Food and Agriculture Organization of the United Nations

FAO and the Enhanced transparency framework

Reporting a LULUCF GHG inventory under the ETF

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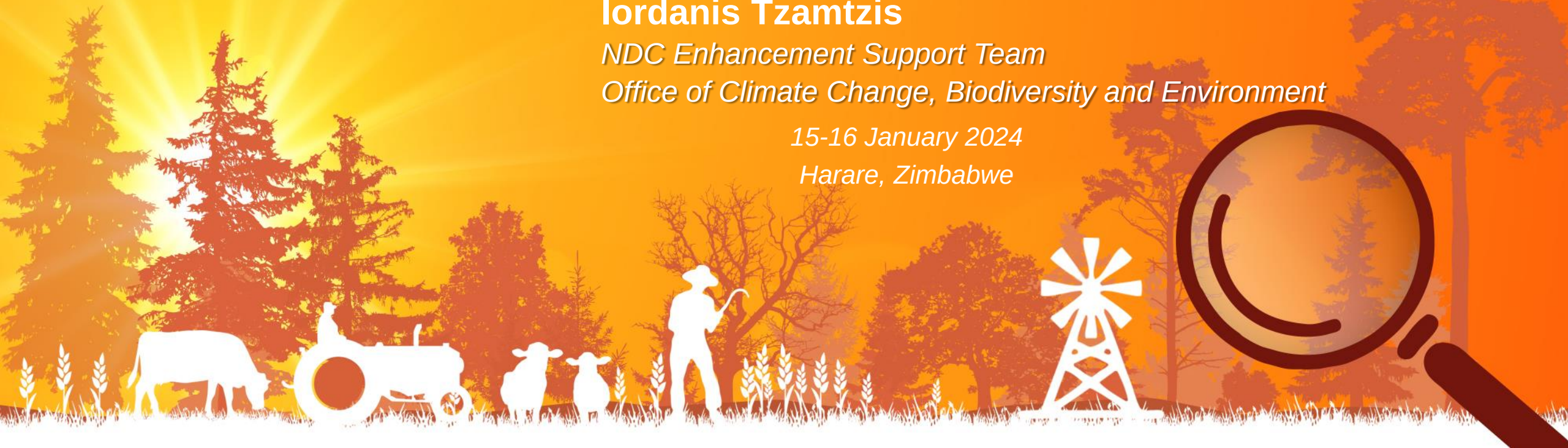
NDC Enhancement Support Team

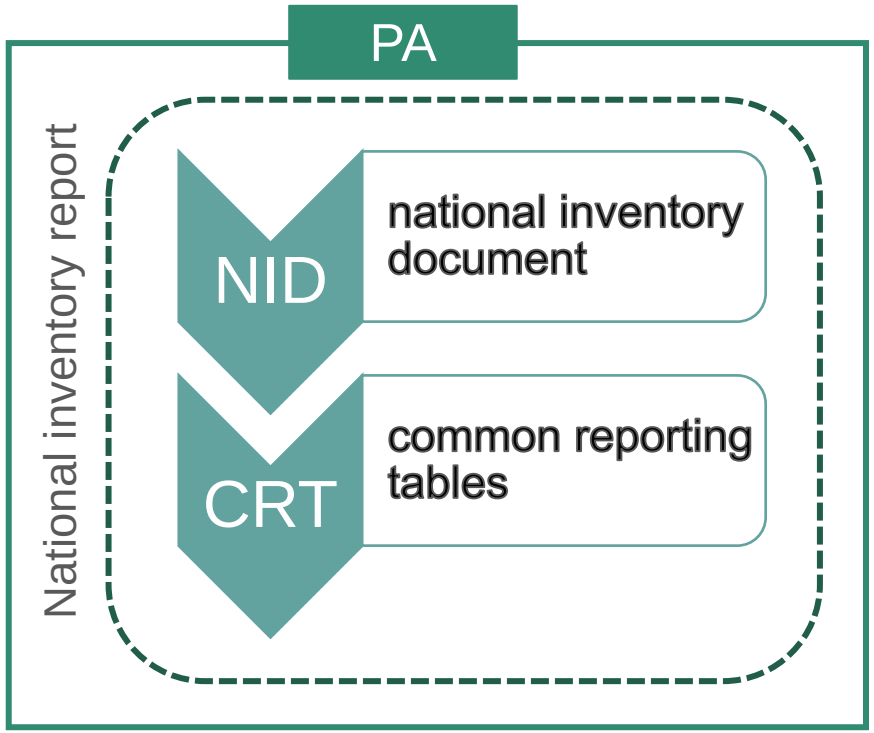
Office of Climate Change, Biodiversity and Environment

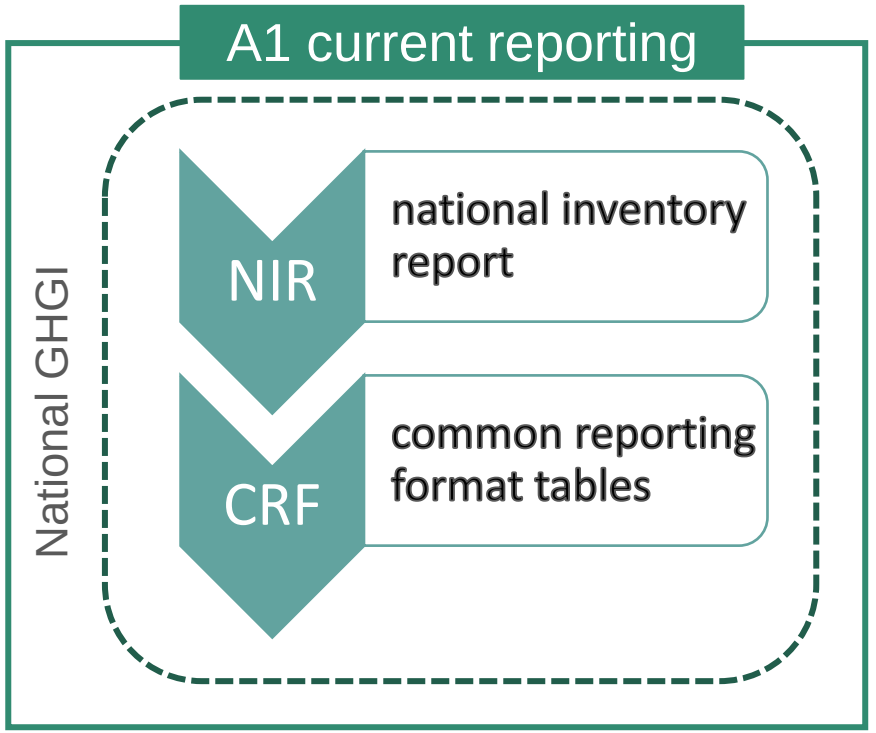
15-16 January 2024

Harare, Zimbabwe



Reporting GHGIs under the ETF





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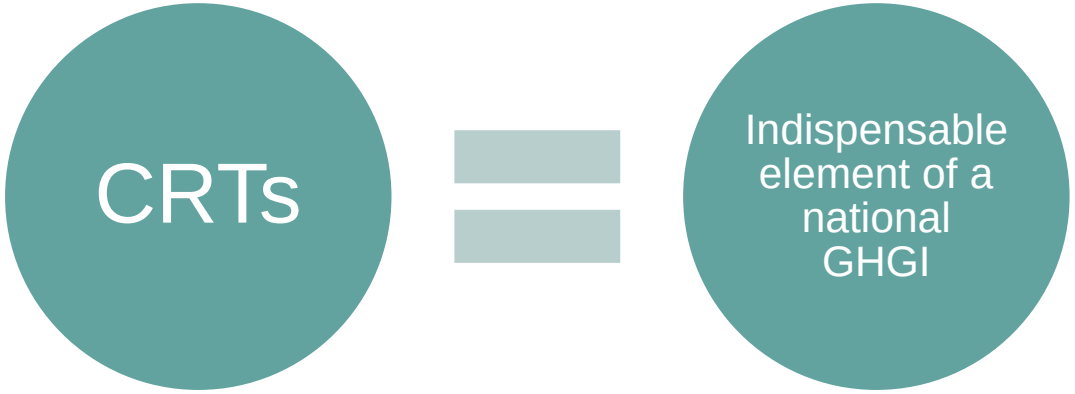
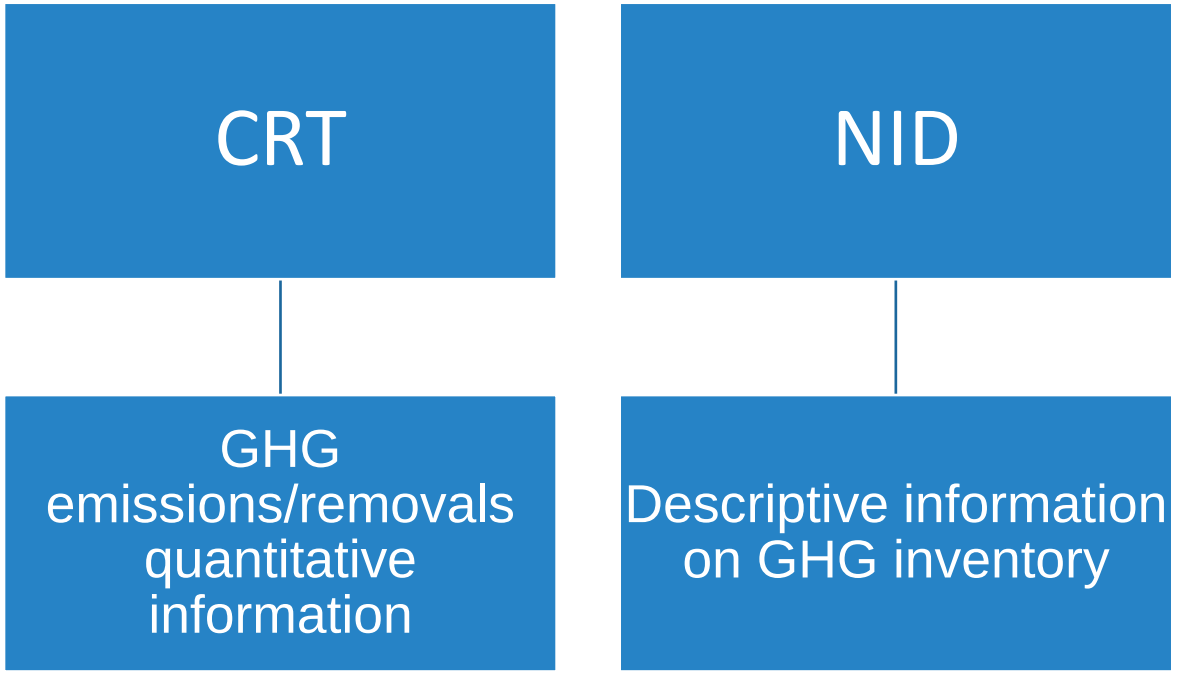




Reporting GHGIs under the ETF

To put it simply:

- ✓ CRTs: a set of standardized tables that Parties must use which accompany the NID. Contain the ‘numbers’
- ✓ NID: the national report document. Contains all related information about how the numbers are produced (together with additional information)
- ✓ Developed Parties have long-lasting experience vs developing Parties in common format tables reporting because of the CRF tables currently used

?

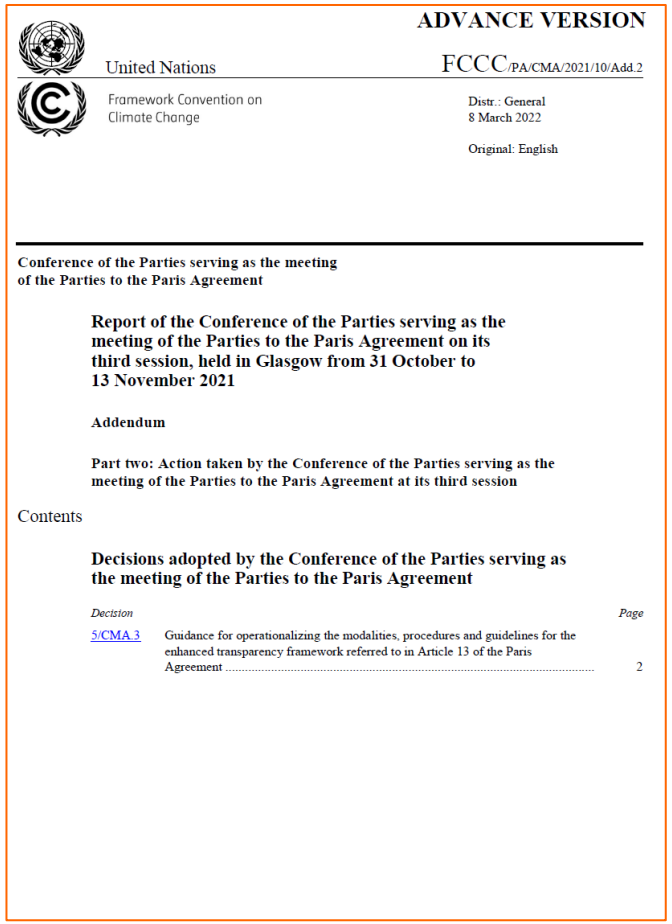
Reporting GHGIs under the ETF

- Dec. 18/CMA.1 (par. 12(a)), requests SBSTA to develop according to MPGs

  common reporting tables for the electronic reporting of the information referred to in chapter II of the annex, taking into account the existing common reporting formats (CRFs)

CRTs have been adopted through decision 5/CMA.3 (COP 26)

https://unfccc.int/documents/311076



ADVANCE VERSION

United Nations

Framework Convention on Climate Change

FCCC/PA/CMA/2021/10/Add.2

Distr.: General
8 March 2022

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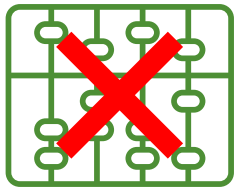
Reporting GHGIs under the ETF

WHAT ARE NOT CRTs?

