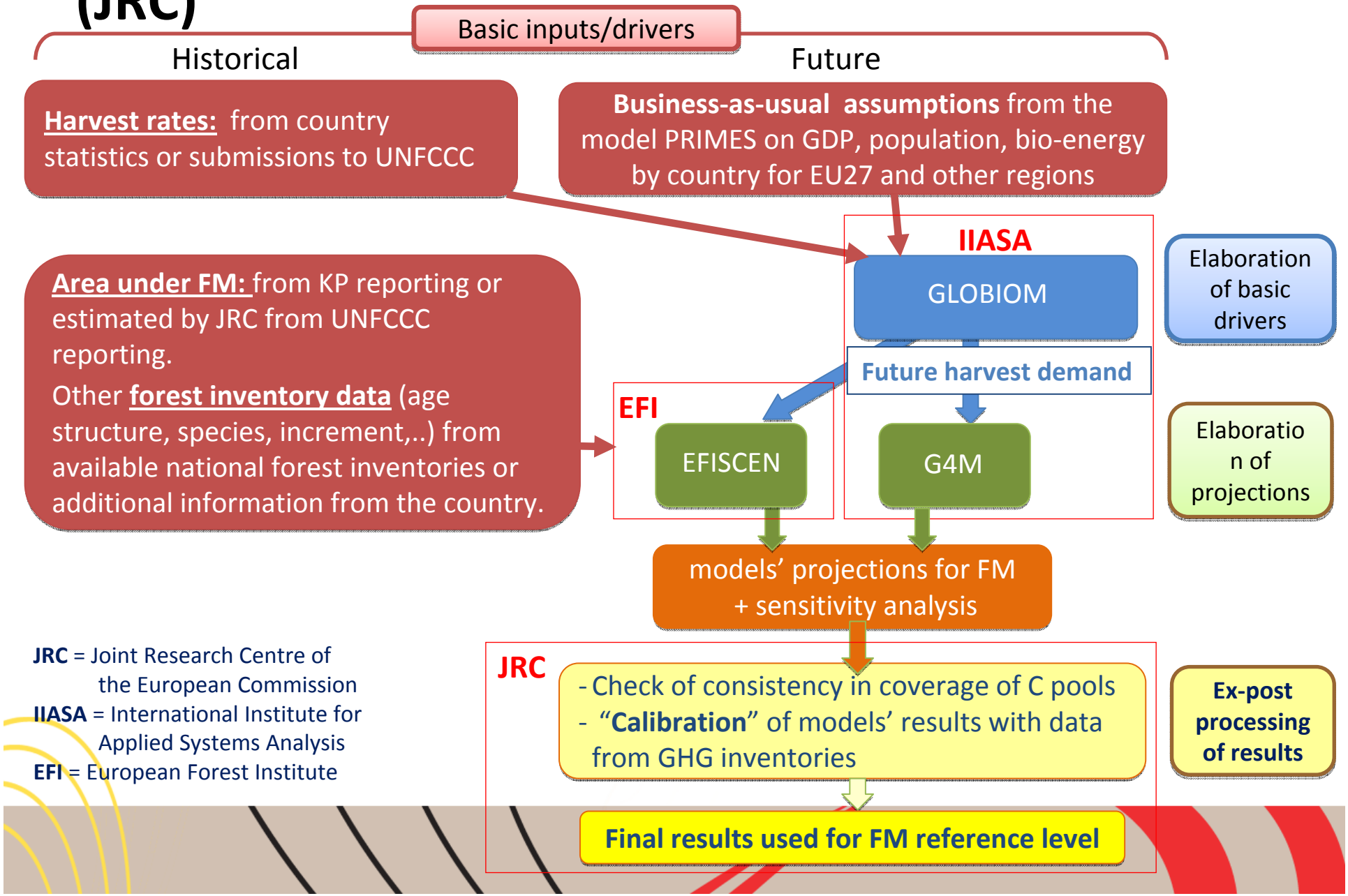
- Projections provided by the **Joint Research Centre** of the European Commission (JRC) are based on elaboration of the results of independent EU modeling groups, coordinated by the **International Institute for Applied Systems Analysis** (IIASA), assisted by the JRC and funded by the European Commission Directorate General of Climate Action (**DG CLIM**). The models used to project GHG from FM are **G4M** (from IIASA) and **EFISCEN** (from the European Forest Institute, EFI).

- All member states had the possibility to interact with modelers by providing updated data and/or comment to the methodology used.

- The 14 member states which decided to use these projections to set their FM reference level are: Belgium; Bulgaria; Czech Republic; Estonia; France; Greece; Italy; Latvia; Lithuania; Netherlands; Poland; Romania; Slovakia; Spain.
- These countries cover about 50% of EU forest area, 75% of the forest sink and 42% of harvest in 2008.

