Peter Iversen (EEA), Carmen Schmid (ETC/CM), JRC LULUCF workshop 2022

Updated tools for the EEA initial checks on the LULUCF sector

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Outline

- Introduction & background (EEA)
- Overview of the checks and tools (ETC)
  - Dataflow and technical implementation
  - Short presentation of each check
- Q&A

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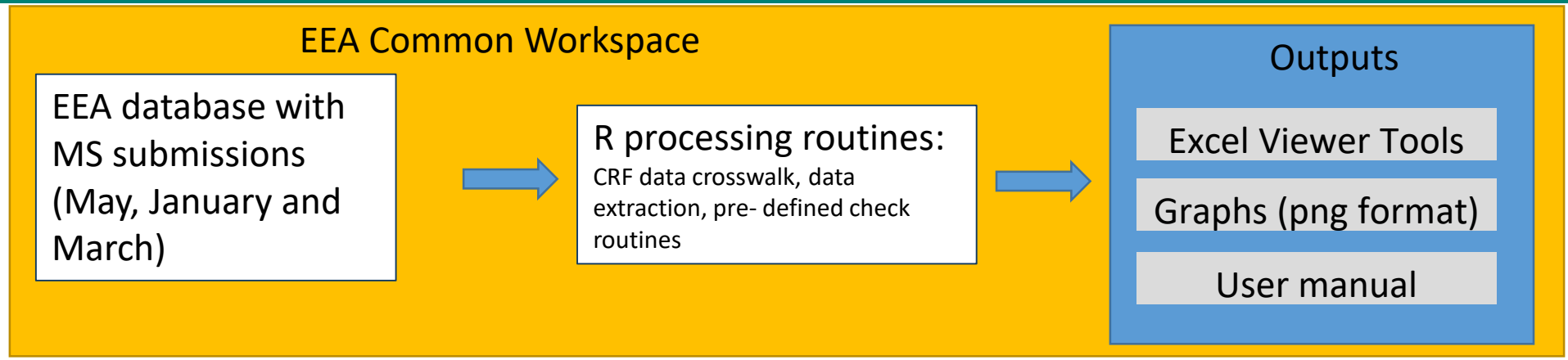
Overview of the checks and tools



Objectives:

- Automatisation of data flow
- Consistency across MS
- Comparison of submissions
- Continuous documentation of results
- Harmonisation of EU inventory / CRF

Limitations:

- Checks are (currently) limited to data provided in CRF
- MS specific sub- categories are not included in the EEA database
- Automatically generated results need interpretation by a LULUCF expert !!

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Overview of the checks

Check tool name	Description/objective of the check
1) Blank cells and zeros	Identification of blank cells and cells including zero in the CRF tables
2) Notation keys	Compare the use of notation keys across MS
3) Key categories	Highlight changes in key categories compared to previous submissions, show key categories over the time series, identification of significant pools
4) HWP consistency	Detect reporting inconsistencies in HWP table 4.G.s.1
5) Soil N2O	Highlight categories in which N2O emissions would be expected because a C loss in mineral soil was reported
6) Land area consistency	Detect inconsistencies in the land use matrix and reported areas in the CRF
7) Recalculations	Highlight and filter recalculations, with option to select a threshold for filtering the recalculations
8) Spikes	Detect and visualise spikes in the time series
9) Visualisation of time series	Visualisation of time series per category and pool per MS and comparison against IQR of EU timeseries
10) Data look up tool	Presentation of CRF data as full time series, filtering by MS