- They are ***NOT*** a GHGI estimation tool



- They are tables in which Parties ***report*** their already estimated GHG emissions/removals, and related information

TABLE 5.C SECTORAL BACKGROUND DATA FOR WASTE ventory 2019
Incineration and open burning of waste sion 2021 v1
(Sheet 1 of 1) ITALY

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA Amount of wastes (incinerated/open burned) (kt wet weight)	IMPLIED EMISSION FACTOR			EMISSIONS		
		CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
		(kg/t waste)			(kt)		
1. Waste Incineration	91.36	551.78	0.06	0.14	50.41	0.01	0.01
Biogenic [1]	49.35	369.56	0.06	0.17	18.24	0.00	0.01
Municipal solid waste	49.35	369.56	0.06	0.17	18.24	0.00	0.01
Other *(please specify)* [2]	NO	NO	NO	NO	NO	NO	NO
Non-biogenic	42.01	1200.00	0.06	0.10	50.41	0.00	0.00
Municipal solid waste	42.01	1200.00	0.06	0.10	50.41	0.00	0.00
Other *(please specify)* [3]	NO	NO	NO	NO	NO	NO	NO
2. Open burning of waste	863.58	5.86	2.52	0.06	5.06	2.17	0.05
Biogenic [1]	858.16	NA	2.53	0.06	NA	2.17	0.05
Municipal solid waste	5.41	NA	NE	NE	NA	NE	NE
Other *(please specify)*	852.75	NA	2.55	0.06	NA	2.17	0.05
agricultural waste	852.75	NA	2.55	0.06	NA	2.17	0.05
Non-biogenic	5.41	935.00	NO,NE	NO,NE	5.06	NO,NE	NO,NE
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Note: Only emissions from waste incineration without energy recovery are to be reported under the waste sector. Emissions from incineration with energy

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Documentation box:
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Documentation box	

Reporting GHGIs under the ETF

WHY CRTs?

- Their “common” characteristic ensures comparability of reported information among countries
- All countries should report the same information in the same way (e.g., source/sink categorization) & with the same allocation following specific rules as defined by the CRTs’ structure and the relevant decisions

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Reporting GHGIs under the ETF

WHY CRTs?

- documentation boxes (background information and references to NID for additional information)
- space for reporting memo items and data: not added to emissions/removals totals (e.g. international bunkers, CO_2 emissions from biomass combustion in Energy, N_2O indirect emissions from sectors other than Agriculture and LULUCF)

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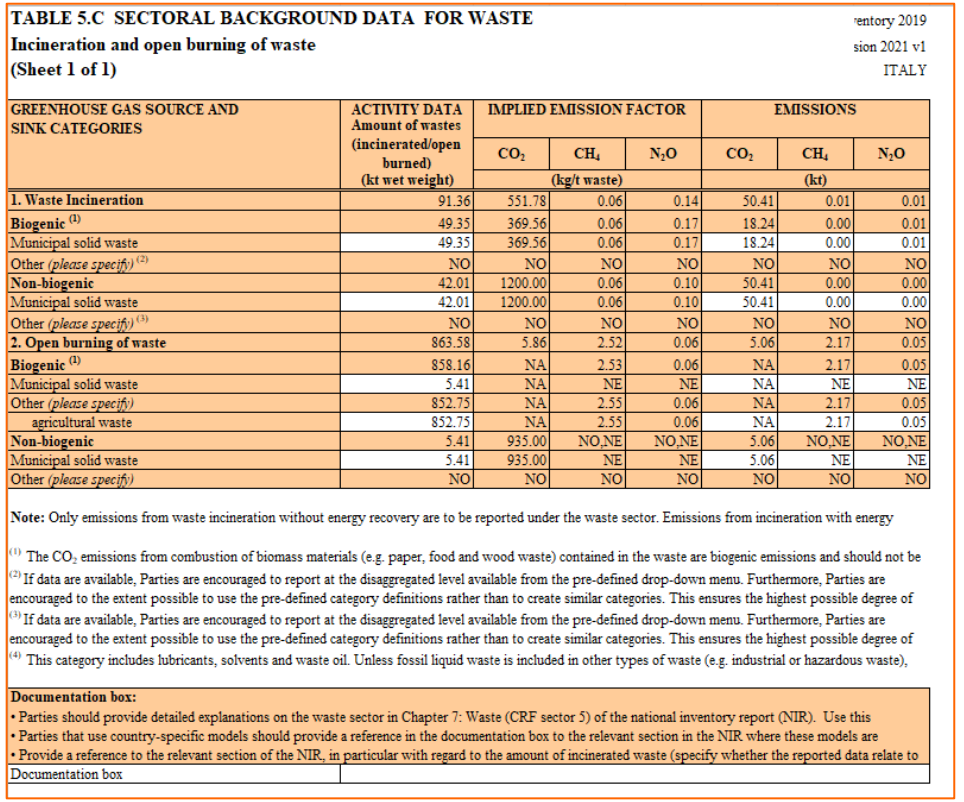
Reporting GHGIs under the ETF

WHY CRTs?

Information submitted by Parties to UNFCCC Secretariat with the CRFs are utilized in other tools→ comprehensive inventory database

Currently, there are several tools:

- GHG data (https://unfccc.int/process-and-meetings/transparency-and-reporting/greenhouse-gas-data/ghg-data-unfccc/ghg-data-from-unfccc)
- GHG Locator tool, Comparison tool (https://rt.unfccc.int/)
- …



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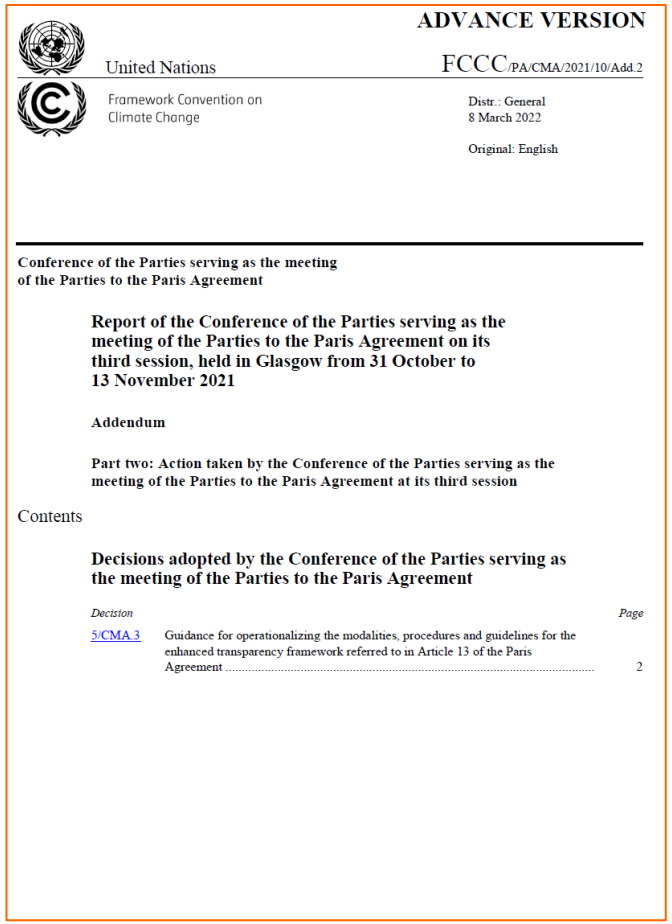
Reporting GHGIs under the ETF

- UNFCCC secretariat will prepare a reporting tool (dedicated software application) for the preparation, filling, and electronic reporting of the CRTs by countries
- Test version is expected by June 2023 & final version of the tools expected to be completed by June 2024
- It is very important that GHG inventory compilers have adequate knowledge of the CRTs & the CRT reporting tool (structure, functionalities) → to prepare & submit appropriately the national GHG inventory



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Decision *Page*

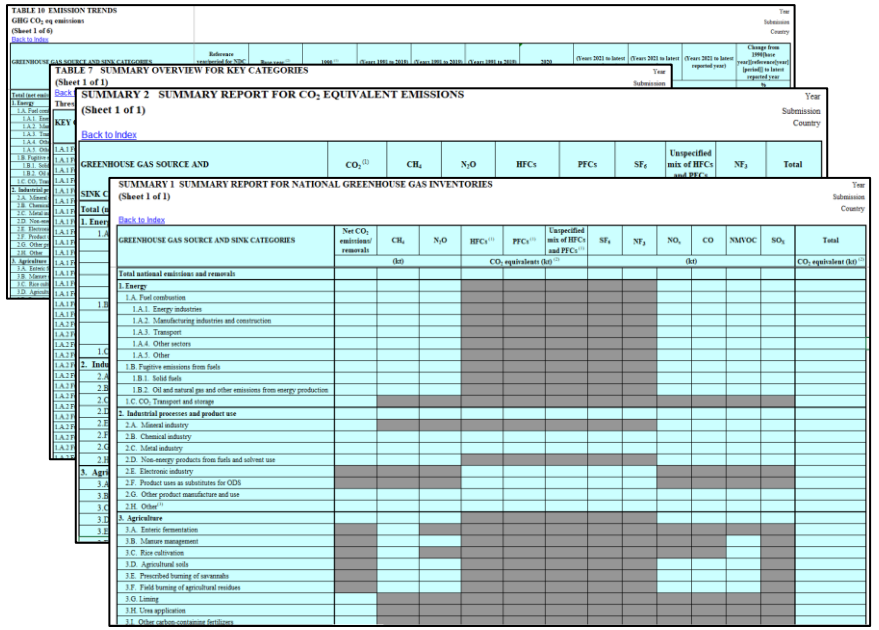
5/CMA.3 Guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement 2

Reporting GHGIs under the ETF| CRT structure

- CRTs → comprise 60 separate tables (some tables are split in multiple sheets)
- Each set of CRT = data for one inventory reporting year (except table 10)
- Parties: should submit a set for the whole time-series (e.g., 1990–2022 in the 2024 submission), meaning a large number of CRTs (for the 2024 submission → for 33 years)

BUT

Don’t get panicked!!

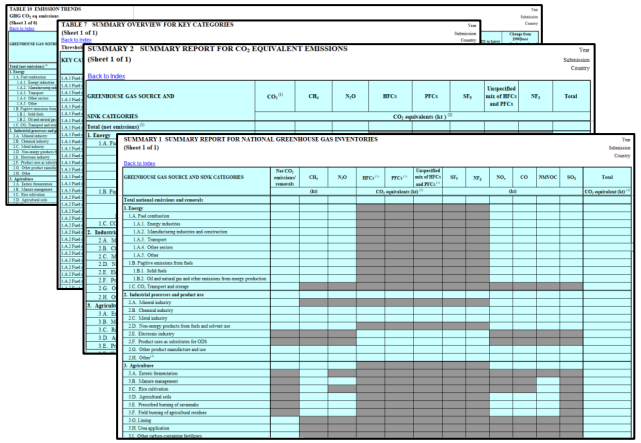


Reporting GHGIs under the ETF| CRT structure

- include data on all sectors, categories, C pools as defined in the MPGs + a number of summary tables
- source/sink definitions are based upon the 2006 IPCC GLs categorization
- 3 distinct levels are identified, with each level entailing a different degree of information aggregation