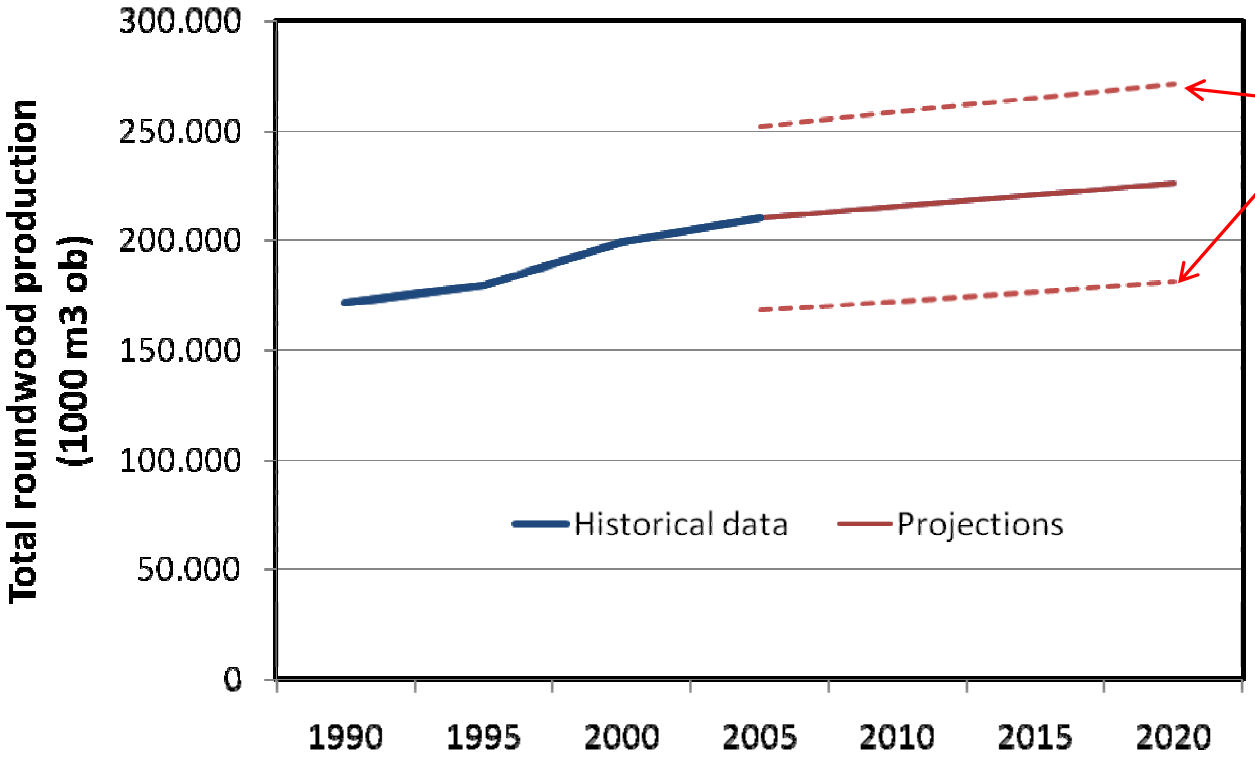
- All the data in next slides only refer to the sum of these 14 Parties.

Overview of modelling architecture (JRC)



Future harvest rate (JRC)

The **business-as-usual harvest in 2020** is derived from key drivers (GDP, population, total EU bioenergy demand) modelled based only on policies and measures enacted up to July 2009. Thus, the 20% EU renewable target is not included.

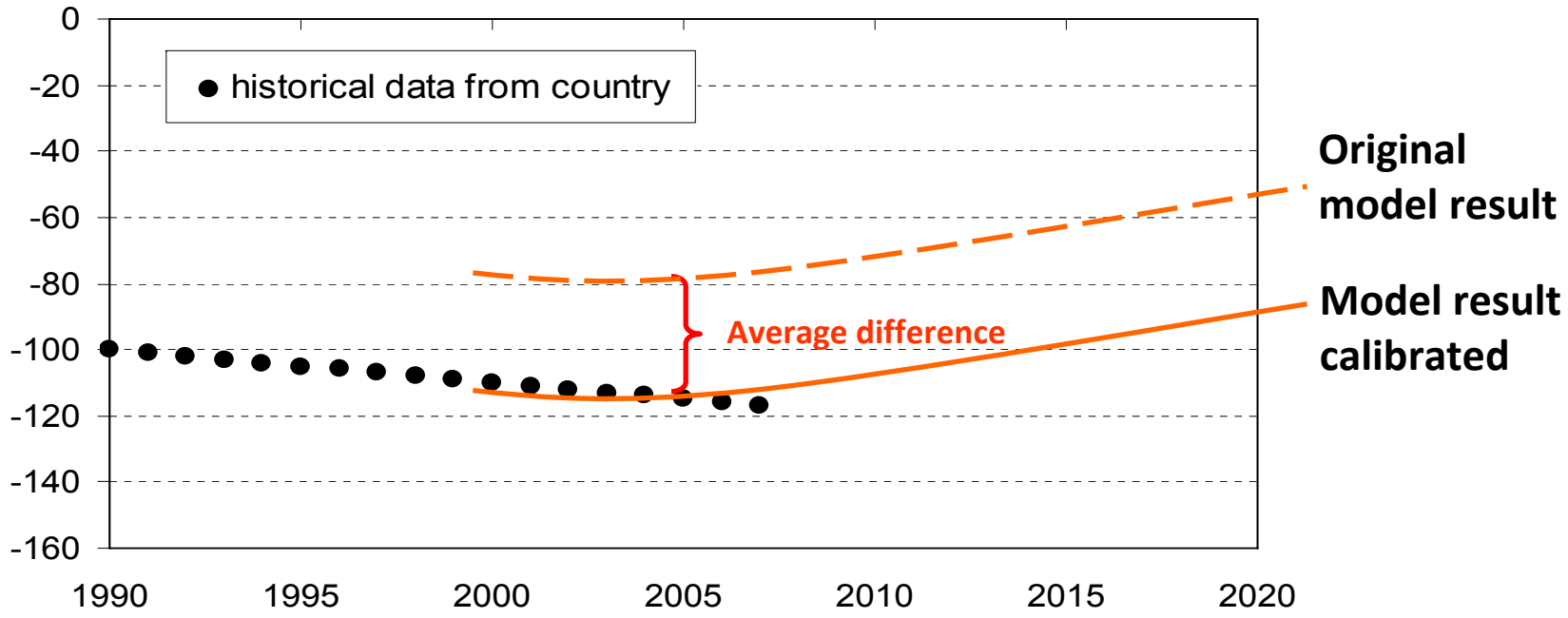


Sensitivity analysis (+/- 20% of future harvest):
- Which is the effect of different harvest assumptions on future sink?
- Which is the potential enhancement of the sink due to lower harvest?

