# Closing the KP2: Forest Management Reference Level and Technical Corrections

G. Grassi, R. Abad Viñas

JRC LULUCF workshop, 7 June 2021

The Forest Management Reference Level (FMRL) is a value of average annual net emissions and removals from FM in the 2nd Commitment Period of the Kyoto Protocol (KP CP2), against which the net emissions and removals reported for FM during CP2 will be compared for accounting purposes.
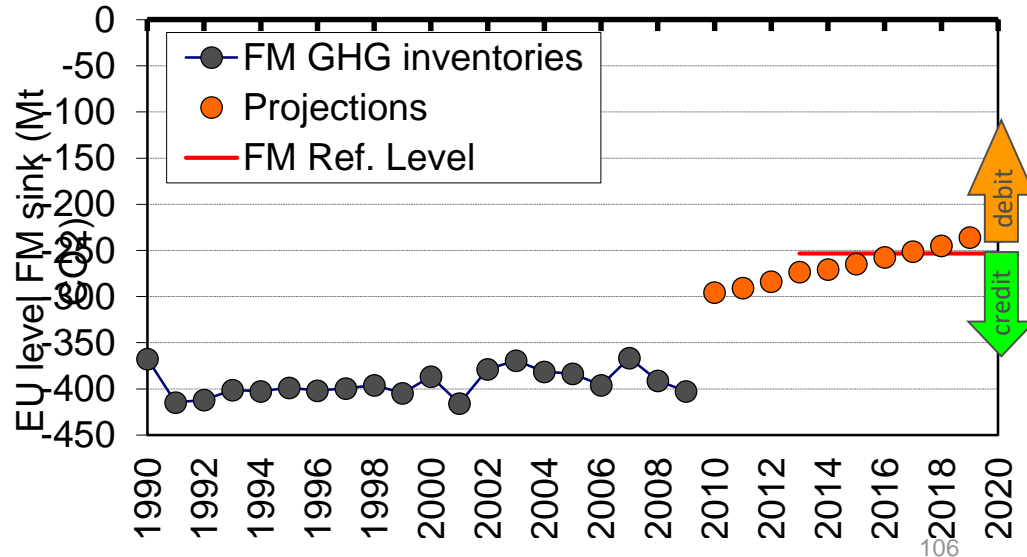
The guidance on how to construct the FMRL is provided by the Appendix II to the UNFCCC Decision 2/CMP.6

Based on IPCC KP supplement (https://www.ipcc-nggip.iges.or.jp/home/2013KPSupplementaryGuidance_inv.html),

this presentation covers:

- Short overview of approaches/methods used and elements considered for FMRL (this information provides the basis for assessing the methodological consistency)

- Methodological consistency related to the FMRL (Section 2.7.5 IPCC KP Suppl)

- Technical Corrections (Section 2.7.6 IPCC KP Suppl)

European Commission

APPROACHES AND METHODS USED FOR FMRLs

38 Parties submitted FMRLs with following **approaches**:

1) FMRLs based on <u>projections under a 'business as usual'</u> (BAU) scenario. This includes two **methods**:

   (a) model-based projected BAU, with country-specific methodology, or common methodological approach (JRC-IIASA-EFI).

   (b) projections based on the elaboration (average/extrapolation) of historical data from GHG inventories, assumed as proxy for a BAU

2) <u>Historical FMRL based on the single year 1990</u>

3) <u>FMRL equal to zero</u>

European Commission

ELEMENTS CONSIDERED FOR FMRLs

- Pools and gases
- Area under Forest Management
- Historical data from greenhouse gas inventory
- Forest characteristics and related management
- Historical and assumed harvesting rates
- Harvested wood products
- Natural disturbances
- Factoring out
- Policies included

European Commission

METHODOLOGICAL CONSISTENCY

Consistency is a key principle in GHG inventories.

2006 IPCC Guidelines (GL): consistency means that an inventory should be internally consistent in all its elements over a period of years (*time-series consistency*), i.e. the same methodologies and consistent data sets used for all years.

Under certain circumstances an inventory using different methodologies for different years can be considered to be consistent if it has been recalculated in a transparent manner, and if potential inconsistencies are minimized in accordance with IPCC GL.