Allocation of GHG emissions/removals

- Confusion may arise in the beginning
- Follow the agreed CRTs

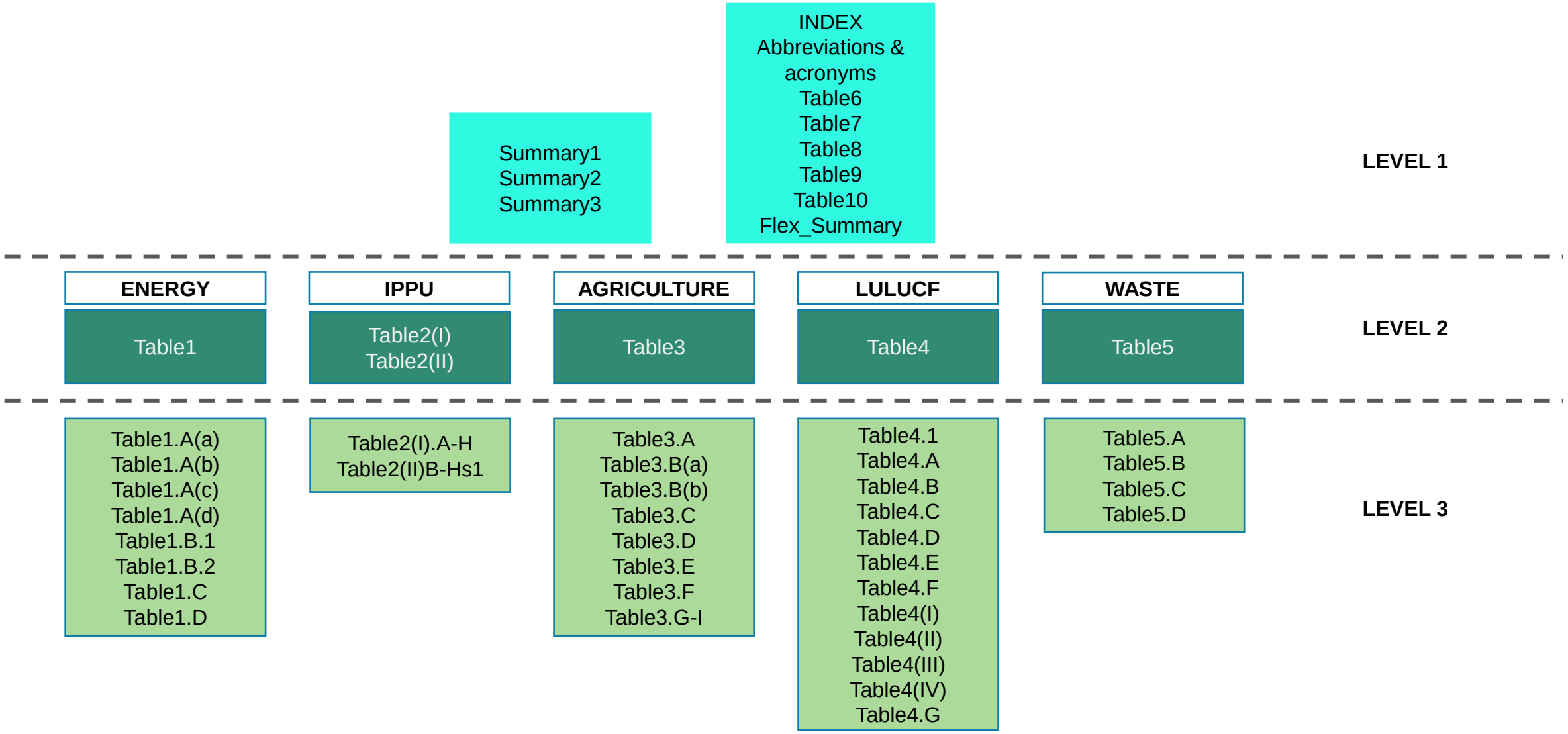


TIP

CRT familiarity comes with time & practice

Footnotes important, provide great guidance

Reporting GHGIs under the ETF| CRT structure



Reporting GHGIs under the ETF| CRT structure

Color coding

In some cases, the user can overwrite over the formula in green cells (through the software)

Grey shaded cells	no need to be filled in
colored shaded cells	automatically filled in
Unshaded cells	**to be filled in by the Party**

Every unshaded cell: either a data entry (e.g., number) or one of the standard CRT notation keys (NKs)

Reporting GHGIs under the ETF| CRT structure

Level 3

- Most of the data in the CRTs are included in this level
- It consists of the sectoral background data tables
- These CRTs require detailed information on emissions, AD & other relevant information at a category, subcategory & C pool level

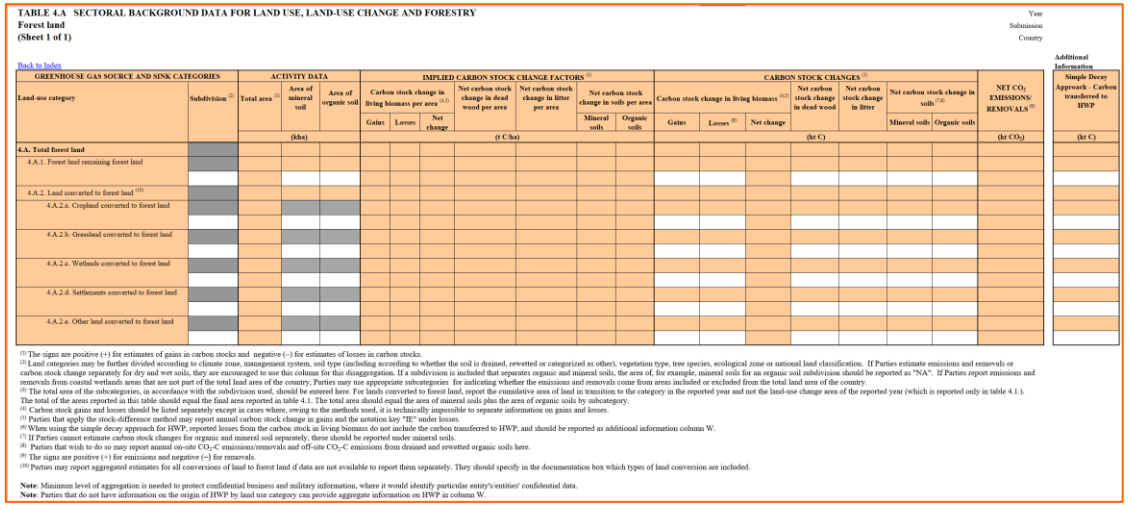


TABLE 4.A SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Forest land
(Sheet 1 of 1)

Year
Submission
Country

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON STOCK CHANGE FACTORS [2]						CARBON STOCK CHANGES [2]							Additional Information
Land-use category	Subdivision [2]	Total area [3]	Area of mineral soil	Area of organic soil	Carbon stock change in living biomass per area [4,5]			Net carbon stock change in dead wood per area	Net carbon stock change in litter per area	Net carbon stock change in soils per area	Carbon stock change in living biomass [4,5]			Net carbon stock change in dead wood	Net carbon stock change in litter	Net carbon stock change in soils [7,8]		NET CO_2 EMISSIONS/ REMOVALS [9]	Simple Decay Approach - Carbon transferred to HWP
					Gains	Losses	Net change			Mineral soils	Gains	Losses [6]	Net change			Mineral soils	Organic soils		
		(kha)			(t C/ha)						(kt C)							(kt CO_2)	(kt C)
4.A. Total forest land																			
4.A.1. Forest land remaining forest land																			
4.A.2. Land converted to forest land [10]																			
4.A.2.a. Cropland converted to forest land																			
4.A.2.b. Grassland converted to forest land																			
4.A.2.c. Wetlands converted to forest land																			
4.A.2.d. Settlements converted to forest land																			
4.A.2.e. Other land converted to forest land																			

(1) The signs are positive (+) for estimates of gains in carbon stocks and negative (–) for estimates of losses in carbon stocks.
(2) Land categories may be further divided according to climate zone, management system, soil type (including according to whether the soil is drained, rewetted or categorized as other), vegetation type, tree species, ecological zone or national land classification. If Parties estimate emissions and removals or carbon stock change separately for dry and wet soils, they are encouraged to use this column for this disaggregation. If a subdivision is included that separates organic and mineral soils, the area of, for example, mineral soils for an organic soil subdivision should be reported as "NA". If Parties report emissions and removals from coastal wetlands areas that are not part of the total land area of the country, Parties may use appropriate subcategories for indicating whether the emissions and removals come from areas included or excluded from the total land area of the country.
(3) The total area of the subcategories, in accordance with the subdivision used, should be entered here. For lands converted to forest land, report the cumulative area of land in transition to the category in the reported year and not the land-use change area of the reported year (which is reported only in table 4.1.).
The total of the areas reported in this table should equal the final area reported in table 4.1. The total area should equal the area of mineral soils plus the area of organic soils by subcategory.
(4) Carbon stock gains and losses should be listed separately except in cases where, owing to the methods used, it is technically impossible to separate information on gains and losses.
(5) Parties that apply the stock-difference method may report annual carbon stock change in gains and the notation key "IE" under losses.
(6) When using the simple decay approach for HWP, reported losses from the carbon stock in living biomass do not include the carbon transferred to HWP, and should be reported as additional information column W.
(7) If Parties cannot estimate carbon stock changes for organic and mineral soil separately, these should be reported under mineral soils.
(8) Parties that wish to do so may report annual on-site CO_2-C emissions/removals and off-site CO_2-C emissions from drained and rewetted organic soils here.
(9) The signs are positive (+) for emissions and negative (–) for removals.
(10) Parties may report aggregated estimates for all conversions of land to forest land if data are not available to report them separately. They should specify in the documentation box which types of land conversion are included.

Note: Minimum level of aggregation is needed to protect confidential business and military information, where it would identify particular entity's/entities' confidential data.
Note: Parties that do not have information on the origin of HWP by land use category can provide aggregate information on HWP in column W.

- Several of the CRTs from higher levels are populated automatically by the CRT software based on data in these 3rd level
- Parties must enter all required information in these tables → the foundation for data used by other CRTs
- Totals (summed emissions/removals) & implied emission factors (IEFs)/implied carbon stock change factors (ICSCFs) are automatically populated

Reporting GHGIs under the ETF| CRT structure

TABLE 4.A SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Forest land
(Sheet 1 of 1)

Year
Submission
Country

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON STOCK CHANGE FACTORS [1]						CARBON STOCK CHANGES [1]							Additional Information
Land-use category	Subdivision [2]	Total area [3]	Area of mineral soil	Area of organic soil	Carbon stock change in living biomass per area [4,5]			Net carbon stock change in dead organic matter per area [4]	Net carbon stock change in litter per area [4]	Net carbon stock change in soils per area	Carbon stock change in living biomass [4,5]			Net carbon stock change in dead organic matter [4]	Net carbon stock change in litter [4]	Net carbon stock change in soils [7,8]		NET CO_2 EMISSIONS/ REMOVALS [9]	Simple Decay Approach - Carbon transferred to HWP
					Gains	Losses	Net change			Mineral soils	Gains	Losses [6]	Net change			Mineral soils	Organic soils		
		(kha)			(t C/ha)						(kt C)							($kt CO_2$)	(kt C)
4.A. Total forest land																			
4.A.1. Forest land remaining forest land																			
4.A.2. Land converted to forest land [10]																			
4.A.2.a. Cropland converted to forest land																			
4.A.2.b. Grassland converted to forest land																			
4.A.2.c. Wetlands converted to forest land																			
4.A.2.d. Settlements converted to forest land																			
4.A.2.e. Other land converted to forest land																			

Source/sink categories
D, CS

Activity data
R

Implied emission factor
NR

Carbon stock changes emissions/removals
R

Reporting GHGIs under the ETF| CRT structure

EF vs IEF: Are you fully aware of the difference??

EF	IEF
A coefficient that quantifies emissions/removals of a gas per unit activity. Emission factors are often based on a sample of measurement data, averaged to develop a representative rate of emission for a given activity level under a given set of operating conditions	Emissions divided by the relevant measure of activity (emissions / activity data)

Reporting GHGIs under the ETF| CRT structure

Are EF and IEF expected to have the same value??

- implied → automatically calculated based on emissions/removals divided by AD entered by a Party in the CRTs
- IEF **may or may not** match EFs used by the Party
- different categorization or more complex calculations may have been applied
- IEFs/ICSCFs are very useful as measures of a Party's emissions/removals indexed by its AD. Help in comparison among countries

Reporting GHGIs under the ETF| CRT structure

Level 2

- CRTs that aggregate data from sectoral background data tables at sectoral level
- Serve as a useful summary of the sector
- There are CRTs of level 2 for every IPCC GHGI sector

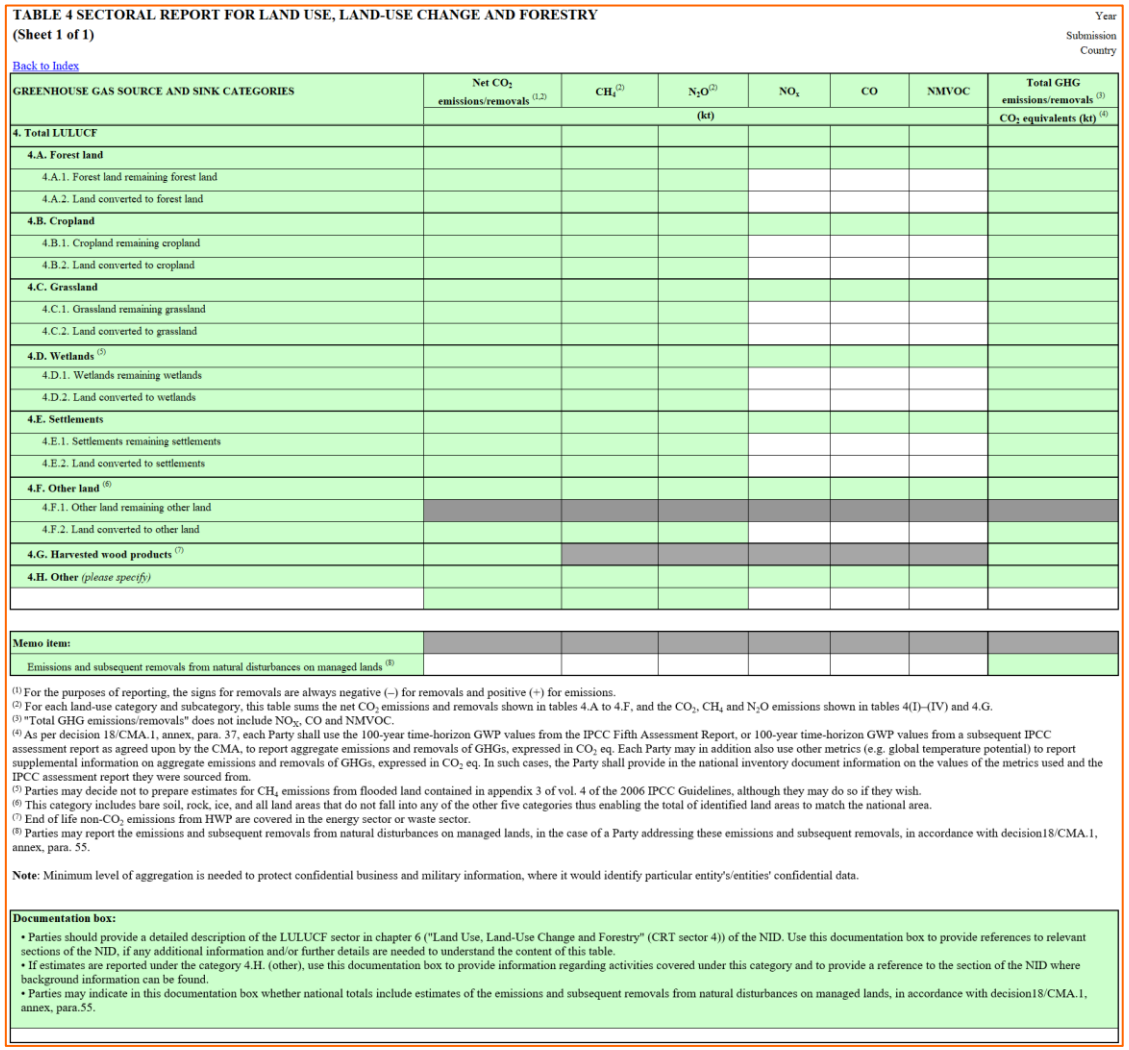

TABLE 4 SECTORAL REPORT FOR LAND USE, LAND-USE CHANGE AND FORESTRY
(Sheet 1 of 1)