For the 14 Parties considered, historical harvest increased by **22%** from 1990 to 2005.
For the period 2013-2020, projections foresee a further increase of **6%** compared to 2005.
(if the 20% EU renewable target was included, the increase compared to 2005 would be 13%)

Ex-post processing of results (JRC)

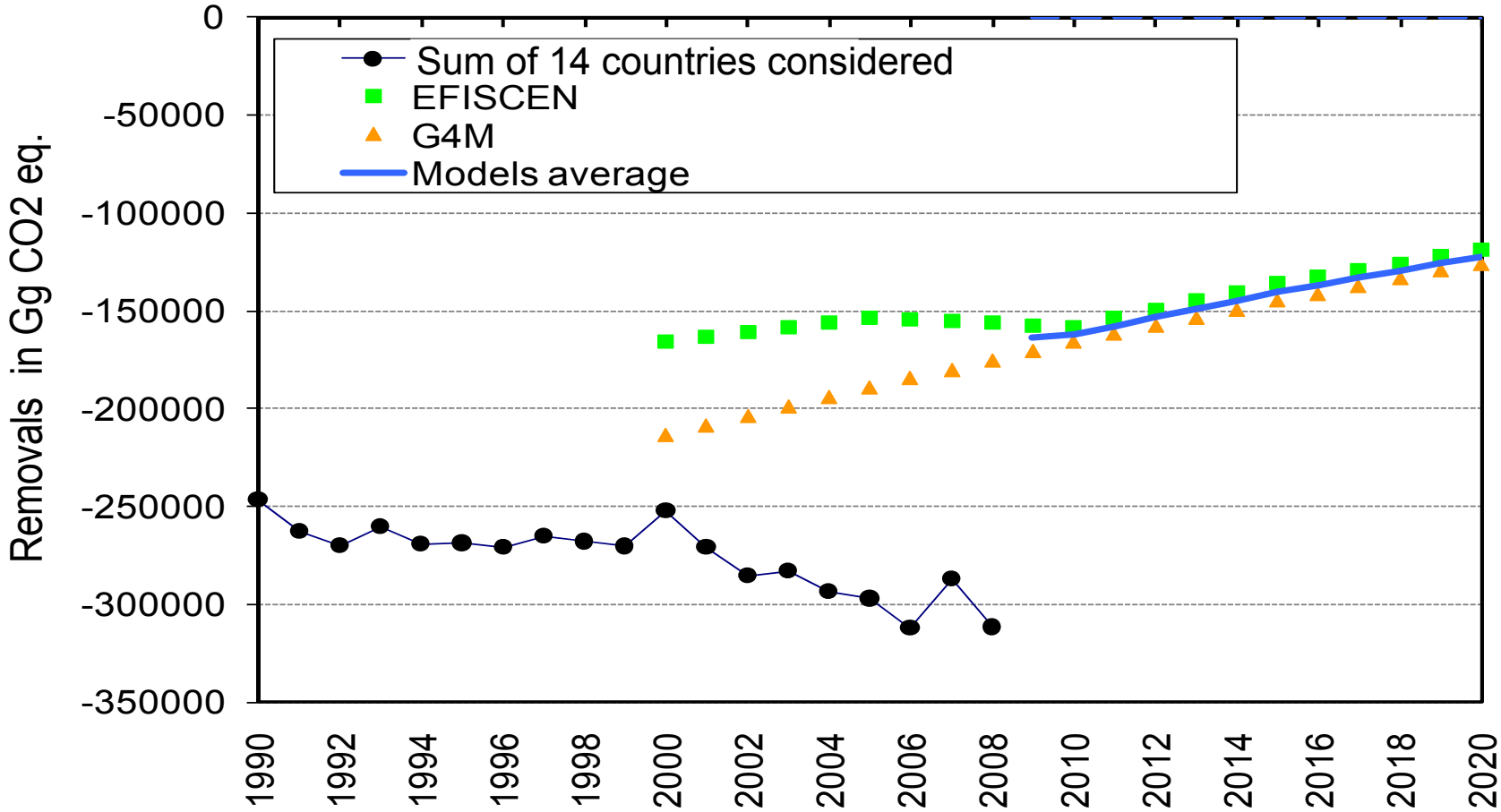
Necessary to ensure consistency with regard to:
- **coverage of carbon pools:** our projections include only the pools also reported by the country in KP/UNFCCC submissions (with one exception: see EU submission for details).
- **countries' historical emissions**: to make models' results comparable (in absolute levels) with historical data, models' results were "calibrated", i.e. adjusted to match the average historical data provided by country for the period 2000-2008. E.g.:



Calibration automatically incorporates the average rate of past natural disturbances
This interacts with the threshold to be elected for the FORCE MAJEURE