European Commission

2006 IPCC GL describes **situations in which time series consistency may not be achieved**, e.g.:

(i)   Recalculations due to methodological changes / refinements;

    • *Methodological change*: a switch to a different tier (or to a different method, e.g. from Stock-Difference to Gain-Loss, or from inventory-based to process-based method), often driven by the development of new and different data sets.

    • *Methodological refinement*: same tier used, but different data source, model version or level of aggregation.

    Both methodological changes and refinements over time are an essential part of improving inventory quality.

(i)   Adding new categories (including new C pools and gases).

European Commission

In the context of FMRL, methodological consistency refers to the need of consistency, during the CP, between the **methodological elements** used in the construction of FMRL (as reported in the FMRL submission) and those used in the reporting of FM, i.e.:

(i)   *Method* used for FMRL (models or aver./extrap. of historical time series);

(ii) *Historical data* used for FMRL, e.g. forest area, harvest, increment, age structure, forest characteristics and management, net emissions and related estimation parameters, etc.;

(iii) Other elements used for FMRL, e.g.: pools and gases, treatment of HWP, natural disturbances, climate and other parameters used by models;

A change in methodological elements used in the construction of FMRL triggers a methodological inconsistency, to be addressed through a **Technical Correction**

European Commission

By contrast, a deviation in **policy assumptions** under business-as-usual scenario (as reported in the FMRL submission) from those assumed in constructing the FMRL *does not represent a methodological inconsistency* → no Technical Correction.

Policy assumptions include economic assumptions or responses (e.g. harvesting decisions), assumptions on future FM area, on future management of forest, on forest characteristics, on harvesting rates (including variations in harvesting rates as compared to historical period) or amounts, on HWP (including the assumptions about the quantities of HWPs produced in the major categories, i.e. sawnwood, panels, paper).

European Commission

For projected FMRLs, it is *good practice:*

- To provide information on main factors generating the accounted quantity (FM - FMRL), e.g., that a higher (or lower) sink during the CP as compared to what assumed in the BAU FMRL is quantitatively consistent with the observed lower (or higher) harvest rate, and/or to provide evidence of other major factors involved. The aim of this information is to show that estimates in the 2nd CP can be explained as deviations in policy assumptions (e.g., harvest rate) compared to FMRL.

- To show that model-based calculations used for FMRL reproduce the data for FM or FL-FL for the historical period reported in the FMRL submission (i.e. period not affected by deviations from policy assumptions under BAU).

FM area

In the event of change in FM area during the CP, it is *good practice* to document transparently that this is not a result of change in FM activity definition, but rather a result of newly implemented policies not included in the FMRL submission.

C pools included

Once a pool has been included in the FMRL, for consistency reasons this pool is required to be reported and accounted also during the CP, irrespective of the pool being a sink or a source.

European Commission

TECHNICAL CORRECTIONS

If methodological inconsistency exists between the FMRL and the FM reporting during the CP, to ensure consistency, Parties are required to apply a Technical Correction.

The Technical Correction (TC) is a net value of emissions /removals, which is added at the time of accounting to the original FMRL to ensure that accounted emissions / removals will not reflect the impact of methodological inconsistencies

Technical Correction = FMRL$_{corr}$ - FMRL

European Commission

CHECK LIST TO DETECT METHODOLOGICAL INCONSISTENCIES AND NEED FOR TC

Criteria	Action
1 The method used for GHG reporting of FM or FL-FL changed after the adoption of FMRL	Calculate FMRL$_{corr}$ ensuring consistency between reported FM and FMRL
2. Any of the following methodological elements used for FMRL (as reported in the FMRL submission) changed after adoption of FMRL	

Element	Addition /modification in GHG inventory
a) Pools and gases	New pools or gases
b) Area under FM	Recalculated historical data* on area
c) Historical data for GHG inventory	Recalculated historical data* for FL-FL or FM.
d) Forest characteristics and management	Recalculated historical data*
e) Historical Harvesting rates	Recalculated historical data*
f) Climate data assumed by models for projecting FMRL	Different observed climate data as compared to what assumed in FMRL
g) Harvested wood products	New/recalculated data and/or methods
i) Natural disturbances	New/recalculated data and/or method; inclusion of submitted (in 2015) or revised (later) background level and margin with assumptions different from FMRL

3. Other possible methodological inconsistencies, e.g., the FMRL model's outputs are not capable of reproducing the historical data* reported for FM or FL-FL.