Year
Submission
Country

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/removals (1,2)	CH_4 (2)	N_2O (2)	NO_x	CO	NMVOC	Total GHG emissions/removals (3)
	(kt)						CO_2 equivalents (kt) (4)
4. Total LULUCF							
4.A. Forest land							
4.A.1. Forest land remaining forest land							
4.A.2. Land converted to forest land							
4.B. Cropland							
4.B.1. Cropland remaining cropland							
4.B.2. Land converted to cropland							
4.C. Grassland							
4.C.1. Grassland remaining grassland							
4.C.2. Land converted to grassland							
4.D. Wetlands (5)							
4.D.1. Wetlands remaining wetlands							
4.D.2. Land converted to wetlands							
4.E. Settlements							
4.E.1. Settlements remaining settlements							
4.E.2. Land converted to settlements							
4.F. Other land (6)							
4.F.1. Other land remaining other land							
4.F.2. Land converted to other land							
4.G. Harvested wood products (7)							
4.H. Other *(please specify)*							

Memo item:							
Emissions and subsequent removals from natural disturbances on managed lands (8)							

(1) For the purposes of reporting, the signs for removals are always negative (–) for removals and positive (+) for emissions.
(2) For each land-use category and subcategory, this table sums the net CO_2 emissions and removals shown in tables 4.A to 4.F, and the CO_2, CH_4 and N_2O emissions shown in tables 4(I)–(IV) and 4.G.
(3) "Total GHG emissions/removals" does not include NO_x, CO and NMVOC.
(4) As per decision 18/CMA.1, annex, para. 37, each Party shall use the 100-year time-horizon GWP values from the IPCC Fifth Assessment Report, or 100-year time-horizon GWP values from a subsequent IPCC assessment report as agreed upon by the CMA, to report aggregate emissions and removals of GHGs, expressed in CO_2 eq. Each Party may in addition also use other metrics (e.g. global temperature potential) to report supplemental information on aggregate emissions and removals of GHGs, expressed in CO_2 eq. In such cases, the Party shall provide in the national inventory document information on the values of the metrics used and the IPCC assessment report they were sourced from.
(5) Parties may decide not to prepare estimates for CH_4 emissions from flooded land contained in appendix 3 of vol. 4 of the 2006 IPCC Guidelines, although they may do so if they wish.
(6) This category includes bare soil, rock, ice, and all land areas that do not fall into any of the other five categories thus enabling the total of identified land areas to match the national area.
(7) End of life non-CO_2 emissions from HWP are covered in the energy sector or waste sector.
(8) Parties may report the emissions and subsequent removals from natural disturbances on managed lands, in the case of a Party addressing these emissions and subsequent removals, in accordance with decision18/CMA.1, annex, para. 55.

Note: Minimum level of aggregation is needed to protect confidential business and military information, where it would identify particular entity's/entities' confidential data.

Documentation box:

- Parties should provide a detailed description of the LULUCF sector in chapter 6 ("Land Use, Land-Use Change and Forestry" (CRT sector 4)) of the NID. Use this documentation box to provide references to relevant sections of the NID, if any additional information and/or further details are needed to understand the content of this table.
- If estimates are reported under the category 4.H. (other), use this documentation box to provide information regarding activities covered under this category and to provide a reference to the section of the NID where background information can be found.
- Parties may indicate in this documentation box whether national totals include estimates of the emissions and subsequent removals from natural disturbances on managed lands, in accordance with decision18/CMA.1, annex, para.55.

Reporting GHGIs under the ETF| CRT structure

Level 1

- Contains several CRTs for summary & cross-cutting information
- Summary tables for total emissions/removals on both molecular mass & CO_2-eq basis
- Summary table presenting quick reference for the types of methods & EFs applied by the Party in the GHGI estimation
- Cross-cutting CRTs:
  - ✓ indirect emissions of N_2O & CO_2
  - ✓ Key categories
  - ✓ Recalculations performed relatively to the previous submission
  - ✓ Categories or subcategories which were not estimated or included elsewhere
  - ✓ Summary of emission trends over the entire time series
  - ✓ Information on the use of flexibility provision

SUMMARY 1 SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES Year
(Sheet 1 of 1) Submission
Country

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net CO_2 emissions/ removals	CH_4	N_2O	HFCs [1]	PFCs [1]	Unspecified mix of HFCs and PFCs [1]	SF_6	NF_3	NO_x	CO	NMVOC	SO_x	Total
	(kt)			CO_2 equivalents (kt) [2]			(kt)						CO_2 equivalent (kt) [2]
Total national emissions and removals													
1. Energy													
1.A. Fuel combustion													
1.A.1. Energy industries													
1.A.2. Manufacturing industries and construction													
1.A.3. Transport													
1.A.4. Other sectors													
1.A.5. Other													
1.B. Fugitive emissions from fuels													
1.B.1. Solid fuels													
1.B.2. Oil and natural gas and other emissions from energy production													
1.C. CO_2 Transport and storage													
2. Industrial processes and product use													
2.A. Mineral industry													
2.B. Chemical industry													
2.C. Metal industry													
2.D. Non-energy products from fuels and solvent use													
2.E. Electronic industry													
2.F. Product uses as substitutes for ODS													
2.G. Other product manufacture and use													
2.H. Other [3]													
3. Agriculture													
3.A. Enteric fermentation													
3.B. Manure management													

Reporting GHGIs under the ETF| CRT structure

TABLE 1.A(a) SECTORAL BACKGROUND DATA FOR ENERGY
Fuel combustion activities - sectoral approach
(Sheet 1 of 4)
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	AGGREGATE ACTIVITY DATA		IMPLIED EMISSION FACTORS			EMISSIONS		
	Consumption		CO_2 [1]	CH_4	N_2O	CO_2 [2][3]	CH_4	
	(TJ)	NCV/GCV [5]	(t/TJ)	(kg/TJ)				(kt)
1.A.1. Energy industries								
Liquid fuels								
Solid fuels								
Gaseous fuels [6]								
Other fossil fuels [7]								
Peat [8]								
Biomass [3]								
1.A.1.a. Public electricity and heat production [9]	PEHP = C+D+E+F+G+H							
Liquid fuels	C = 1+7+..							
Solid fuels	D = 2+8+..							
Gaseous fuels [6]	E = 3+9+..							
Other fossil fuels [7]	F = 4+10+..							
Peat [8]	G = 5+11+..							
Biomass [3]	H = 6+12+..							
Drop-down list:								
1.A.1.a.i. Electricity generation	A = 1+2+3+4+5+6							
Liquid fuels	1							
Solid fuels	2							
Gaseous fuels [6]	3							
Other fossil fuels [7]	4							
Peat [8]	5							
Biomass [3]	6							
1.A.1.a.ii. Combined heat and power generation	B = 7+8+9+10+11+12							
Liquid fuels	7							
Solid fuels	8							
Gaseous fuels [6]	9							
Other fossil fuels [7]	10							
Peat [8]	11							
Biomass [3]	12							

Reporting GHGIs under the ETF| CRT structure

When no numerical values are used to fill in the CRTs

notation keys ***shall*** be used

All cells should contain either a value or a notation key

Biomass Burning[1]
(Sheet 1 of 1)

Submission 2022 v3

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED EMISSION FACTOR			EMISSIONS		
		Description[4]	Unit	Values	CO_2	CH_4	N_2O	CO_2[5][6]	CH_4	N_2O
Land-use category[2]	Subdivision [3]		(ha or kg dm)		(t/activity data unit)			(kt)		
Total for land-use categories			no unit					NO,IE,NA	0.43	0.02
A. Forest land			no unit					NO,IE	0.39	0.02
1. Forest land remaining forest land[7]			no unit					IE	0.37	0.02
Controlled burning			kg dm	52645918.08	IE	0.00	0.00	IE	0.25	0.01
Wildfires			ha	696.40	IE	0.17	0.01	IE	0.12	0.01
2. Land converted to forest land			ha	147.85	NO,IE	0.16	0.01	NO,IE	0.02	0.00
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	147.85	IE	0.16	0.01	IE	0.02	0.00
B. Cropland			ha	873.49	IE,NA	0.01	0.00	IE,NA	0.01	0.00
1. Cropland remaining cropland[8]			ha	873.49	NA	0.01	0.00	NA	0.01	0.00
Controlled burning			ha	436.74	NA	NA	NA	NA	NA	NA
Wildfires			ha	436.74	NA	0.02	0.00	NA	0.01	0.00
2. Land converted to cropland			ha	IE	IE	IE	IE	IE	IE	IE
Controlled burning			ha	IE	IE	IE	IE	IE	IE	IE
Wildfires			ha	IE	IE	IE	IE	IE	IE	IE
C. Grassland			ha	2255.56	NO,IE	0.01	0.00	NO,IE	0.03	0.00
1. Grassland remaining grassland[6]			ha	2255.56	NO,IE	0.01	0.00	NO,IE	0.03	0.00
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	2255.56	IE	0.01	0.00	IE	0.03	0.00
2. Land converted to grassland			ha	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	IE	IE	IE	IE	IE	IE	IE
D. Wetlands			ha	NO	NO	NO	NO	NO	NO	NO
1. Wetlands remaining wetlands			ha	NO	NO	NO	NO	NO	NO	NO
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	NO	NO	NO	NO	NO	NO	NO
2. Land converted to wetlands			ha	NO	NO	NO	NO	NO	NO	NO
Controlled burning			ha	NO	NO	NO	NO	NO	NO	NO
Wildfires			ha	NO	NO	NO	NO	NO	NO	NO
E. Settlements			ha	NO	NO	NO	NO	NO	NO	NO
F. Other land			ha	NO	NO	NO	NO	NO	NO	NO
H. Other (please specify)										

Reporting GHGIs under the ETF| CRT structure

- Land transition matrix
- To be completed with annual areas
- Basis for constructing land representation based on the transition period applied

Table 4.1 LAND TRANSITION MATRIX

Areas and changes in areas between the previous and the current inventory year (1)

Year

Submission

Country

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TO: / FROM:	Forest land (managed)	Forest land (unmanaged)	Cropland	Grassland (managed)	Grassland (unmanaged)	Wetlands (managed)	Wetlands (unmanaged)	Settlements	Other land	Total unmanaged land	**Initial area**
FROM:	**(kha)**										
Forest land (managed) (2)											
Forest land (unmanaged) (2)											
Cropland (2)											
Grassland (managed) (2)											
Grassland (unmanaged) (2)											
Wetlands (managed) (2)											
Wetlands (unmanaged) (2)											
Settlements (2)											
Other land (2)											
Total unmanaged land (3)											
Final area											
Net change (4)											

Reporting GHGIs under the ETF| CRT structure

In background tables 4.A-F, CSCs from all land uses and land-use change categories/subcategories & C pools, including SOM mineral are reported

Each of CRT 4.A-F covers one of the six land-use categories

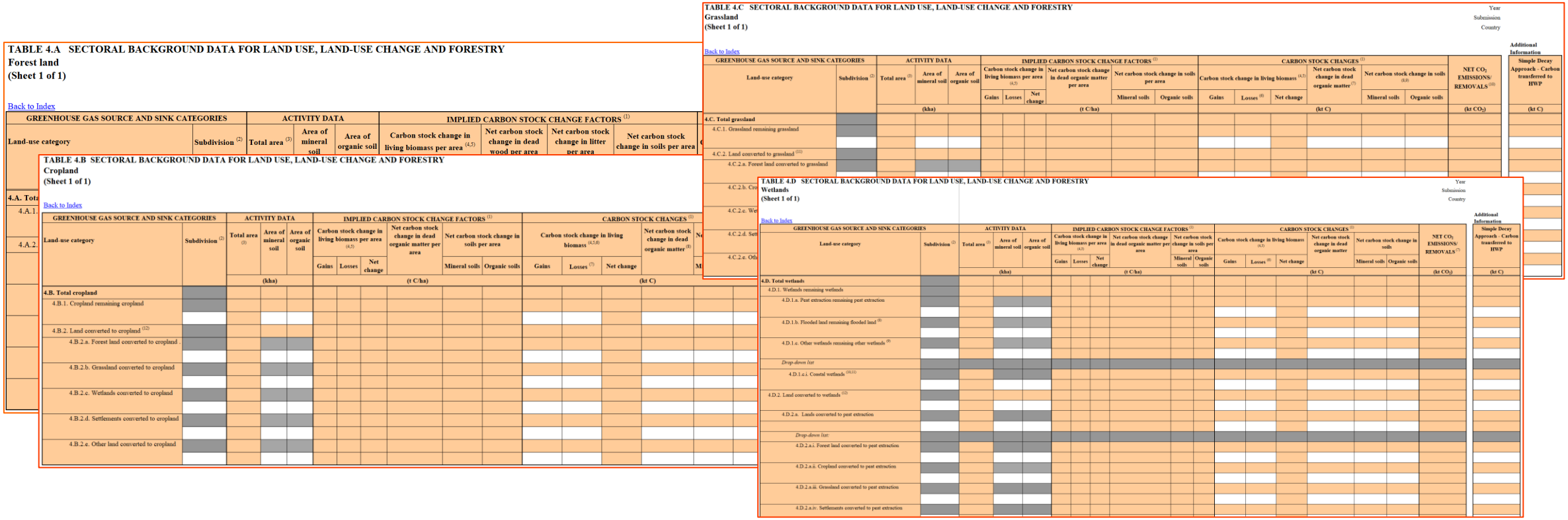

TABLE 4.A SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Forest land
(Sheet 1 of 1)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON STOCK CHANGE FACTORS (1)			
Land-use category	Subdivision (2)	Total area (3)	Area of mineral soil	Area of organic soil	Carbon stock change in living biomass per area (4,5)	Net carbon stock change in dead wood per area	Net carbon stock change in litter per area	Net carbon stock change in soils per area
		(kha)			(t C/ha)			
4.A. Tot								
4.A.1.								
4.A.2.								