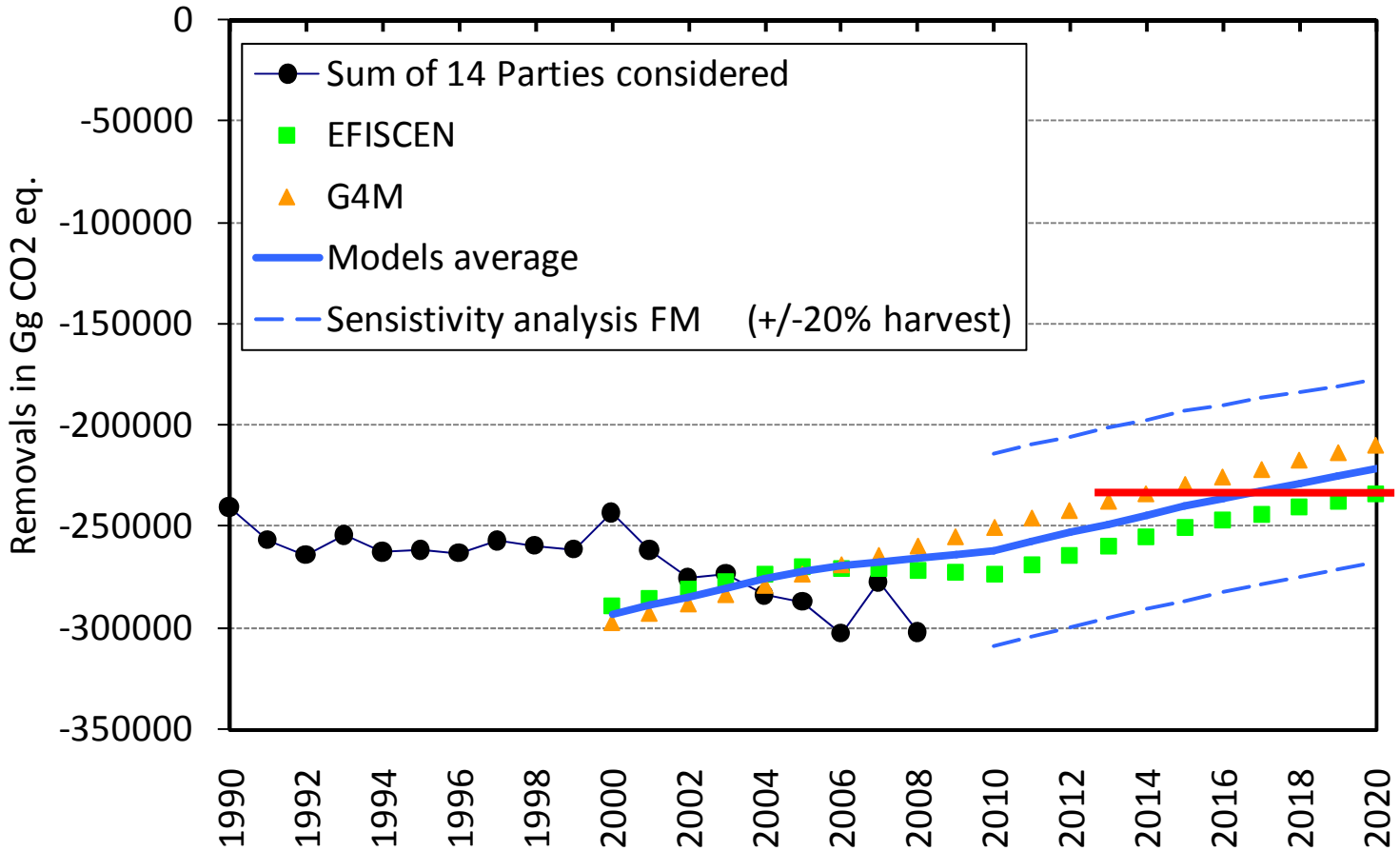
Results (JRC)

1. Original models results



The original models' results indicated a total sink for the period 2000-2008 in the 14 Parties considered which is about 1/3 less than what reported in the GHG inventories. This is compatible with the high uncertainties typically reported for LULUCF.

2. Calibrated models results (used for setting the reference level)



Average for 2013-2020 (**sum of ref levels**): 235517 GgCO2

Overall, for the 14 Parties, in the period 2013-2020 models project a sink **11%** lower than the average of 1990-2007, due to ageing forest structure and slightly higher harvest rates.

Sensitivity analysis: a +/- 20% of harvest would lead to a variation of the sink of about +/- 20%, corresponding to +/-1.4% of total KP base emissions.

Comparison with results shown in COP 15

As compared to the EU submission in COP 15, the decline in the sink projected by models for the 14 countries is now less pronounced (11% lower than 1990-2007, it was 17% in COP 15). Main reasons for this differences:

(i)new historical time series in GHG inventories submitted to UNFCCC, reflecting recalculations and/or different coverage of carbon pools; any change in historical time series affects the "calibration" procedure, and thus the reference level;

(ii)new data on future wood demand from Primes model;

(iii)comments and/or new data provided by member states to models;

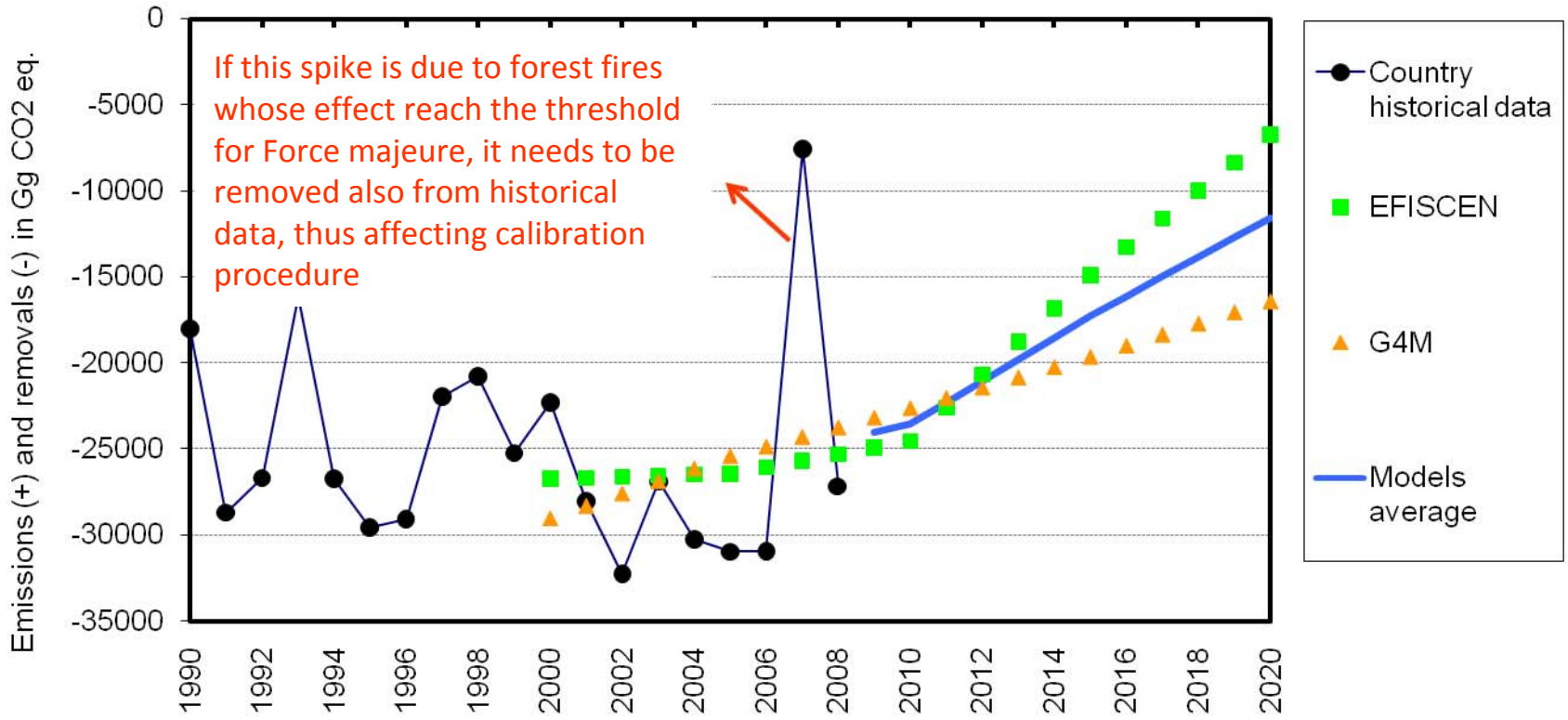
It is important to note that, for consistency reasons, **technical adjustments** (to the reference level OR to the accounted quantities) would be needed in the following cases:

1)if the threshold selected for the "force majeure" indicates that an event in the 2000-2008 period can be consider "force majeure", this event should be removed from historical emissions;

2)If a future recalculations and/or different coverage of carbon pools (also during the 2nd commitment period) affects data for the period 2000-2008.

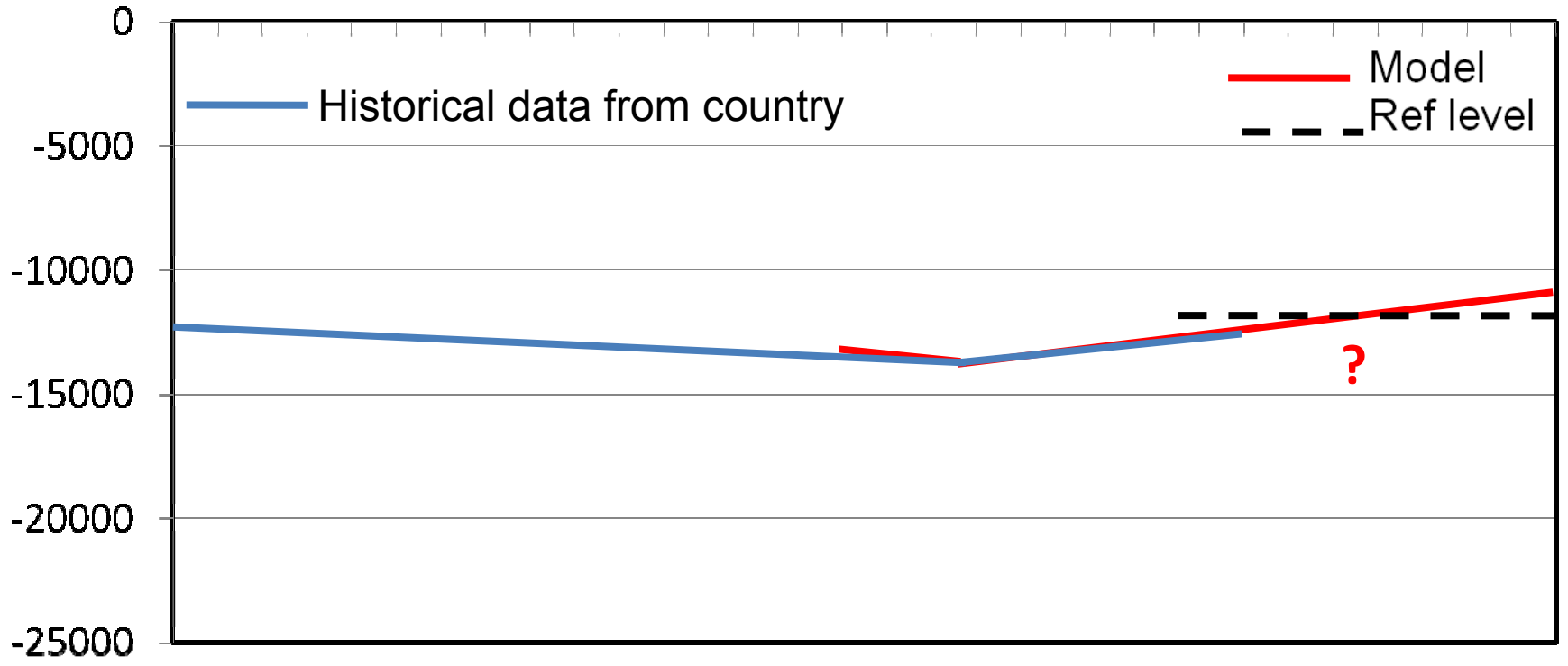
In both cases the calibration procedure would be affected, and the accounting consequences cannot be ignored.