Check: Blank cells and zeros in CRF

- Identifies blank cells and real zeros in the CRF tables

TableNr	Party	Code	Category	Activity	Pool	Variable	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Table4D	CYP	4D.2.3	Land converted to other wetlands	LULUC	DOM	CSC	kt C	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
Table4D	CYP	4D.2.3	2.3 Land converted to other wetlands	LULUC	Min Soil	ICSCF	t C/ha	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
Table4D	CYP	4D.2.3	Land converted to other wetlands	LULUC	Biomass Losses	CSC	kt C	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
Table4E	CYP	4E.2.4	Wetlands converted to settlements	LULUC	Biomass Losses	ICSCF	t C/ha											
Table4E	CYP	4E.2.4	Wetlands converted to settlements	LULUC	Biomass Losses	CSC	kt C											
Table4Gs1	CYP	4G	Harvested Wood Products	Total HWP from	Solid wood IU	Stock Gains	t C	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK
Table4Gs1	CYP	4G	Harvested Wood Products	Total HWP from	Solid wood IU	Stock Losses	t C	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK
Table4Gs1	CYP	4G	Harvested Wood Products	Total HWP from	Solid wood IU	Net Stock Chan	kt C	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK
Table4Gs1	CYP	4G	Harvested Wood Products	HWP in SWDS	All HWPs SWDS	Stock Losses	t C	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
Table4Gs1	CYP	4G	Harvested Wood Products	Total HWP from	Solid wood IU	Emi/Rem	kt CO2	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK
Table4	CZE	4C.1	Grassland remaining grassland		All	Emi/Rem	kt CO2	ZERO	ZERO	ZERO	ZERO							
Table4(V)	CZE	4(V)A.1	Forest land remaining forest land	Controlled burni	Biomass	IEF	t CH4/AD unit											
Table4(V)	CZE	4(V)A	Forest land	Controlled burni	Biomass	IEF	t N2O/AD unit											
Table4(V)	CZE	4(V)A.1	Forest land remaining forest land	Controlled burni	Biomass	IEF	t N2O/AD unit											
Table4(V)	CZE	4(V)A.1	Forest land remaining forest land	Controlled burni	Biomass	IEF	t CO2/AD unit											
Table4(V)	CZE	4(V)	Total all land-use categories	Controlled burni	Biomass	IEF	t CO2/AD unit											
Table4(V)	CZE	4(V)	Total all land-use categories	Controlled burni	Biomass	IEF	t CH4/AD unit											
Table4(V)	CZE	4(V)	Total all land-use categories	Controlled burni	Biomass	IEF	t N2O/AD unit											
Table4(V)	CZE	4(V)A	Forest land	Controlled burni	Biomass	IEF	t CO2/AD unit											
Table4(V)	CZE	4(V)A	Forest land	Controlled burni	Biomass	IEF	t CH4/AD unit											
Table4C	CZE	4C.1	Grassland remaining grassland	LULUC	Min Soil	ICSCF	t C/ha	ZERO	ZERO	ZERO	ZERO							
Table4C	CZE	4C.1	Grassland remaining grassland	LULUC	All	Emi/Rem	kt CO2	ZERO	ZERO	ZERO	ZERO							
Table4C	CZE	4C.1	Grassland remaining grassland	LULUC	Min Soil	CSC	kt C	ZERO	ZERO	ZERO	ZERO							
Table4(V)	DNM	4(V)C.2	Land converted to grassland	Wildfires	Biomass	IEF	t N2O/AD unit	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK
Table4(V)	DNM	4(V)D.1	Wetlands remaining wetlands	Wildfires	Biomass	IEF	t N2O/AD unit	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK
Table4(V)	DNM	4(V)D.1	Wetlands remaining wetlands	Wildfires	Biomass	IEF	t CO2/AD unit	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK

Check: Notation keys

- for Tables 4.A - 4.F: based on comparison against Table 1.2. of the 2006 IPCC Guidelines
- limitations: issues are flagged on a very aggregated level => issues need further inspection by review expert

	A	B	C	D	E	F	G	H	I	J
1	Select here: issue and year to filter the results									
2	potential issue: NK used despite availbility of IPCC method									
3	2020									
4										
5										
6	category	pool	category/pool	AUT	BEL	BGR	CYP	CZE	DEU	DNM
24	Forest Land	Mineral Soil	Cropland to Forest Land: Mineral Soil							
25	Forest Land	Mineral Soil	Forest Land to Forest Land: Mineral Soil							
26	Forest Land	Mineral Soil	Grassland to Forest Land: Mineral Soil							NA
27	Forest Land	Mineral Soil	Other Land to Forest Land: Mineral Soil							
28	Forest Land	Mineral Soil	Settlements to Forest Land: Mineral Soil							
29	Forest Land	Mineral Soil	Wetlands to Forest Land: Mineral Soil	NO				NO		NA