TABLE 4.B SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Cropland
(Sheet 1 of 1)

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON STOCK CHANGE FACTORS (1)						CARBON STOCK CHANGES (1)					
Land-use category	Subdivision (2)	Total area (3)	Area of mineral soil	Area of organic soil	Carbon stock change in living biomass per area (4,5)			Net carbon stock change in dead organic matter per area	Net carbon stock change in soils per area		Carbon stock change in living biomass (4,5,8)			Net carbon stock change in dead organic matter (8)	Ne	
					Gains	Losses	Net change		Mineral soils	Organic soils	Gains	Losses (7)	Net change			M
		(kha)			(t C/ha)						(kt C)					
4.B. Total cropland																
4.B.1. Cropland remaining cropland																
4.B.2. Land converted to cropland (12)																
4.B.2.a. Forest land converted to cropland																
4.B.2.b. Grassland converted to cropland																
4.B.2.c. Wetlands converted to cropland																
4.B.2.d. Settlements converted to cropland																
4.B.2.e. Other land converted to cropland																

TABLE 4.C SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Grassland
(Sheet 1 of 1)

Year
Submission
Country

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON STOCK CHANGE FACTORS (1)						CARBON STOCK CHANGES (1)						NET CO_2 EMISSIONS/ REMOVALS (10)	Additional Information: Simple Decay Approach - Carbon transferred to HWP
Land-use category	Subdivision (2)	Total area (3)	Area of mineral soil	Area of organic soil	Carbon stock change in living biomass per area (4,5)			Net carbon stock change in dead organic matter per area	Net carbon stock change in soils per area		Carbon stock change in living biomass (4,5)			Net carbon stock change in dead organic matter (7)	Net carbon stock change in soils (8,9)			
					Gains	Losses	Net change		Mineral soils	Organic soils	Gains	Losses (6)	Net change		Mineral soils	Organic soils		
		(kha)			(t C/ha)						(kt C)						(kt CO_2)	(kt C)
4.C. Total grassland																		
4.C.1. Grassland remaining grassland																		
4.C.2. Land converted to grassland (11)																		
4.C.2.a. Forest land converted to grassland																		
4.C.2.b. Cro																		
4.C.2.c. We																		
4.C.2.d. Set																		
4.C.2.e. Oth																		

TABLE 4.D SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Wetlands
(Sheet 1 of 1)

Year
Submission
Country

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON STOCK CHANGE FACTORS (1)						CARBON STOCK CHANGES (1)						NET CO_2 EMISSIONS/ REMOVALS (7)	Additional Information: Simple Decay Approach - Carbon transferred to HWP
Land-use category	Subdivision (2)	Total area (3)	Area of mineral soil	Area of organic soil	Carbon stock change in living biomass per area (4,5)			Net carbon stock change in dead organic matter per area	Net carbon stock change in soils per area		Carbon stock change in living biomass (4,5)			Net carbon stock change in dead organic matter	Net carbon stock change in soils			
					Gains	Losses	Net change		Mineral soils	Organic soils	Gains	Losses (6)	Net change		Mineral soils	Organic soils		
		(kha)			(t C/ha)						(kt C)						(kt CO_2)	(kt C)
4.D. Total wetlands																		
4.D.1. Wetlands remaining wetlands																		
4.D.1.a. Peat extraction remaining peat extraction																		
4.D.1.b. Flooded land remaining flooded land (8)																		
4.D.1.c. Other wetlands remaining other wetlands (9)																		
Drop-down list																		
4.D.1.c.i. Coastal wetlands (10,11)																		
4.D.2. Land converted to wetlands (12)																		
4.D.2.a. Lands converted to peat extraction																		
Drop-down list:																		
4.D.2.a.i. Forest land converted to peat extraction																		
4.D.2.a.ii. Cropland converted to peat extraction																		
4.D.2.a.iii. Grassland converted to peat extraction																		
4.D.2.a.iv. Settlements converted to peat extraction																		

Reporting GHGIs under the ETF| CRT structure

TABLE 4.A SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Forest land
(Sheet 1 of 1)

Year
Submission
Country

Index

GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA			IMPLIED CARBON STOCK CHANGE FACTORS (1)							CARBON STOCK CHANGES (1)							NET CO_2 EMISSIONS/ REMOVALS (9)
se category	Subdivision (2)	Total area (3)	Area of mineral soil	Area of organic soil	Carbon stock change in living biomass per area (4,5)			Net carbon stock change in dead wood per area	Net carbon stock change in litter per area	Net carbon stock change in soils per area		Carbon stock change in living biomass (4,5)			Net carbon stock change in dead wood	Net carbon stock change in litter	Net carbon stock change in soils (7,8)		
					Gains	Losses	Net change			Mineral soils	Organic soils	Gains	Losses (6)	Net change			Mineral soils	Organic soils	
		(kha)			(t C/ha)							(kt C)							(kt CO_2)
4.A. Total forest land																			
4.A.1. Forest land remaining forest land																			
4.A.2. Land converted to forest land (10)																			
4.A.2.a. Cropland converted to forest land																			
4.A.2.b. Grassland converted to forest land																			
4.A.2.c. Wetlands converted to forest land																			
4.A.2.d. Settlements converted to forest land																			
4.A.2.e. Other land converted to forest land																			

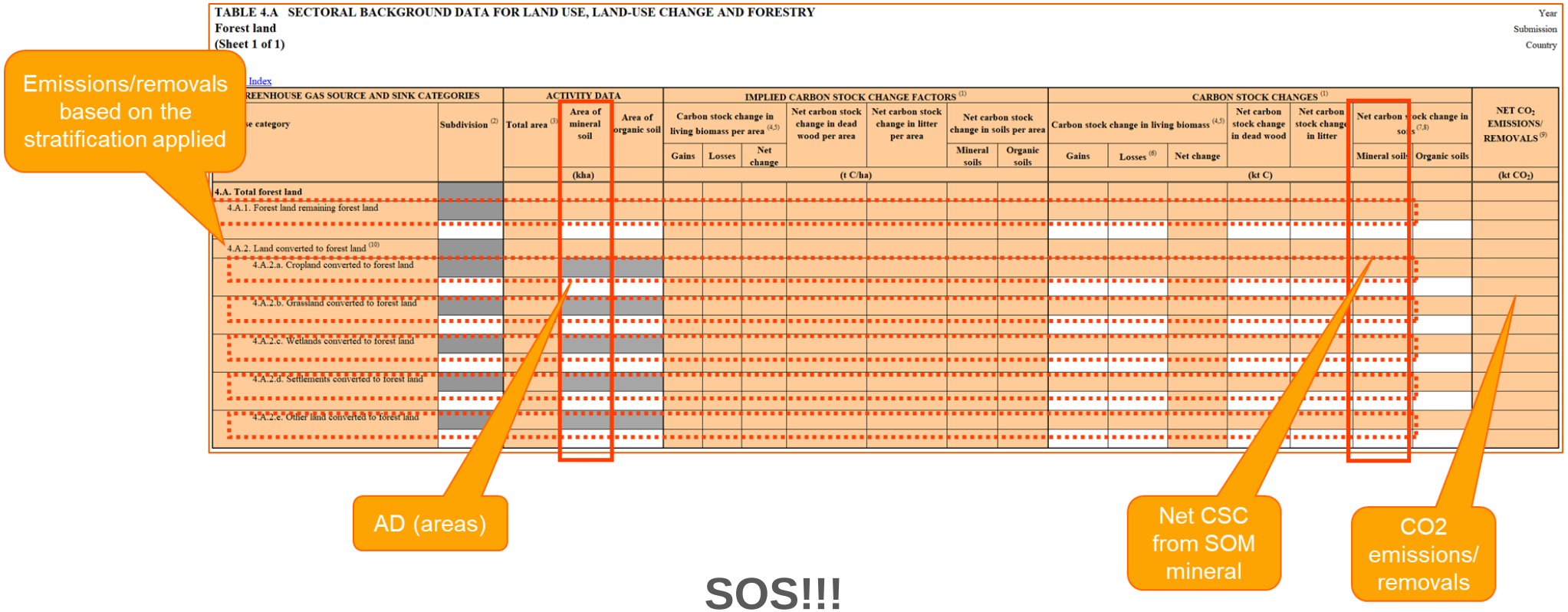
Emissions/removals based on the stratification applied

AD (areas)

Net CSC from SOM mineral

CO2 emissions/ removals

Reporting GHGIs under the ETF| CRT structure



SOS!!!

When reporting CSCs: **Gains** are positive (**+**) & **losses** are negative (**–**)

When reporting emissions/removals: **Emissions** are positive (**+**) & **removals** are negative (**–**)

Reporting GHGIs under the ETF| CRT structure

TABLE 4(II) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY — Year
Emissions and removals from drainage and rewetting and other management of organic and mineral soils — Submission
(Sheet 1 of 1) — Country
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GREENHOUSE GAS SOURCE AND SINK CATEGORIES		ACTIVITY DATA	IMPLIED EMISSION FACTORS			EMISSIONS		
Land-use category [1]	Subdivision [2]	Area (kha)	CO_2 per area (kg CO_2/ha)	N_2O–N per area [3] (kg N_2O–N/ha)	CH_4 per area (kg CH_4/ha)	CO_2 [4]	N_2O (kt)	CH_4
4(II). Total for all land use categories								
4(II).A. Forest land [5]								
4(II).A.1 Forest land remaining forest land								
Total organic soils								
Drop-down list:								
Drained organic soils								
Rewetted organic soils								
Other *(please specify)*								
Total mineral soils								
Drop-down list:								
Rewetted mineral soils								
Other *(please specify)*								
4(II).A.2 Land converted to forest land								
Total organic soils								
Drop-down list:								
Drained organic soils								
Rewetted organic soils								
Other *(please specify)*								

CH_4 emissions from rewetted and created wetlands on IWMS

CO_2 emissions from rewetting of cropland with IWMS unless they are included in CRT 4.B

Reporting GHGIs under the ETF| CRT structure

Direct & indirect N_2O emissions from N mineralization/immobilization as a result of the loss/gain of SOM due to land-use/-management changes on mineral soils

TABLE 4(III) SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY Year

Direct and indirect nitrous oxide (N_2O) emissions from nitrogen (N) mineralization/immobilization associated with loss/gain of soil organic matter resulting from change of land use or management of mineral soils (1) Submission

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GREENHOUSE GAS SOURCE AND SINK CATEGORIES	ACTIVITY DATA AND OTHER RELATED INFORMATION		IMPLIED EMISSION FACTORS		N_2O EMISSIONS		
Land-use category (2)	Area (3) (kha)	N mineralised in mineral soils associated with loss of soil C from soil organic matter (4) (t N/year)	N_2O–N emissions per area (5) (kg N_2O–N/ha)	N_2O–N emissions per unit of N lost through leaching and run-off (kg N_2O–N/kg N)	Direct Emissions (kt)	Indirect Emissions (4,6) (kt)	Total Emissions (kt)
4(III). Total for all land-use categories							
4(III).A. Forest land (7)							
4(III).A.1. Forest land remaining forest land							
4(III).A.2. Lands converted to forest land (8)							
Drop down list:							
4(III).A.2.a. Cropland converted to forest land							
4(III).A.2.b. Grassland converted to forest land							
4(III).A.2.c. Wetlands converted to forest land							
4(III).A.2.d. Settlements converted to forest land							
4(III).A.2.e. Other land converted to forest land							
4(III).B. Cropland (2)(7)							
4(III).B.2. Lands converted to cropland (7)(8)							
Drop down list:							
4(III).B.2.a. Forest land converted to cropland							
4(III).B.2.b. Grassland converted to cropland							
4(III).B.2.c. Wetlands converted to cropland							
4(III).B.2.d. Settlements converted to cropland							
4(III).B.2.e. Other land converted to cropland							
4(III).C. Grasslands (7)							
4(III).C.1. Grasslands remaining grasslands							
4(III).C.2. Lands converted to grasslands (8)							
Drop down list:							
4(III).C.2.a. Forest land converted to grasslands							
4(III).C.2.b. Cropland converted to grasslands							
4(III).C.2.c. Wetlands converted to grasslands							
4(III).C.2.d. Settlements converted to grasslands							
4(III).C.2.e. Other land converted to grasslands							
4(III).D. Wetlands (7)							
4(III).D.1. Wetlands remaining wetlands							