1) Need to ensure consistent treatment of natural disturbances, e.g.:



2) Any recalculation of the historical time series (also during the 2nd commitment period) should trigger a technical correction of the reference level OR of the accounted quantities

Impact of a recalculation of the time series

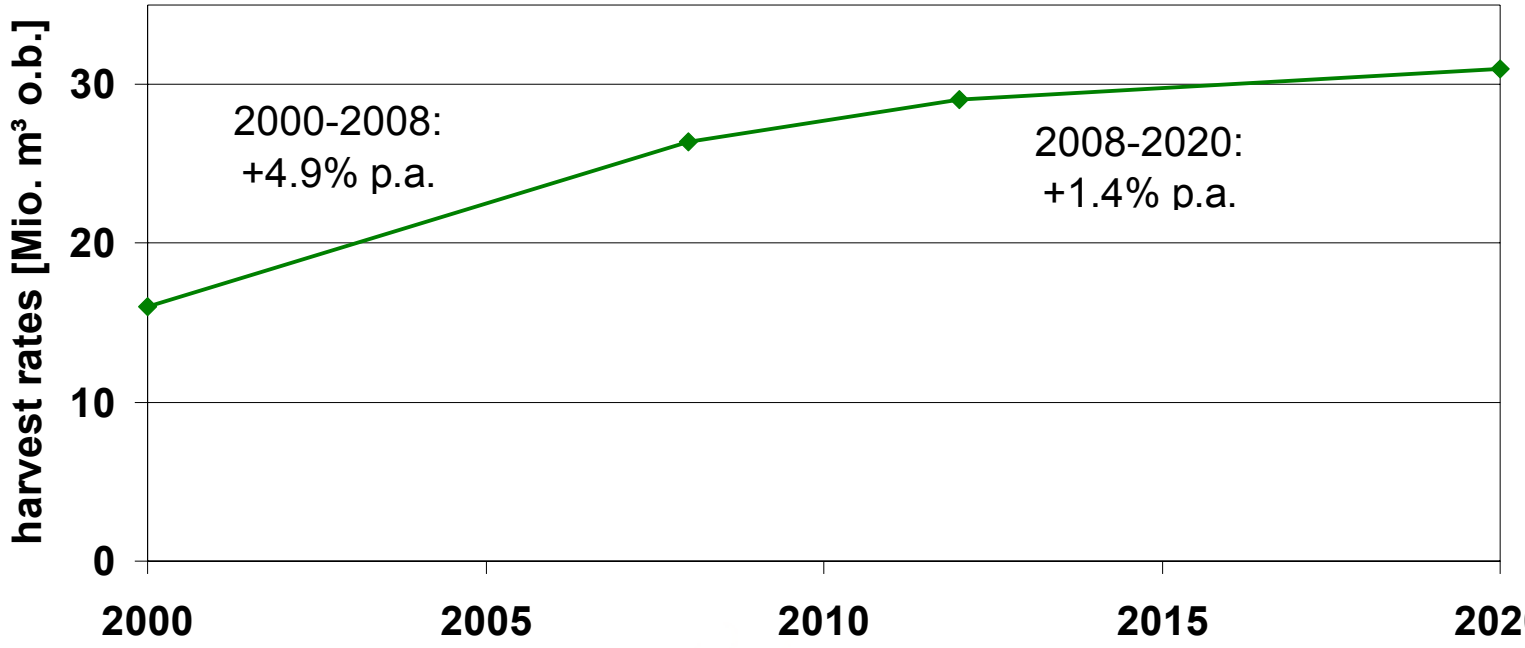


EU Member States
using their own projections

Illustrations from Austria, Denmark, Finland, Germany, Ireland, Sweden,…

Austria (1)

	1990	2008	2008-2012	2013-2020
net-CO_2 removals [Mt]	11.5	6.6	4.4	2.1
harvest rates [Mio. m³]	19.0	26.4	28.2	30.1



Austria (2)

- **Method:**
- PROGNAUS is yield and silvicultural science based model, consisting of
- → a basal area increment model
- → a height increment model
- → a tree recruitment model
- → a tree mortality model,
- → all models developed for specific Austrian circumstances
- **Model runs:**
- latest national forest inventory data used
- historic development in biomass and fuel prices considered
- economic assessment on sample plot level:
- → stands with negative increase in value evaluated and upscaled
- → survey plots with positive profit margin considered for deriving harvesting potential
- full consideration of nature conservation, as areas subject to Natura 2000 directive and other protected areas not considered for harvesting

Austria (3)

- **Pools:**
- UNFCCC: aboveground & belowground biomass, litter, dead wood
- Reference Level: aboveground & belowground biomass, litter, **dead wood pool has been added in new submission (only change to former version)**
- → now all pools as reported under UNFCCC are considered in Reference level
- **Gases:**
- UNFCCC: CO_2 emissions from biomass burning
- Reference Level:CO_2 emissions from biomass burning
- → all gases as reported under UNFCCC are considered in Reference level
- **Natural Disturbances:**
- → not considered in setting Reference level

Denmark (1)

- NFI since 2002, app. 8.500 plots, 1/5 covered every year – 5 years for a full rotation
- Species and age specific average carbon stocks from NFI data 2004-2008 (5-3 years average)
- Probabilities for regeneration for species and production classes based on data from forest census 1990 and 2000
- The prognosis for carbon stock during the period 2009-2020 is based on the NFI data on carbon stock by age classes for the different species and the probability functions for regeneration
- An overweight of old stands result in a prognosis of net emissions for the period 2013-2020.