* data for the time period used in the construction of the FMRL

EXAMPLES OF CASES WHICH MAY LEAD TO METHODOLOGICAL INCONSISTENCY BETWEEN FMRL AND REPORTING OF FM DURING THE 2ND CP

Case 1:

At the time of FMRL submission:

-The GHG inventory used a *Stock-Difference* or *Gain-Loss* (i.e. not a model)

-The FMRL was constructed using model X

Can this country apply a different method in GHG reporting during the 2ⁿᵈ CP?

Yes, but this will create a methodological inconsistency, which triggers a TC.

Can this country apply the model X in GHG reporting?

Yes, this will ensure consistency between the FMRL and FM.

Can this country apply a new model Y in GHG reporting?
Yes, but this will create a methodological inconsistency, which requires a TC. In this case, a possible way to address the inconsistency is using the new model Y also for calculating the $FMRL_{corr}$ as part of the TC process.

European Commission

EXAMPLES OF CASES WHICH MAY LEAD TO METHODOLOGICAL INCONSISTENCY BETWEEN FMRL AND REPORTING OF FM DURING THE 2ND CP

Case 2:

At the time of FMRL submission:

- The GHG inventory used model X

- FMRL was constructed using model X

Can this country use a new model Y (or new version of model X) in GHG reporting?

Yes, this will create a methodological inconsistency, which may be addressed by using the new model Y (or new version of the model X) also for calculating the FMRLcorr as part of a TC process.

European Commission

EXAMPLES OF CASES WHICH MAY LEAD TO METHODOLOGICAL INCONSISTENCY BETWEEN FMRL AND REPORTING OF FM DURING THE 2ND CP

Case 3:

At the time of FMRL submission:

- The GHG inventory used data from NFIs representing the years 1995 and 2005

- FMRL was modelled using historical input data for the period 2000-2009, where 2000-2005 were based on the two NFIs and 2006-2009 were extrapolated using existing NFI-data.

In the year 2012, a new NFI was finalized resulting in a recalculation of data for the period 2006-2009. This triggers a recalculation of the GHG inventory, and consequently a TC has to be applied. The new time series for 2000-2009 including historical data for 2000-2005 and recalculated historical data for 2006-2009 are used for calculating the FMRLcorr. Only data representing the same years as the data used to calculate the initial FMRL shall be used to calculate the FMRLcorr.

# HOW TO PERFORM AND DOCUMENT THE CALCULATION OF FMRL$_{CORR}$

Several methods possible, depending on the approach used for FMRL, the cause of the inconsistency and the data available.

It is *good practice* to provide information that the method used avoids the expectation of net credits / debits linked to any inconsistency between FMRL$_{corr}$ and reporting for FM during the CP.

In the case of projected FMRLs, FMRL$_{corr}$ may be calculated by, e.g., a new model-based projection using new historical data. *It is essential to keep all the policy assumptions of the FMRL submission unchanged*.

It is *good practice* to show that the new model-based calculations used for FMRL$_{corr}$ are capable of reproducing the data for FM or FL-FL for the historical period reported in the FMRL submission (or to provide any explanation if it is not the case).