Reporting GHGIs under the ETF| CRT structure

Allocation of emissions between LULUCF and Agriculture

Source/sink category	Agriculture	LULUCF	
		Agricultural land	Non-agricultural land
Fertilization, liming, urea application	N_2O (cropland, grassland) and CO_2 emissions		N_2O emissions if disaggregated information is available ensuring consistency with agriculture sector, otherwise aggregated N_2O emissions from all land-use categories in agriculture
Drained and rewetted organic soils	N_2O emissions from drainage of soils (cultivation of cropland, grassland)	• CO_2 emissions from drainage of soils • (CH_4 emissions from drainage of soils) • (CO_2 removals from rewetting of soils) • (CH_4 emissions from rewetting of soils) • (N_2O emissions from rewetting of soils, higher tier)	
			N_2O emissions from drainage
N mineralization/ Immobilization associated with loss/gain of soil organic matter due to land-use/management changes	N_2O emissions/avoidance in agricultural land, except land converted to cropland and land converted to grassland	N_2O emissions/avoidance from land converted to cropland and land converted to grassland	N_2O emissions/avoidance
Biomass burning	N2O, CH4 from crop residues burning, prescribed burning of savannahs	• CO2 emissions from burning of perennial biomass, DOM and SOM, if any • non-CO2 emissions from burning of any C stocks, except from those reported under agriculture	• CO2 emissions from burning of perennial biomass, DOM and SOM, if any • non-CO2 emissions from burning of any C stocks
Rice cultivation	CH4 emissions		

(When 2013 IPCC Wetlands Supplement is applied)

Reporting GHGIs under the ETF| notation keys

‘NO’ (not occurring)	for categories or processes, including recovery, under a particular source or sink category that do not occur within a Party
‘NE’ (not estimated)	for activity data and/or emissions by sources and removals by sinks of GHGs that have not been estimated but for which a corresponding activity may occur within a Party
‘NA’ (not applicable)	for activities under a given source/sink category that do occur within the Party but do not result in emissions or removals of a specific gas

Reporting GHGIs under the ETF| notation keys

‘IE’ (included elsewhere)	for emissions by sources and removals by sinks of GHGs estimated but included elsewhere in the inventory instead of under the expected source/sink category
‘C’ (confidential)	for emissions by sources and removals by sinks of GHGs where the reporting would involve the disclosure of confidential information
‘FX’ (flexibility)	for reflecting the application of a specific flexibility as contained in the annex to dec. 18/CMA.1

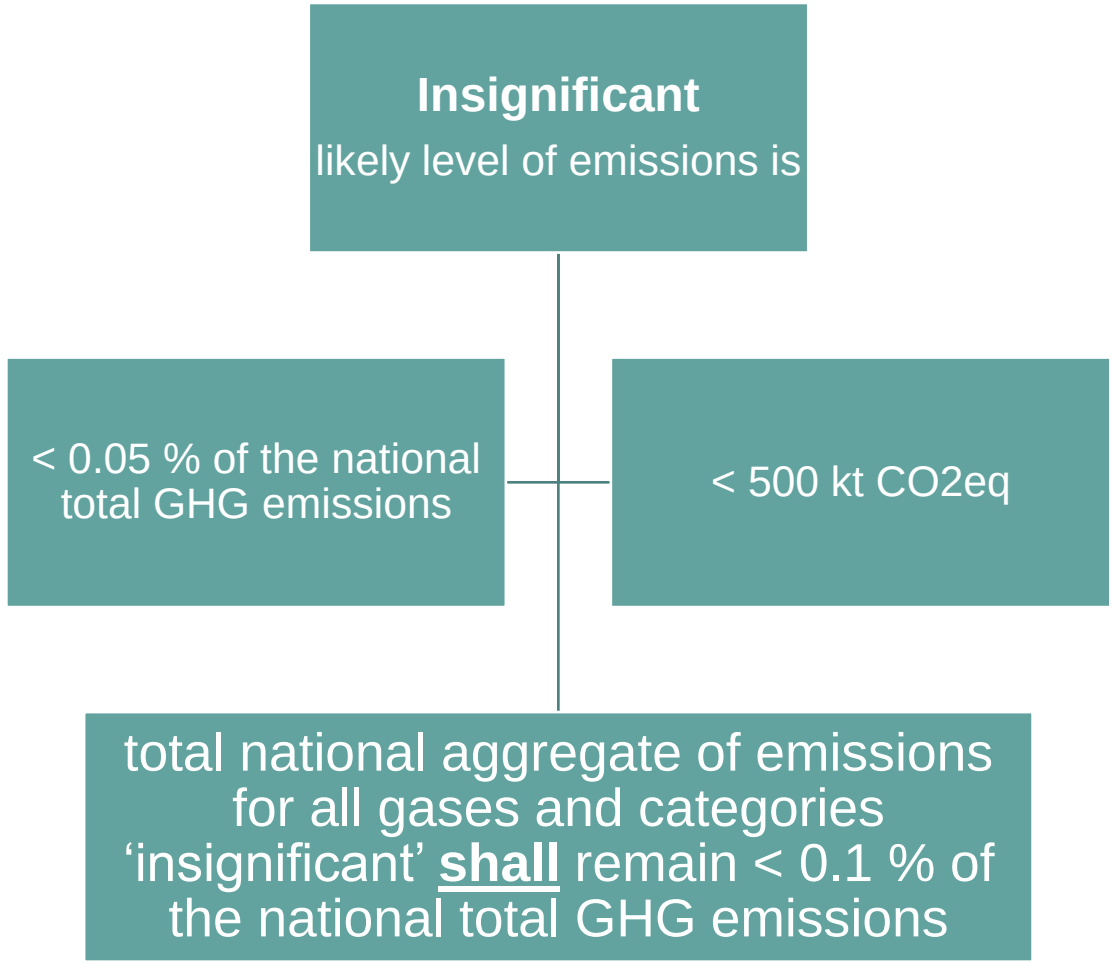
Reporting GHGIs under the ETF| notation keys

However, NE …

when a category is considered ‘insignificant’ in terms of the overall level in national total* emissions

Parties should use approximated AD and default IPCC EFs to derive a likely level of emissions for the respective category

Once emissions from a specific category have been reported in a previous submission, figures shall be reported in subsequent submissions



*total emissions: excluding LULUCF

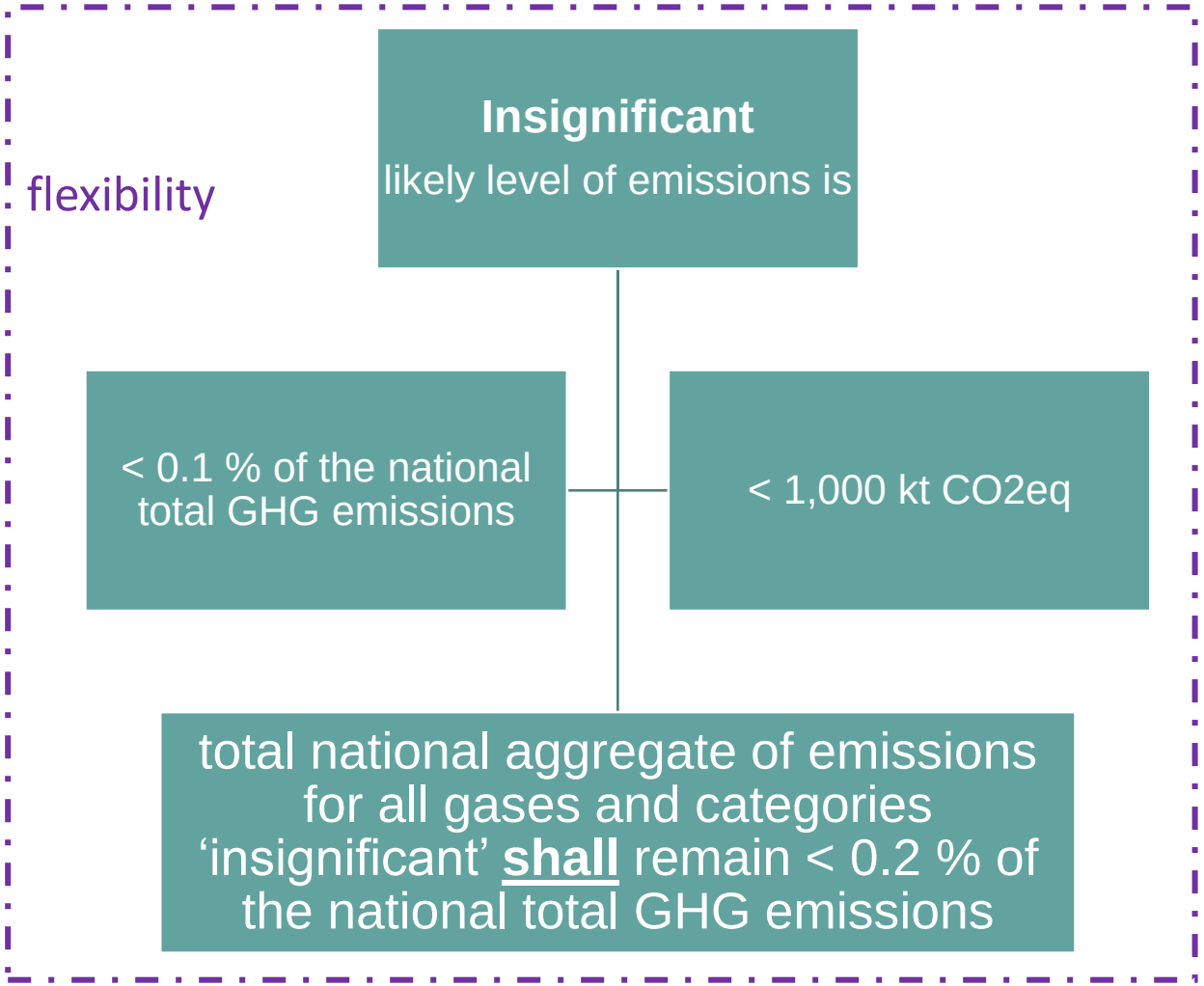
Reporting GHGIs under the ETF| notation keys

However, NE …

when a category is considered ‘insignificant’ in terms of the overall level in national total* emissions

Parties should use approximated AD and default IPCC EFs to derive a likely level of emissions for the respective category

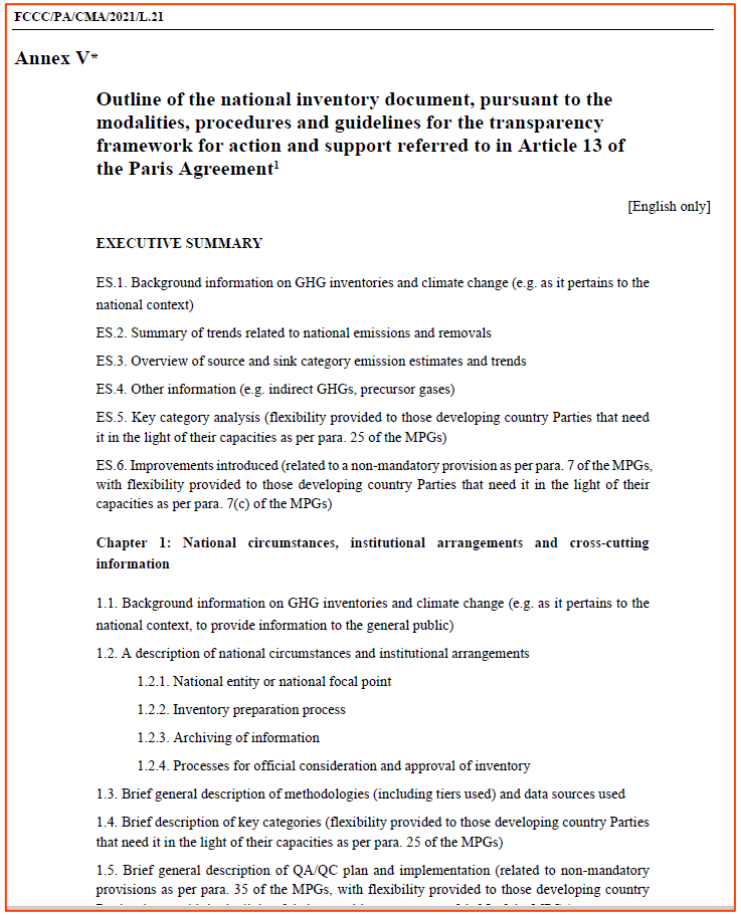
Once emissions from a specific category have been reported in a previous submission, figures shall be reported in subsequent submissions



*total emissions: excluding LULUCF

Reporting GHGIs under the ETF| NID

- The outlines for the BTR (annex IV) & the national inventory document (NID) (annex V), as well as the technical expert review report (FCCC/PA/CMA/2021/L.21) have been adopted through decision 5/CMA.3
- Parties are encouraged to follow the NID outline
- It facilitates a structured and consistent developmend of the report & ensures transparency



FCCC/PA/CMA/2021/L.21

Annex V*

Outline of the national inventory document, pursuant to the modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement[1]

[English only]

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ES.1. Background information on GHG inventories and climate change (e.g. as it pertains to the national context)

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ES.5. Key category analysis (flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 25 of the MPGs)

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1.2.3. Archiving of information

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Reporting GHGIs under the ETF| NID