Denmark (2)

- **Proposed RL : 179 Gg CO2**
- Since Copenhagen : change in RL from 323 to 179 due to the addition of one more year of NFI data (2009) and updated land use maps for 1990
- **Harvesting**

  Inventory methods have improved – from forest census to stock change approach – the reference level involves no estimation of growth or harvesting
- **Pools**

  The projection includes above ground and below ground living biomass and dead wood

  No soil monitoring module in the NFI – working on application of the non-source principle

  Assume no change in the litter pool
- **Natural events** which have occurred between forest census carried out in 1990 and 2000 include a background disturbance to the probability function for regeneration (this period was without large events)

Finland (1)

Historical data and projections of FM net removals (MtCO2eq):

1990	av. 1990-2007	projection 2008-12	projection 2013-20
- 23,933	-30,530	- 24,712	- 13,700

Differences between the Copenhagen submission and the present one: none

Methods used:

- compilation of estimates of C stock change in pools, forest land divided into mineral and organic soils
- SF-GTM model for simulation of economic situation of forest sector
- Mela forestry model for forest resources
- Yasso model for mineral soils

Pools and gases:

- above-ground biomass, below-ground biomass, litter, dead wood, mineral and organic soil
- N2Ofrom drainage of organic soils

Natural disturbances

Not separately quantified in historical data, not included in projections

Finland (2)

Harvest rates (mio. m3):

2000	2005	2010	2020	ratio av. 2016-25/2000	ratio av. 2013-20/2005
60,608	60,356	62,787	66,179	1,09	1,10

Harvesting volumes for the years 2006-35 based on NFI data (2004-06) and development of the forest sector until 2015 based on Finland's National Forest Programme 2015 and National Climate and Energy Strategy

Reasons for estimated decreasing sink:

- increased harvesting (use of forest biomass to be increased up to 12 mio. m3 by 2020)
- N2O emissions from drained organic soils (not included in historical data)
- decreasing amount of litter due to harvesting of forest biomass
- uncertainties in estimating emissions from soils (in recent research work, emissions seem to increase due to higher temperatures)

Germany (1)

1) Significant reduction of the sequestration rate since 1990:

- Based i. a. on reforestation activities after WW I and WW II which are now due to be harvested (age-class structure).
- Declining net increment of stocks measured by NFI (mainly due to increased harvests).
- Little higher harvests than increments (small net source) in biomass assumed for the future (2013-2020) mainly due to increasing harvest rates.

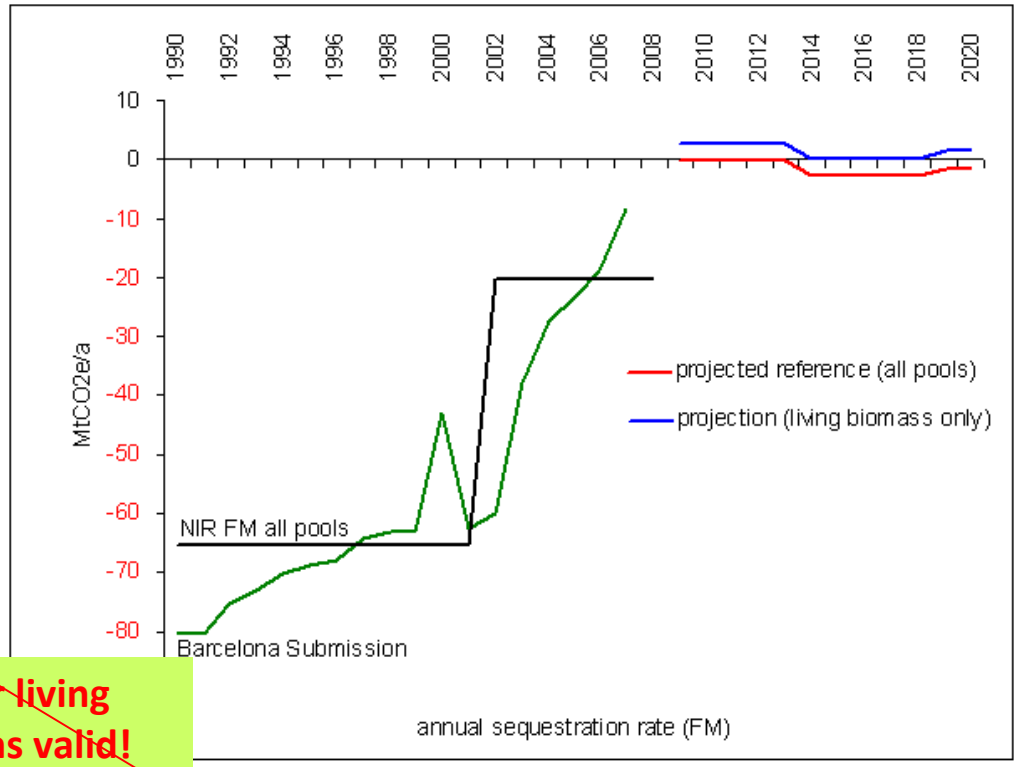
2) Derivation of the projection (WEHAM forecast) and inclusion of further pools:

- WEHAM = national forest projection model based on NFI (BWI 1987, BWI 2002 and IS 2008), consists of growth simulator, management simulator and a grading model. Harvest rates are included.
- Emissions from mineral soils and litter: actually reported as zero under IPCC methodology, thus considered zero as well for the RL.
- CO_2-emissions from forest fires: reported actually (included in the stock-change of living biomass, not explicitly calculated). Separate estimation within the RL is not possible.
- Emissions of non-CO_2-gases due to fertilization are not relevant (no application of fertilizers (except $CaCO_3$) in German forests.

3) Harvesting rates in the used scenario are the result of initial state of forests found by statistical forest inventories (last in 2008) including their structure and based on guidelines for sustainable forest management. The rates in the period 2013-2020 increase by 64% (26%) compared to the historical level of 2000 (2005).

Germany (2)

4) **Differences between the CPH submission and the current submission** (figure): the CPH submission used annual data ("Barcelona submission" 1990: -79,97 $MtCO_2e$) and a WEHAM forecast (2013-20: 0,85 $MtCO_2e$ <u>without</u> other pools than living biomass). The annual data of the "Barcelona submission" reflected an adjustment of the NIR 2009 by annual harvesting data on specific request and for illustration purposes.