European Commission

If the need for a TC has been identified, but a **new model run** cannot be done, time-series consistency may be ensured by using one of the methods by 2006 IPCC GL, including the "**overlap**" (ex-post calibration) between models results and data for the historical period (before the FMRL submission).
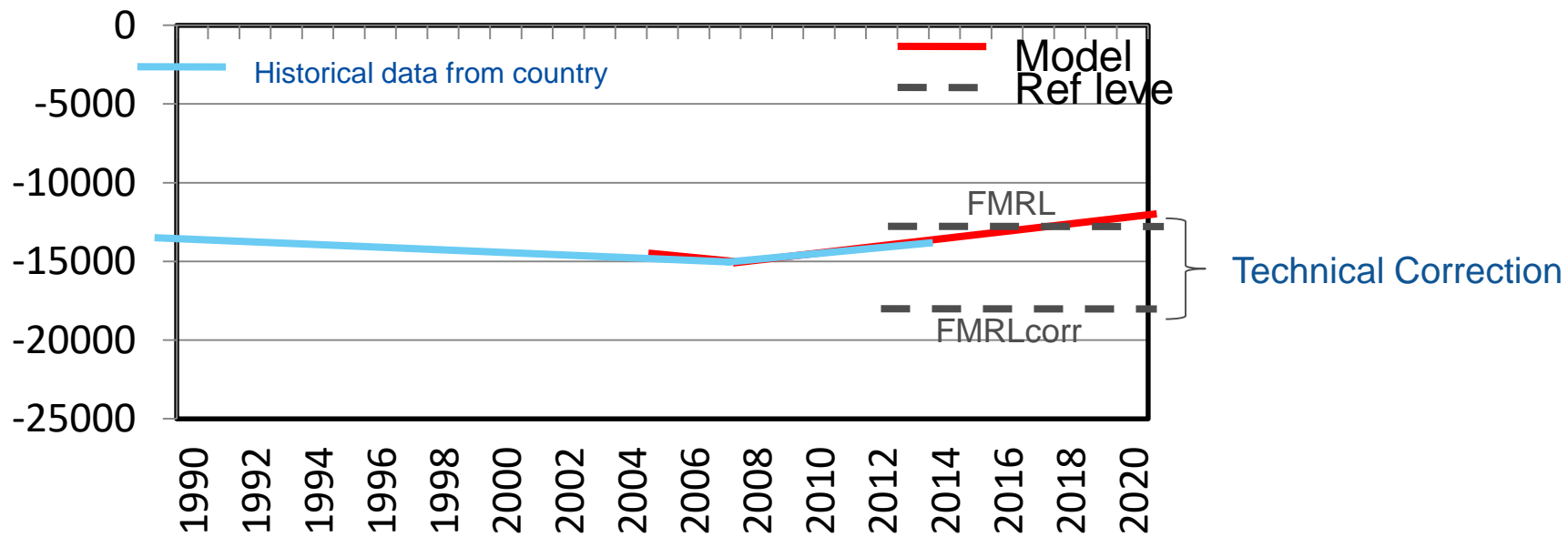
It is *good practice* to complement any TC with transparent information on:

- Rationale for calculating FMRLcorr;

- Methods used to calculate FMRLcorr;

- Results (i.e. the FMRLcorr) and discussion of the differences between FMRLcorr and FMRL.

EXAMPLE OF SUMMARY TABLE WHEN PERFORMING A TECHNICAL CORRECTION	
	Emissions and Removals
FMRL	-10,000 [Gg yr^{-1}]
FMRL$_{corr}$	-10,500 [Gg yr^{-1}]
Difference in per cent =100•[(FMRL$_{corr}$–FMRL)/FMRL] %	5%
Technical Correction= FMRL$_{corr}$ - FMRL	-500 [Gg yr^{-1}]
FM reported during the commitment period	-12,000 [Gg yr^{-1}]
Accounting Parameter = reported FM – (FMRL + Technical Correction)	-1,500 [Gg yr^{-1}]

European Commission

TABLE 4(KP-I)B.1.1. SUPPLEMENTARY BACKGROUND FOR LAND USE, LAND-USE CHANGE AND FORESTRY ACTIVITIES UNDER THE KYOTO PROTOCOL

Article 3.4 activities: Forest management

Additional information: Forest management reference level (FMRL) and technical correction

Approach applied for FMRL[1]	Value inscribed in the Appendix to the annex to decision 2/CMP.7 [2]	Technical correction[3]
	(kt CO_2 eq/yr)	
Drop-down list		
Business-as-usual projection		
Base year		
Zero at 1 January 2013		

Documentation box

Parties should provide detailed explanation on the land use, land-use change and forestry sector in the relevant annex of the NIR: Supplementary information on LULUCF activities under the Kyoto Protocol. Use this documentation box to provide references to relevant sections of the NIR if any additional details are needed to understand the content of this table.

[1] Provide additional information consistent with Box 2.7.3 in the *IPCC 2013 Revised Supplementary Methods and Good Practice Guidance arising from the Kyoto Protocol* in the NIR.

[2] The value inscribed in the appendix to the annex of decision 2/CMP.7 is here reported in kt CO_2 eq/yr. Provide information in the documentation box on how HWP is included under FMRL (either instantaneous oxidation, first-order decay function, or country-specific.)