- EXECUTIVE SUMMARY
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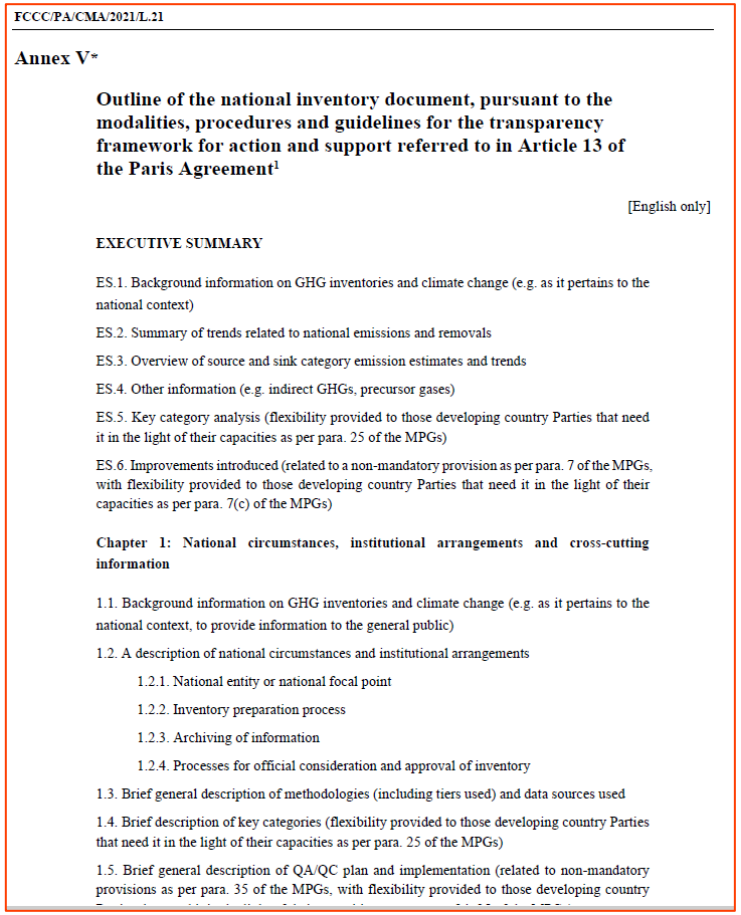
- Chapter 2: Trends in greenhouse gas emissions and removals
- Chapter 3: Energy (CRT sector 1)
- Chapter 4: Industrial processes and product use (CRT sector 2)
- Chapter 5: Agriculture (CRT sector 3)



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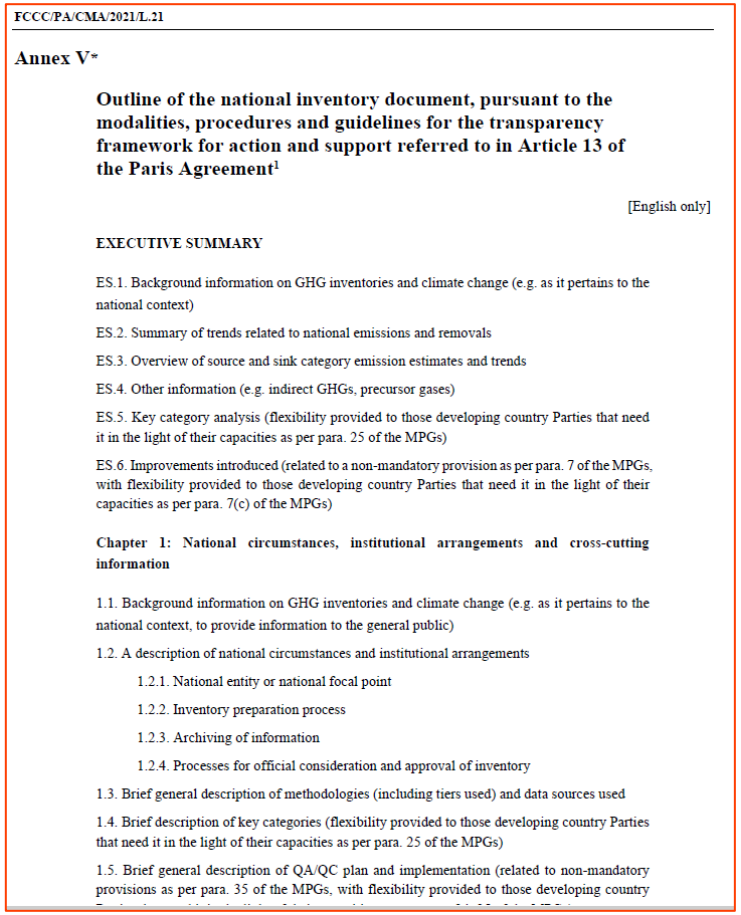
Reporting GHGIs under the ETF| NID

- Chapter 6: Land use, land-use change and forestry (CRT sector 4)
- Chapter 7: Waste (CRT sector 5)
- Chapter 8: Other (CRT sector 6) (if applicable)
- Chapter 9: Indirect carbon dioxide and nitrous oxide emissions
- Chapter 10: Recalculations and improvements



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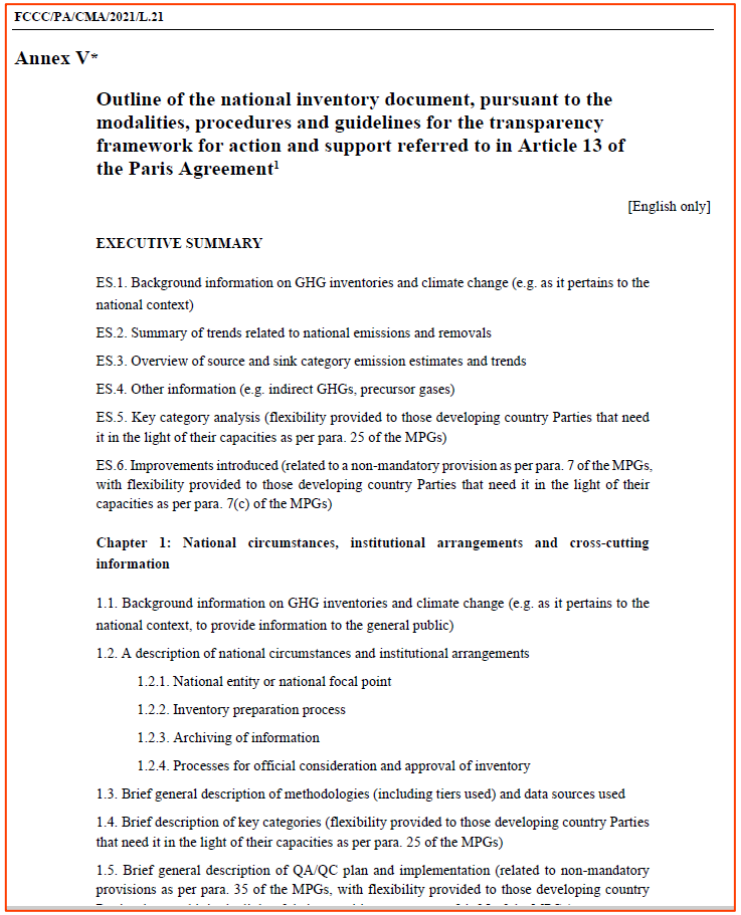
Reporting GHGIs under the ETF| NID

- Annex 1: Key categories
- Annex 2: Uncertainty assessment
- Annex 3: Detailed description of the reference approach (incl. inputs to the RA) and the results of the comparison of national estimates of emissions with those obtained using the reference approach)
- Annex 4: QA/QC plan
- Annex 5: Any additional information, as applicable, incl. methodological descriptions of source or sink categories and the national emission balance
- Annex 6: Common reporting tables



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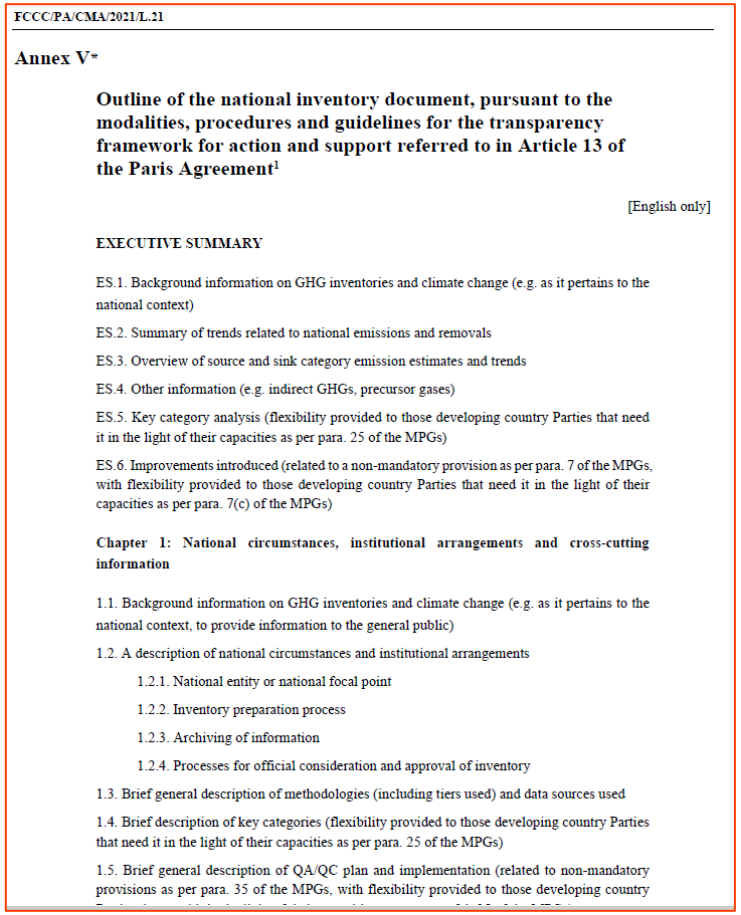
Reporting GHGIs under the ETF| NID

- Developing country Parties that need flexibility may report information on specific flexibility applied in a separate chapter and/or within relevant sectoral chapters
- Parties may also include a summary table on the flexibilities applied



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Reporting GHGIs under the ETF| NID

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1.5. Brief general description of QA/QC plan and implementation (related to non-mandatory provisions as per para. 35 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per paras. 34–35 of the MPGs)

1.6. General uncertainty assessment, including data pertaining to the overall uncertainty of inventory totals (flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 29 of the MPGs)

1.7. General assessment of completeness (related to a non-mandatory provision as per para. 30 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 32 of the MPGs)

- 1.7.1. Information on completeness (including information on non-reported categories or any methodological or data gaps in the inventory) (related to a non-mandatory provision as per para. 30 of the MPGs)
- 1.7.2. Description of insignificant categories, if applicable (related to a non-mandatory provision as per para. 32 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 32 of the MPGs)
- 1.7.3. Total aggregate emissions considered insignificant, if applicable (related to a non-mandatory provision as per para. 32 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 32 of the MPGs)

1.8. Metrics (related to a non-mandatory provision as per para. 37 of the MPGs)

1.9. Summary of any flexibility applied (i.e. by developing country Parties that need it in the light of their capacities as per paras. 4–6 of the MPGs)[2]

Reporting GHGIs under the ETF| NID

Chapter 2: Trends in greenhouse gas emissions and removals

2.1. Description of emission and removal trends for aggregated GHG emissions and removals

2.2. Description of emission and removal trends by sector and by gas

Chapter 3: Energy (CRT sector 1)[3]

3.1. Overview of the sector (e.g. quantitative overview and description, including trends and methodological tiers by category) and background information

3.2. Fuel combustion (CRT 1.A), including detailed information on:

3.2.1. Comparison of the sectoral approach with the reference approach (related to a non-mandatory provision as per para. 36 of the MPGs)

3.2.2. International bunker fuels (related to a non-mandatory provision as per para. 53 of the MPGs)

3.2.3. Feedstocks and non-energy use of fuels (related to a non-mandatory provision as per para. 54 of the MPGs)

3.2.4. Category (CRT category number)

3.2.4.1. Category description (e.g. characteristics of sources)

3.2.4.2. Methodological issues (e.g. choice of methods/activity data/emission factors and activity data and emission factors used, assumptions, parameters and conventions underlying the emission estimates and the rationale for their selection,

Chapter 4: Industrial processes and product use (CRT sector 2)

4.1. Overview of the sector (e.g. quantitative overview and description, including trends and methodological tiers by category) and background information

4.2. Category (CRT category number)

4.2.1. Category description (e.g. characteristics of sources)

4.2.2. Methodological issues (e.g. choice of methods/activity data/emission factors and activity data and emission factors used, assumptions, parameters and conventions underlying the emission estimates and the rationale for their selection, information on carbon dioxide capture, any specific methodological issues (e.g. description of national methods and models))

4.2.3. Description of any flexibility applied (i.e. by developing country Parties that need flexibility in the light of their capacities as per paras. 4–6 of the MPGs)[7]

4.2.4. Uncertainty assessment and time-series consistency (flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 29 of the MPGs)

4.2.5. Category-specific QA/QC and verification, if applicable (related to non-mandatory provisions as per para. 35 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per paras. 34–35 of the MPGs)

4.2.6. Category-specific recalculations, if applicable, including explanatory information and justifications for recalculations, changes made in response to the review process and impacts on emission trends

4.2.7. Category-specific planned improvements, if applicable (e.g. methodologies, activity data, emission factors), including tracking of those identified in the review process (related to a non-mandatory provision as per para. 7 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 7(c) of the MPGs)

Chapter 7: Waste (CRT sector 5)