Select here: issue and year to filter the results

potential issue: NK used despite availbility of IPCC method

equilibrium assumption allowed; NK used
no IPCC method available; NK used
potential issue: blank AD-, IEF- and/or CSC cells
potential issue: check table
potential issue: consistency with AD; however, check AD NK
potential issue: inconsistency between AD and CSC
potential issue: NK used despite availbility of IPCC method

ESP	EST	FIN	FRK	GBE	GBK	GRC	HRV	HUN	IRL	ISL	ITA	LTU	LUX	LVA	MLT	NLD	NOR	POL
						NE								NA	NO			
						NE								NA	NO			
		NA	NE											NA				
														NA				
	NA		NO									NE		NA				

- for tables 4(I)-4(V), 4.G.s.1, 4.G.s.2 and 4.1. a list of all categories with NKs is provided for a simple comparison

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Check: Key categories & significant pools

Approach:

- key categories extracted from CRF table 7
- calculation of significant pools (<=25%) of the key category
- comparison of key categories from previous submission to identify new KCs
- helps the review expert to put the focus on important pools/categories

Significant Pools: HUN

Colour coding: Key category

Pool vs National Total:

PvNT_mean	Mean pool contribution in absolute % to the National Total (without LULUCF) over the times series
PvNT_max	Maximum pool contribution in absolute % to the National Total (without LULUCF) over the times
PvNT_yminus2	2019 pool contribution in absolute % to the National Total (without LULUCF) over the times

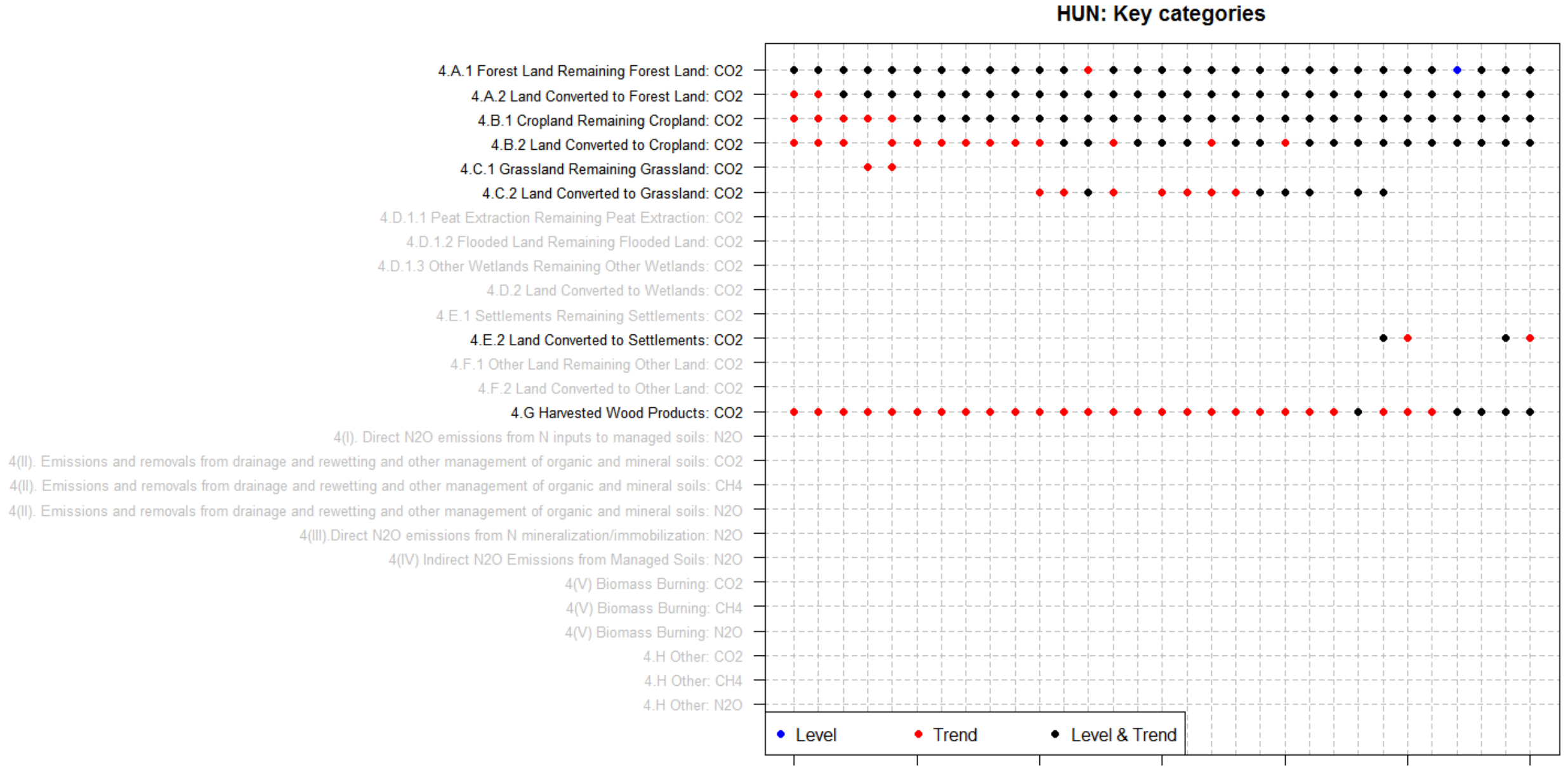
Pool vs category:

PvKC_mean	Mean pool contribution in absolute % to respective category over the times series
PvKC_max	Maximum pool contribution in absolute % to respective category over the times
PvKC_yminus2	2019 pool contribution in absolute % to respective category over the times

This column is filtered from largest to smallest

Party3	Category	Ga	POOL	POOL_Category	POOL_Activi	PvNT_mean	PvNT_max	PvNT_ym	PvKC_mean	PvKC_r	PvKC_yi	KEYCAT	SIGPOO
HUN	4.A.1 Forest Land Remaining Forest L	CO2	Biomass Net	Forest land remaining forest land	LULUC	3.406389957999	8.5064796618	8.506479661	93.22430563109	124.59066	97.463574€	YES	YES
HUN	4.A.2 Land Converted to Forest Land	CO2	Biomass Net	Land converted to forest land	LULUC	0.996405060228	1.8451112410	1.368079750	72.56365414957	157.03303	75.3668347	YES	YES
HUN	4.A.2 Land Converted to Forest Land	CO2	Biomass Net	Cropland converted to forest land	LULUC	0.806525421154	1.5633398849	1.180239561	56.78765750821	180.54649	65.0188115	YES	YES
HUN	4.B.1 Cropland Remaining Cropland	CO2	Min Soil	Cropland remaining cropland	LULUC	0.913125452232	1.8112668552	0.539451966	104.67470534851	396.01111	100.794764	YES	YES
HUN	4.G Harvested Wood Products	CO2	All HWPs IU + SWD	Harvested wood products	Total HWP fron	0.198088085779	0.5105296489	0.389748923	100	100	100	YES	YES
HUN	4.G Harvested Wood Products	CO2	All HWPs IU	Harvested Wood Products	Total HWP fron	0.198088085779	0.5105296489	0.389748923	100	100	100	YES	YES
HUN	4.G Harvested Wood Products	CO2	Solid wood IU	Harvested Wood Products	Total HWP fron	0.183871873808	0.4851371816	0.357211120	85.72920761527	135.40207	91.6515985	YES	YES
HUN	4.B.2 Land Converted to Cropland	CO2	Min Soil	Land converted to cropland	LULUC	0.320244930436	0.5110286665	0.326442057	148.2377474963	1287.6822	88.1019064	YES	YES
HUN	4.A.1 Forest Land Remaining Forest L	CO2	Dead wood	Forest land remaining forest land	LULUC	0.266383339039	0.4336431509	0.319512769	12.25761723440	111.59298	3.6608394€	YES	YES
HUN	4.B.2 Land Converted to Cropland	CO2	Min Soil	Grassland converted to cropland	LULUC	0.311956138658	0.4994052311	0.297179507	145.4923875920	1274.4118	80.2043745	YES	YES
HUN	4.A.2 Land Converted to Forest Land	CO2	Litter	Land converted to forest land	LULUC	0.235409364121	0.4151890620	0.280727526	21.54106750139	58.198464	15.4651401	YES	YES
HUN	4.C.2 Land Converted to Grassland	CO2	Min Soil	Land converted to grassland(9)	LULUC	0.299014792345	0.5314510731	0.270340887	179.9184096681	866.61395	170.343524	YES	YES
HUN	4.A.2 Land Converted to Forest Land	CO2	Litter	Cropland converted to forest land	LULUC	0.193067251846	0.3522142657	0.242921902	17.06726238040	44.272572	13.3824471	YES	YES