[3] Detailed information on the technical corrections should be provided in the NIR (see sections 2.7.5 and 2.7.6 in the *IPCC 2013 Revised Supplementary Methods and Good Practice Guidance arising from the Kyoto Protocol*), including information on the technical corrections made in previous submissions and how these have been taken into account in the most recent technical correction.

European Commission

WHEN TO APPLY TECHNICAL CORRECTION

Technical Correction shall be applied when accounting.

Information on technical corrections and methodological consistency shall be reported as part of the *annual* GHG inventories and inventory reports. To this aim, it is *good practice* for Parties to assess annually the need for TC, i.e. checking the criteria set in Table 2.7.1, and to report transparent information on this in the annual NIR.

European Commission

SUMMARY STEPS:

1) Check your FMRL submissions 2011 and the associated technical assessment report
https://unfccc.int/topics/land-use/workstreams/land-use--land-use-change-and-forestry-lulucf/forest-management-reference-levels
(was there an pending issue that still need to be fixed?)

2) **Check for possible methodological incosistencies**, i.e. does the FMRL still reproduce the data for FM or FL-FL for the historical period used?
If not, which 'methodological elements' used in the construction of FMRL did change?

3) **Perform the technical correction**. Can the methodological incosistencies be addressed through a model re-run, or a simple ex-post adjustement is enough?

4) Document the **technical correction, and provide information on main factors generating the accounted quantity (FM - FMRL)**

European Commission

| Member State	Value inscribed in the Appendix to the annex to decision 2/CMP.7 (kt CO2 eq/yr)	Technical correction
Austria	-6516	5823
Belgium	-2499	1430
Bulgaria	-7950	NA
Croatia	-6289	905
Cyprus	-157	NA
Czech Republic	-4686	NA
Denmark	409	-83
Estonia	-2741	NE
Finland	-20466	-10938
France	-67410	21795
Germany	-22418	5268
Greece	-1830	210
Hungary	-1000	-169
Ireland	-142	-934
Italy	-22166	-1680
Latvia	-16302	11703
Lithuania	-4552	-922
Luxembourg	-418	182
Malta	-49	49
Netherlands	-1425	360
Poland	-27133	NA
Portugal	-6830	3369
Romania	-15793	NE
Slovakia	-1084	-2606
Slovenia	-3171	NE
Spain	-23100	NO
Sweden	-41336	8536
UK	-8268	-8375
Iceland	-154	77

BASED on GHGI 2021

So far, 19 EU MS, UK and Iceland have implemented technical corrections in order to ensure consistency between the FMRL and the reporting of FM activity

European Commission

| MS	TC submitted in the GHGI2021.
BEL	YES
BGR	NO
CZE	NO
EST	NO
FRA	YES
HUN	YES
ITA	YES
LVA	YES
LTU	YES
LUX	YES
NDL	YES
ROU	NO
SVK	YES
ESP	NO

For the KP-CP2, **14 MS** set their FMRLs relying in model-based projections using a common approach coordinated by the JRC in collaboration with the International Institute for Applied System Analysis (IIASA) and the European Forest Institute (EFI). To this purpose, the G4M and EFISCEN models were implemented on the basis of information provided by countries.

In the GHGI 2021, **9 of these MS** have already submitted (based on their own efforts) a TC.