5) **The updated German RL** (table) separated in living biomass and further pools plus HWP. <u>Update 1</u>: NIR 2010 instead of annual data. <u>Update 2</u>: addition of further pools than living biomass to the WEHAM forecast.

The forecast for living biomass remains valid!

FM ($MtCO_2e$)	**A** BYE 1990	**B** proposed RL	**C** forecast 08-12	**D** forecast 13-20	**E** E=D-A	**F** F=D-B	**G** G=D-C
(living biomass)	-62,528	0,848	-1,352	0,848	63,375	0,000	2,199
(further pools)	-2,897	-2,915	-2,936	-2,915	-0,018	0,000	0,022
FM total	-65,424	-2,067	-4,288	-2,067	63,358	0,000	2,221
HWP	-6,160	-3,655	-4,427	-3,655	2,505	0,000	0,772
all	**-71,584**	**-5,722**	**-8,715**	**-5,722**	**65,863**	**0,000**	**2,993**

Ireland (1)

- COP15 submission -0.085 Mt CO_2 (2013-2020)
  - Ref. period selected to minimise age class legacy (see extra notes)
  - All pools &all gases except:
    - N_20 from fertiliser (included in Agric. emissions)
    - CO_2 from liming (not occurring)
  - Methods for FM (see extra notes)
    - Sample 1000 plots used in CARBWARE model simulation
    - Use BAU silviculture management scenarios and timber harvest forecast (Coillte)
    - Trend adjustment with historic data (see notes)
    - Good agreement with JRC model (see notes)

Ireland (2)

- **Current changes (small)**

- **Ref (2013-2020) -0.085 to -0.073 $MtCO_2$**
- **Inclusion of natural disturbance (fires)**
  - Consistent with historic time series (disturbances included)
  - Estimated to 0.012 Mt CO_2 in ref. year
  - Methodology NIR 2007, 2008 (Tier 1)
    - Wild fire statistics for area
  - Assumption for projection:
    - use mean value from CRF and NIR (1990-2008) 0.02 Mt CO_2
    - 60 % of total forest area is FM for 2013-2020 period (i.e. 0.02 x 0.6)
  - Other disturbances (wind throw) assumed to be included in forecast

Sweden (1)

- **Key Features:**
- **Average RL for Forest management 2013-2020 : 21.8 M ton CO2 per year**
- Based on official long-term model simulations for roundwood growth and harvest, converted into UNFCCC carbon accounting.
- Instant oxidation of HWP is assumed
- Potential natural disturbances is excluded
- Projected BAU sink slightly bigger than in the reported sink in recent years, which includes the effect from natural disturbances, i.e storms (see graph).
- Annual felling is assumed to be at the level of what is regarded as sustainable in the long term.

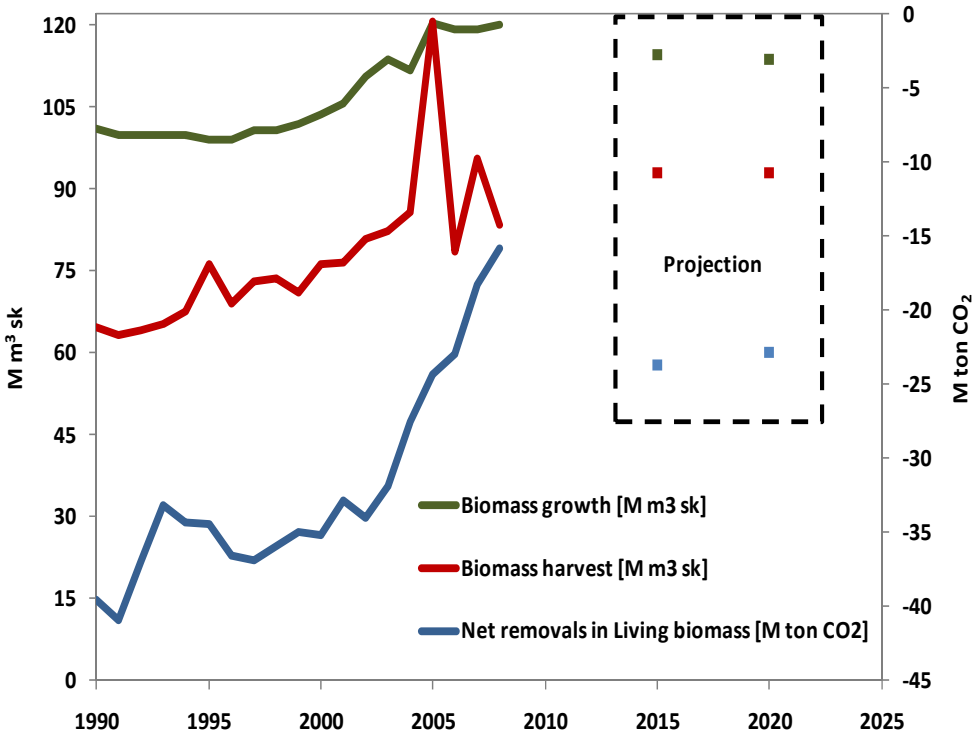


Figure 1. *Historical and projected growth and harvest rates (m3), as well as net removals in the living biomass pool (ton CO2). Historical data includes natural disturbances, projected data excludes natural disturbances.*

Sweden (2)

- **Key Features (cont.):**
- The RL is based on projections of average annual net removals 2013-2020.
- Includes all carbon pools currently reported to the KP.
  (living biomass, dead organic matter and soil organic carbon)
- Net removals in 2013-2020 is calculated using BAU scenarios for 2015 and 2020 including only policies already in place 2009.
- The standing stock at the start of the simulation is based on the Swedish NFI, which also form the base for the annual reporting to the convention and the KP.
- Uncertainty is high, both in underlying historical data and in parameters used in the projections.

For ALL EU Member States: Additional information is available in the EU July 2010 submission as well as in EU submissions in 2009.

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Thank you!