HUN	4.C.2 Land Converted to Grassland	CO2	Min Soil	Cropland converted to grassland	LULUC	0.275832437675	0.4979072498	0.211110988	164.3785487234	715.57316	133.022385	YES	YES
HUN	4.E.2 Land Converted to Settlements	CO2	Min Soil	Land converted to settlements	LULUC	0.103332767531	0.1926952323	0.174523888	44.44014815162	67.256076	52.6396425	YES	YES
HUN	4.A.2 Land Converted to Forest Land	CO2	Min Soil	Cropland converted to forest land	LULUC	0.158190638333	0.2736969802	0.167644610	14.26389728469	35.879850	9.23545844	YES	YES
HUN	4.A.2 Land Converted to Forest Land	CO2	Biomass Net	Grassland converted to forest lan	LULUC	0.171065917245	0.2830754978	0.165654663	15.93501433031	38.441315	9.1258332	YES	YES
HUN	4.E.2 Land Converted to Settlements	CO2	Biomass Net	Land converted to settlements	LULUC	0.084042796026	0.2059560056	0.127929956	44.83200593679	78.102908	38.5860484	YES	YES
HUN	4.A.2 Land Converted to Forest Land	CO2	Min Soil	Land converted to forest land	LULUC	0.094466458543	0.1874651911	0.121300496	6.310587743777	7.9074804	6.6823841	YES	NO
HUN	4(II). Emissions and removals from d	CO2	Soil	Wetlands	Draining, Rewe	0.136014623299	0.2410899722	0.109096448	124.2455466267	166.66005	132.508362	NO	NO
HUN	4(II). Emissions and removals from d	CO2	Soil	Peat extraction lands	Draining, Rewe	0.136014623299	0.2410899722	0.109096448	124.2455466267	166.66005	132.508362	NO	NO
HUN	4(II). Emissions and removals from d	CO2	Org Soil	Peat extraction lands	Draining, Rewe	0.136014623299	0.2410899722	0.109096448	124.2455466267	166.66005	132.508362	NO	NO
HUN	4(II). Emissions and removals from d	CO2	Org Soil	Peat extraction lands	Draining	0.136014623299	0.2410899722	0.109096448	124.2455466267	166.66005	132.508362	NO	NO
HUN	4.A.1 Forest Land Remaining Forest L	CO2	Org Soil	Forest land remaining forest land	LULUC	0.081654353621	0.1062033053	0.098137242	4.470954308858	35.561039	1.1244141€	YES	YES
HUN	4.E.2 Land Converted to Settlements	CO2	Biomass Net	Forest land converted to settleme	LULUC	0.053997062030	0.1748400974	0.095941827	27.50554763105	45.732544	28.9378352	YES	YES
HUN	4.C.2 Land Converted to Grassland	CO2	Biomass Net	Land converted to grassland(9)	LULUC	0.072440645619	0.2669462253	0.085445948	90.90503168902	748.70099	53.8400391	YES	YES

Check: Key categories – time series



Check: HWP consistency

Three issues can be identified in Table 4.G.s.1

- Issue 1 “Deviation from Net CSC”: column E ≠ column F*-44/12
- Issue 2 “Deviation from CSC Gains/Losses”: column E ≠ column B – column C
- Issue 3 “Notation Key/Blank reported in columns E or F”