European Commission

Comparison of the reporting of FL remaining FL   included in GHGI 2021 vs.GHGI 2011. (Ktn CO$_2$) – (I/3)
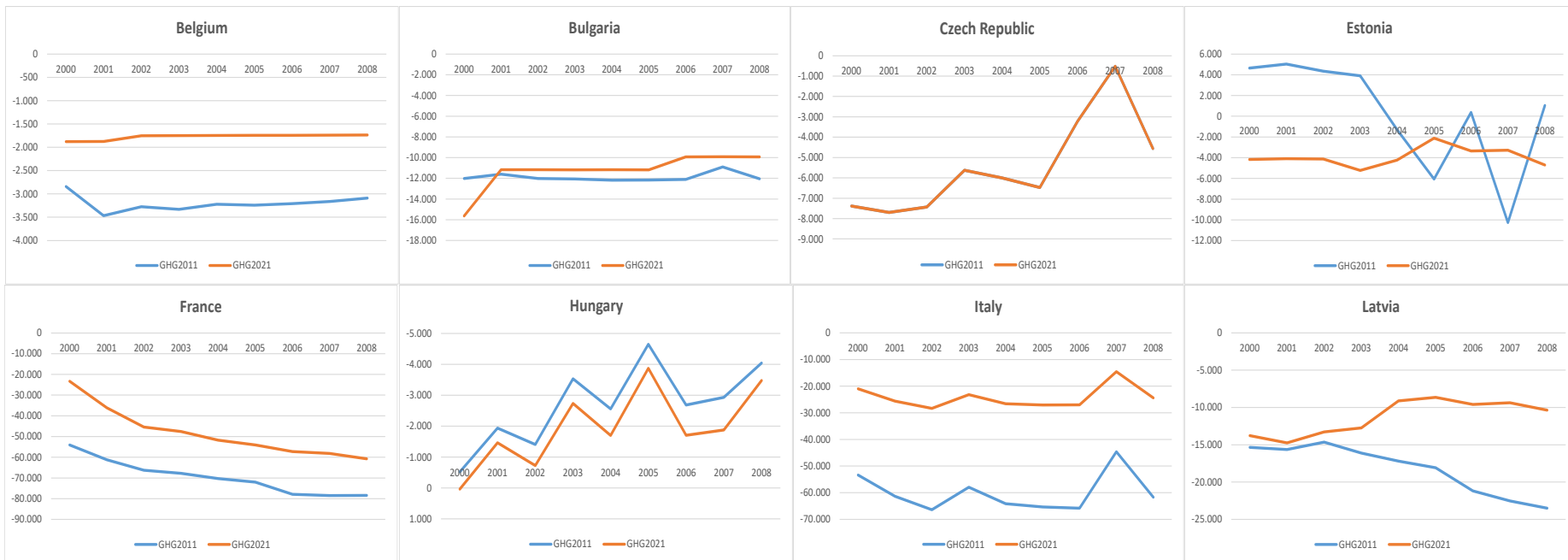
Comparison of the reporting of FL remaining FL   included in GHGI 2021 vs.GHGI 2011. (Ktn CO$_2$) – (2/3)
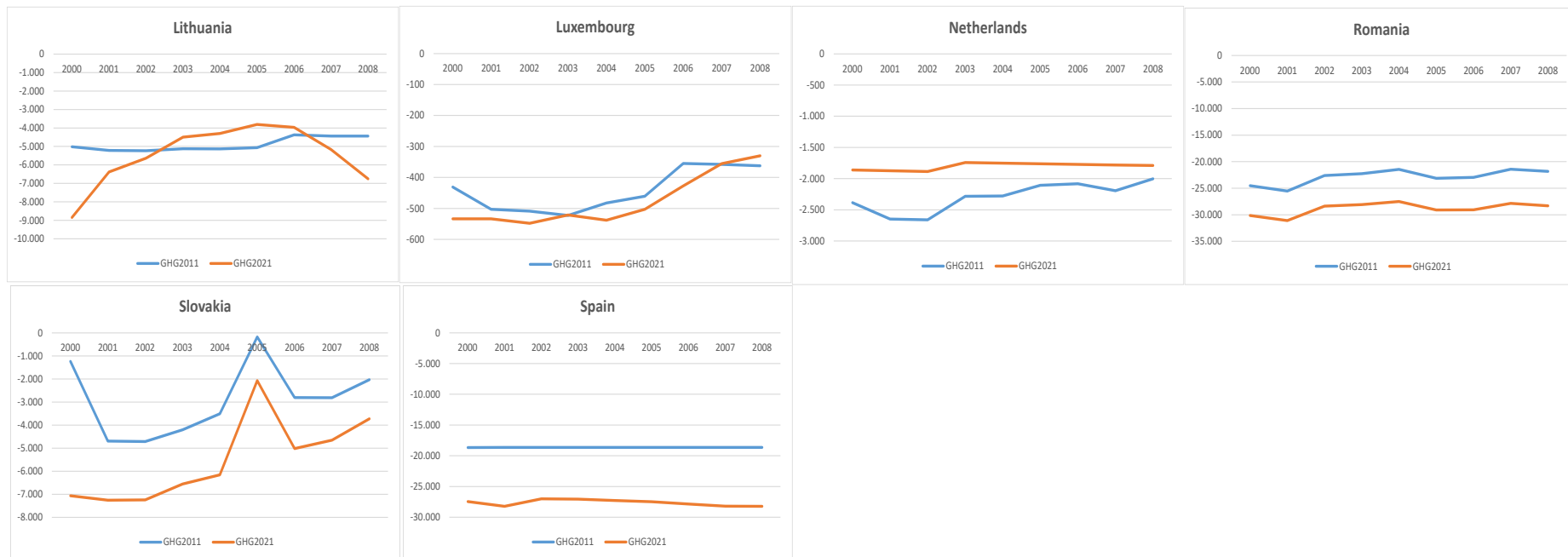
Information on how the new TC of those MS that relied on the JRC approach has been calculated (NIRs_2021)