7.1. Overview of the sector (e.g. quantitative overview and description, including trends and methodological tiers by category) and background information

7.2. Category (CRT category number)

7.2.1. Category description (e.g. characteristics of sources)

7.2.2. Methodological issues (e.g. choice of methods/activity data/emission factors and activity data and emission factors used, assumptions, parameters and conventions underlying the emission estimates and the rationale for their selection, any specific methodological issues (e.g. description of national methods and models))

7.2.3. Uncertainty assessment and time-series consistency (flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 29 of the MPGs)

7.2.4. Description of any flexibility applied (i.e. by developing country Parties that need flexibility in the light of their capacities as per paras. 4–6 of the MPGs)[10]

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7.2.6. Category-specific recalculations, if applicable, including explanatory information and justifications for recalculations, changes made in response to the review process

7.2.7. Category-specific planned improvements, if applicable (e.g. methodologies, activity data, emission factors), including those in response to the review process (related to a non-mandatory provision as per para. 7 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 7(c) of the MPGs)

Reporting GHGIs under the ETF| NID

Chapter 6: Land use, land-use change and forestry (CRT sector 4)

6.1. Overview of the sector (e.g. quantitative overview and description, including trends and methodological tiers by category, and coverage of pools) and background information

6.2. Land-use definitions and the land representation approach(es) used and their correspondence to the land use, land-use change and forestry categories (e.g. land use and land-use change matrix)

6.3. Country-specific approaches

6.3.1. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

6.3.2. Information on approaches used for natural disturbances, if applicable

6.3.3. Information on approaches used for reporting harvested wood products

6.4. Category (CRT category number)

6.4.1. Description (e.g. characteristics of category)

6.4.2. Methodological issues (e.g. choice of methods/activity data/emission factors and activity data and emission factors used, assumptions, parameters and conventions underlying the emission and removal estimates and the rationale for their selection, any specific methodological issues (e.g. description of national methods and models))

6.4.3. Uncertainty assessment and time-series consistency (flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 29 of the MPGs)

6.4.4. Description of any flexibility applied (i.e. by developing country Parties that need flexibility in the light of their capacities as per paras. 4–6 of the MPGs)[9]

6.4.5. Category-specific QA/QC and verification, if applicable (related to a non-mandatory provision as per para. 35 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per paras. 34–35 of the MPGs)

6.4.6. Category-specific recalculations, if applicable, including explanatory information and justifications for recalculations, changes made in response to the review process and impacts on emission trends

6.4.7. Category-specific planned improvements, if applicable (e.g. methodologies, activity data, emission factors), including those in response to the review process (related to a non-mandatory provision as per para. 7 of the MPGs, with flexibility provided to those developing country Parties that need it in the light of their capacities as per para. 7(c) of the MPGs)

Reporting GHGIs under the ETF| NID

Japan GHGI 2022

b) Methodological Issues

1) Carbon Stock Changes in Soils in "Grassland remaining Grassland"

- ***Estimation Method***

➢ ***Estimation of Carbon stock changes in mineral soils***

Carbon stock change in mineral soils in pasture land was estimated by using the Tier 3 modeling method same as 6.6.1.b)2) cropland remaining cropland (4.B.1.).

➢ ***Estimation of on-site CO_2 emissions resulting from cultivation in organic soils***

With respect to CO_2 emissions from organic soils in pasture land were estimated by applying the Tier 1 estimation method described in section 6.2.3.1 in the *2006 IPCC Guidelines*. The estimation method is the same as cropland remaining cropland (4.B.1.).

➢ ***Estimation of off-site CO_2 emissions via waterborne carbon losses from drained inland organic soils***

Off-site CO_2 emissions via waterborne carbon losses from drained inland organic soils were estimated by applying Tier 1 estimation method described in section 2.2.1.2 in the *Wetlands Guidelines*. The estimation method is the same as cropland remaining cropland (4.B.1.).

- ***Parameters***

➢ ***Assumption for the Roth C model and parameters for estimating mineral soils***

The parameters used are omitted because they are the same as cropland remaining cropland (4.B.1.).

➢ ***Parameters for estimation of CO_2 emissions from organic soils***

Because there is little research data on CO_2 emission factor that is suitable for grassland in Japan, the default value provided in *the Wetlands Guidelines* (Table 2.1, 6.1 t-C/ha/year) which is considered to be most appropriate for the emission factor under the distribution of pasture land and current management system in Japan, was applied. As for off-site CO_2 emissions, the same parameters as cropland remaining cropland (4.B.1.) were used.

Italy GHGI 2022

Table 6.18 Cropland management practices and relative data sources

cropland subcategory	management practice	data source
annual crops	Ordinary	ISTAT
	Organic	National Information system on organic agriculture (SINAB)
	Sustainable	Annual Implementation Reports (RAE) and Annual Report on Operational Programs: 2000-2018
	Set aside	Eurostat: 1990-2016
	Conservative practices	Annual Implementation Reports (RAE): 2008-2018
perennial crops	Ordinary	ISTAT
	Organic	National Information system on organic agriculture (SINAB)
	Sustainable	Annual Implementation Reports (RAE) and Annual Report on Operational Programs: 2000-2018

The annual areas subject to the abovementioned management practices, at regional level, have been estimated, also considering the transition to and from different management practices (e.g. ordinary annual crops to organic annual crops, ordinary annual crops to sustainable annual crops, etc.). Changes in carbon stocks in mineral soils has been calculated by applying the equation 2.25 of the IPCC, 2006 (vol. 4, chapter 2). The IPCC default transition period, i.e. 20 years, has been considered.
The SOC_{ref} classification of the soils is based on the default reference SOC stocks for mineral soils (tC/ha in 0-30 cm) provided in table 2.3 of IPCC 2006. The identification of country specific SOC_{ref} have been performed using a combination of the following map layers:

- IPCC climate zones (JRC) - http://eusoils.jrc.ec.europa.eu/projects/RenewableEnergy/
- Corine Land cover 2006 (grassland: legend codes: 2.3 and 3.2) - http://sia.eionet.europa.eu/CLC2006
- Soil map of Italy - (reclassified according to the main groups of soil types as in table 2.3) - Costantini E.A.C., L'Abate G., Barbetti R., Fantappiè M., Lorenzetti R., Magini S. (2013) Carta dei suoli d'Italia, scala 1:1.000.000 - http://www.soilmaps.it/
- Map of Italy with administrative boundaries.

Overlapping the abovementioned layers, the Italian soils have been classified according to the IPCC soil classes (table 2.3, vol. 4, chapter 2 of the 2006 IPCC Guidelines), and their related climate zones as percentage in each region. According to the thereby defined distribution of the soil types and climate zones in each Italian region, it was possible to define the SOC_{ref}. The stock change factors (F_{LU}, F_{MG}, F_I) adapted to the national circumstances, have been derived by the default values provided in table 5.5 of the 2006 IPCC Guidelines (vol.4, chapter 5) and have been applied considering the percentage of moist and dry climates in each administrative region. The F factors considered, and are reported in the following Table 6.19.

Table 6.19 Stock change factors

	Management practice	F_{LU}	F_{MG}		F_I	
		Moist	*Dry*	*Moist*	*Dry*	*Moist*	*Dry*
annual crops	Ordinary	0.69	0.8	1	1	0.92	0.95
	Organic	0.69	0.8	1	1	1.44	1.37
	Sustainable	0.69	0.8	1.08	1.02	1	1
	Set aside	0.82	0.93	1.15	1.1	0.92	0.95
	Conservative	0.69	0.8	1.15	1.1	1.11	1.04
perennial crops	Ordinary	1	1	1	1	1	1
	Organic	1	1	1.08	1.02	1.44	1.37
	Sustainable	1	1	1.08	1.02	0.92	0.95

The SOC stocks per hectare in the mineral soil, calculated on the basis of the previously described procedure, are shown in the table 6.20, per region and per management practices, for annual and perennial crops. Estimates of SOC stock changes in annual and perennial crops are reported in Table 6.21.

Table 6.20 SOC stocks per region and management practice

Region	annual crops					perennial crops		
	Ordinary	Organic	Sustainable	Set aside	Conservative	Ordinary	Organic	Sustainable
	SOC stock (t C ha^{-1})					*SOC stock (t C ha^{-1})*		
Piemonte	49.04	74.86	56.02	65.64	65.18	72.91	109.79	71.92
Valle D'Aosta	57.29	89.45	67.07	78.13	79.15	89.72	139.09	89.08
Liguria	51.15	78.64	58.89	68.87	68.82	77.29	117.47	76.40
Lombardia	52.32	80.88	60.59	70.76	71.06	80.06	122.53	79.26
Trentino – Alto Adige	56.84	88.97	66.73	77.68	78.87	89.54	139.26	88.97
Veneto	46.88	71.05	53.14	62.38	61.55	68.60	102.36	67.53
Friuli - Venezia Giulia	55.04	87.56	65.67	76.45	77.62	88.12	137.05	87.56
Emilia - Romagna	40.13	59.60	44.50	52.53	50.87	56.17	81.60	54.94
Toscana	38.18	56.43	42.11	49.78	47.98	52.88	76.32	51.64
Umbria	46.72	70.81	52.96	62.17	61.34	68.37	102.01	67.30
Marche	39.05	57.86	43.18	51.02	49.29	54.36	78.72	53.14
Lazio	39.33	58.52	43.69	51.55	50.01	55.26	80.48	54.09
Abruzzo	40.97	60.98	45.54	53.72	52.13	57.61	83.93	56.39
Molise	32.74	47.67	35.52	42.18	40.09	43.94	62.20	42.72
Campania	31.64	45.99	34.26	40.71	38.63	42.31	59.75	41.11
Puglia	29.21	42.21	31.45	37.42	35.30	38.60	54.07	37.42
Basilicata	30.64	44.37	33.05	39.31	37.17	40.67	57.16	39.46
Calabria	34.42	50.34	37.53	44.51	42.48	46.63	66.39	45.39
Sicilia	28.70	41.38	30.81	36.69	34.56	37.76	52.77	36.59
Sardegna	30.11	43.56	32.44	38.60	36.47	39.89	55.99	38.69

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6.3.4.1.4 Changes of carbon stocks in mineral soils of "annual cropland remaining annual cropland" and "perennial cropland remaining perennial cropland" (4.B.1.a)

According to national soil inventories organic soils are not occurring in cropland in Austria.

Emissions/removals due to soil C stock changes in "annual cropland remaining annual cropland" were calculated using a country specific methodology (Tier 2). For the soil organic carbon content the Austrian specific average value of 50 t C ha^{-1} for 0–30 cm depth of cropland was assumed for 1990 which is based on the results of the Austrian soil inventory (Gerzabek et al. 2003., Streb et al. 2003). This assumption is supported by the fact that the soil inventories were carried out between

1988 and 1996. Furthermore, we assumed that this Austrian specific soil C stock for cropland represents a steady state that already includes the effects of the management for the period before 1990 and that cropland management was rather stable in that period.

The further methodology follows closely the 2006 IPCC GL, where the IPCC equation 2.25 includes a management factor (F_{MG}), a land-use factor (F_{LU}) and an input factor for input of organic matter (F_I) (Table 5.5, IPCC 2006).

In a study by the Austrian Agency for Health and Food Safety (AGES) and Umweltbundesamt (Umweltbundesamt 2010b) the IPCC default management factors for SOC (soil organic carbon) stock change have been assessed against results from national long-term field experiments of AGES (Spiegel et al., 2007). The results of the C stock change rates for the agricultural experimental plots were allocated to different management types (management factors) like tillage types and input types:

The country-specific land-use factor (F_{LU}) for long-term cultivated cropland soils of 0.93 is applied according to the results of the long-term field experiments of AGES (Umweltbundesamt 2010b).

The stock change factors for management (F_{MG}) were also applied according to the results of the long-term field experiments of AGES (Umweltbundesamt 2010b, Spiegel et al. 2007), showing the effects of different tillage types (minimum, reduced and conventional tillage) on soil organic carbon. According to these results, F_{MG} full and F_{MG}-reduced have the same country specific management factor of 1.0. For F_{MG} no-till the country specific management factor of 1.09 was derived (Umweltbundesamt 2010b).

The stock change factors for input (F_I) were also revisited: F_I-Low does not occur in Austria, F_I-medium was assigned a management factor of 1.0 according to Umweltbundesamt (2010b), F_I-high-without manure was assigned with a factor of 1.05 and for the input type F_I-high-with manure a factor of 1.11 was derived as mean value of the found results in the long-term field experiments (Umweltbundesamt 2010b).Table 264 shows the revised national factors used compared to the IPCC default values (for cool, temperate, moist regime).

Table 264: Relative stock change factors for cropland according to IPCC default values and revised national factors

Factor value type		Level	IPCC default 2006 IPCC GL (cool, temperate, moist regime)	Applied revised national factors (Umweltbundesamt 2010b)
Land use (F_{LU})	F_{LU}	Long-term cultivated	0.69	0.93
Tillage (F_{MG})	F_{MG1}	Full	1.00	1.00
	F_{MG2}	Reduced	1.08	1.00
	F_{MG3}	No-Till	1.15	1.09
Input (F_I)	F_{I1}	Low	0.92	0.95
	F_{I2}	Medium	1.00	1.00
	F_{I3}	High – without manure	1.11	1.05
	F_{I4}	High – with manure	1.44	1.11

The methodological regime for splitting the annual cropland into the different tillage and input types and assigning the specific management factors is as following:

FAO and the Enhanced transparency framework

www.fao.org/climate-change/our-work/what-we-do/transparency/

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Thank you !