	A	B	C	D	E	F
19						
20	**APPROACH B[12]**					
21	**GREENHOUSE GAS SOURCE AND SINK CATEGORIES[3]**	**HWP in use from domestic harvest**				**Net emissions/ removals from HWP in use[6]**
22		**Gains[4]**	**Losses[4]**	**Half-life[5]**	**Annual Change in stock (ΔC HWP IU DH)**	
23		**(t C)**		**(yr)**	**(kt C)**	**(kt CO_2)**
24	**TOTAL HWP from domestic harvest (ΔC HWP IU DH)**					
25	1. Solid wood[7]					
26	2. Paper and paperboard					
27	3. Other *(please specify)*					
28	**HWP produced and consumed domestically (ΔC HWPdom IU DH)[13]**					
29	***Total***					
30	1. Solid wood[7]					
31	2. Paper and paperboard					
32	3. Other *(please specify)*					
33	**HWP produced and exported (ΔC HWPexp IU DH)[13]**					
34	***Total***					
35	1. Solid wood[7]					
36	2. Paper and paperboard					
37	3. Other *(please specify)*					
38	**Information item:[8]**					

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Check: Soil N2O

- N2O emissions from N mineralisaition of mineral soils and drainage/management of organic soils have to be reported in CRF tables 4(II), 4(III) and 3.D

The check flags:

- if a C loss of mineral soil is reported in tables 4.A.-4.F, but no N2O emissions are reported in table 4(III)
- if a C loss in organic soil is reported in tables 4.A.-4.F, but no N2O emissions are reported in table 4(II)
- and in addition there is a cross check with Agriculture Table 3.D:
  - for Cropland remaining Cropland it flags an issue if a notation key or zero is reported for 3.D.a.5,Mineralization/immobilization of SOC and
  - for Grassland and Cropland in category 3.D.a.6 cultivation of histosoils

The check also requires additional expert judgement

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Check: Land area consistency

- Comparison of initial area in year X with final area in year X-1 in CRF table 4.1.
- Comparison of final area in year X in CRF table 4.1 with area reported in tables 4.A-4.F

Initial vs final area example:

Row Labels	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
⊟PRT																				
Forest land (managed)	0.652	0.663	0.672	0.681	0.692	0.696	0.707	0.715	0.727	0.736	0.747	0.758	0.765	0.779	0.786	0.803	0.81	0.822	0.83	0.842
Forest land (unmanaged)																				
Cropland	0.006	0.001	0.003	0.004	0.007	0.001	0.001	0.004		0.177	0.16106	0.16385	0.15742	0.16298	0.16153	0.16207	0.17443	0.16213	0.16349	0.00985
Grassland (managed)	0.001	0.001		0.001	0.001	0.002	0.002	0.003	0.001	0.071	0.06106	0.06385	0.05842	0.06298	0.06153	0.05907	0.06543	0.05813	0.05449	0.09715
Grassland (unmanaged)																				
Wetlands (managed)	0.003	0.002	0.002	0.002	0.003	0.003	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.006	0.005			0.001
Wetlands (unmanaged)																				
Settlements	0.126	0.004	0.002	0.003	0.004	0.003	0.003	0.003	0.005	0.004	0.003	0.004	0.004	0.003	0.005	0.004	0.155	0.004	0.003	0.004
Other Land	0.768	0.663	0.669	0.677	0.685	0.697	0.707	0.712	0.728	0.629	0.645	0.657	0.665	0.676	0.686	0.698	0.541	0.714	0.718	0.73
Unmanaged land																				
⊟ROU																				