MS	Synthesis of information provided in the GHG 2021	MS	Synthesis of information provided in the GHG 2021
Belgium	The technical correction of the FRL presented below is **based on the ex-post processing of the model results**, as presented in the report "Submission of information on forest management reference levels by Belgium", submitted in February 2011 and taking into account the corrections (new model run) applied according to the recommendations of the ERT during the technical assessment of the reference level in 2011	Latvia	Tehnical Correction for this submission will be recalculated based on a model re-calibration. The technical correction of FMRL has not been performed in 2020 due to prioritizing of the development of the Forest Reference Level for Latvia. **The work on the technical corrections of the FMRL will be completed in 2021 by the implementation of the Forest Growth Model (AGM) and other models, which were used for implementation of the FRL.**
France	**There are no plans to completely recalculate the FMRL based on new modeling.** The FMRL is based on forest modeling data that is different from the forest data used in the inventory. Nevertheless, a **calibration procedure (also known as postadjustment)** makes it possible to restore consistency between the historical FM and the FMR	Lithuannia	Lithuania has already applied technical correction to the forest management reference level which is equal to -922.0 kt CO2 eq. **G4M and EFISCEN models, used for FMRL estiamtion, were updated with more recent NFI data to calculate technical correction**.
Hungary	The method used for GHG reporting for biomass for FM is different than that for the development of the FMRL, since Hungary applies the IPCC stock-difference method for FM while the FMRL was assessed by applying two process models (i.e., G4M and EFISCEN). Because of this, **Hungary applied an ex-post calibration/adjustment** already at the time of the FMRL submission using an offset, defined as the difference between the average of the historical FM net emissions for 2000–2008 (estimated using the stock change method) and the average of the mean values from the model for the same period. Hungary has continued to use the stock change method since this ex-post calibration. Even if there were no additional change of method or data for the historical time series for FM had not been changed since the first ex-post calibration, this calibration would have to be kept	Luxembourg	The IPCC KP Supplements require a technical correction of the FMRL if methodological changes result in calculation of the time series, if new historical data become available or if pools are included in current reporting that have not been taken into account in the FMRL. Those conditions are fulfilled as the current FMRL does not use the methodological approach employed in Luxembourg and hence a technical correction of the FMRL was carried out.
Italy	Basically, the rationale for the calculating the FMRLcorr is to address the elements of methodological inconsistency as listed in the Table 9.19. The key element is the use, in the elaboration of the FMRLcorr, **of the same model used in the FM reporting (i.e. the For-est model, as described in paragraphs 6.2.4 and 9.3.1.1)**. In addition, the latest available activity data (i.e. forest areas, harvest statistics, fires occurrences) have been used and the HWP have been estimated following the 2013 KP Supplement (IPCC, 2014) methodology	Netherlands	To cover the various changes leading to these inconsistencies between FM and FMRL technical corrections need to be applied to the adopted FMRL. **This technical correction is based on the difference between the adopted FMRL and a newly calculated FMRL (FMRLcorr).** To assess the FMRLcorr the original inputs used in the assessment of the adopted FRML are included within the current methodologies (see Section 4.2) to assess emissions and removals for FM.
		Slovakia	Slovakia needs to discuss the main factors responsible for the reporting of a greater sink during the commitment period compared with the FMRL (including harvest, and forest growth and natural disturbances) in the GHG inventory 2022 (end of CP2), alongside with any final technical correction to FMRL arising from new runs with Efiscen and G4M.