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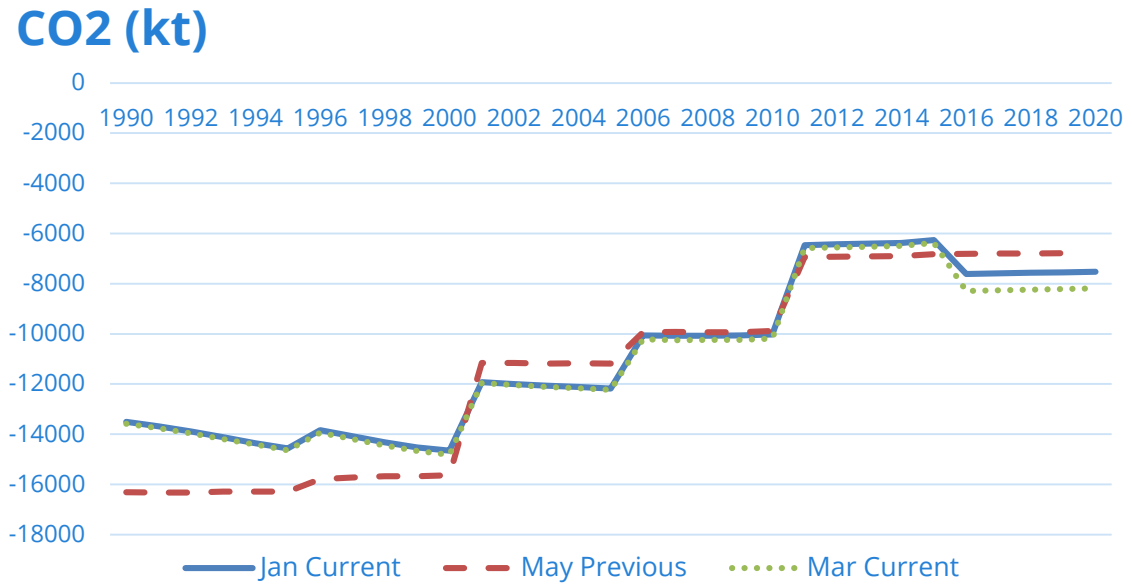
Check: recalculations

- Comparison of submissions: final submission of previous year vs. January vs. March submission
- Review expert can filter the results by applying thresholds
- Results are available for all CRF tables for the net emissions/removals for remaining categories and LUCs and per gas

Party3	BGR	TableNr	Table4	Code	4A.1	Category	Forest land remaining forest land



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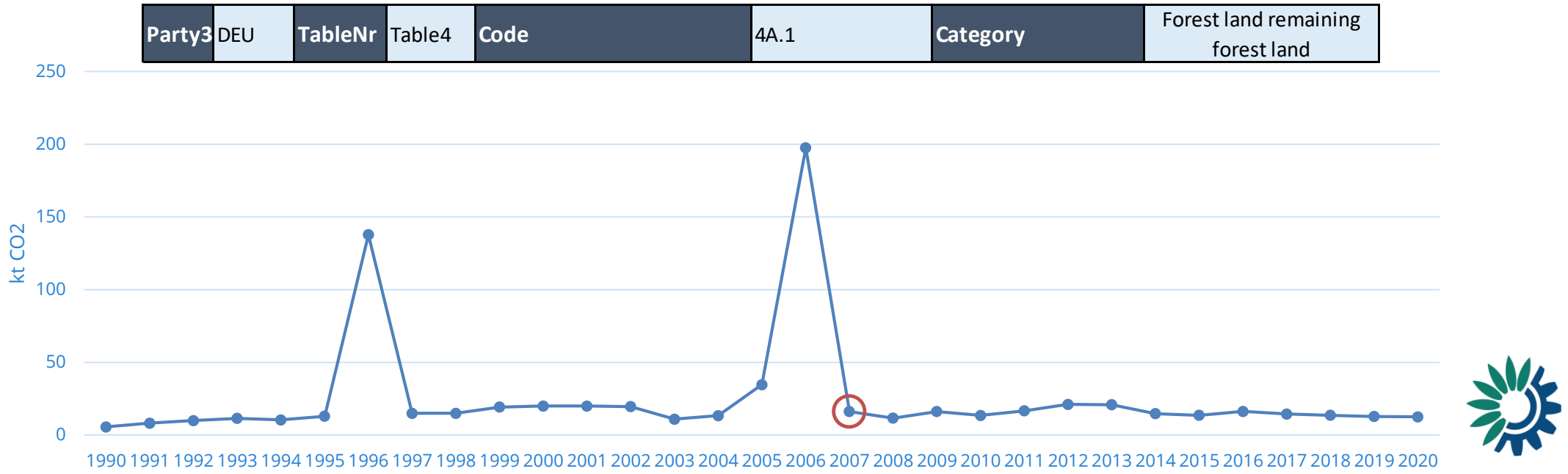
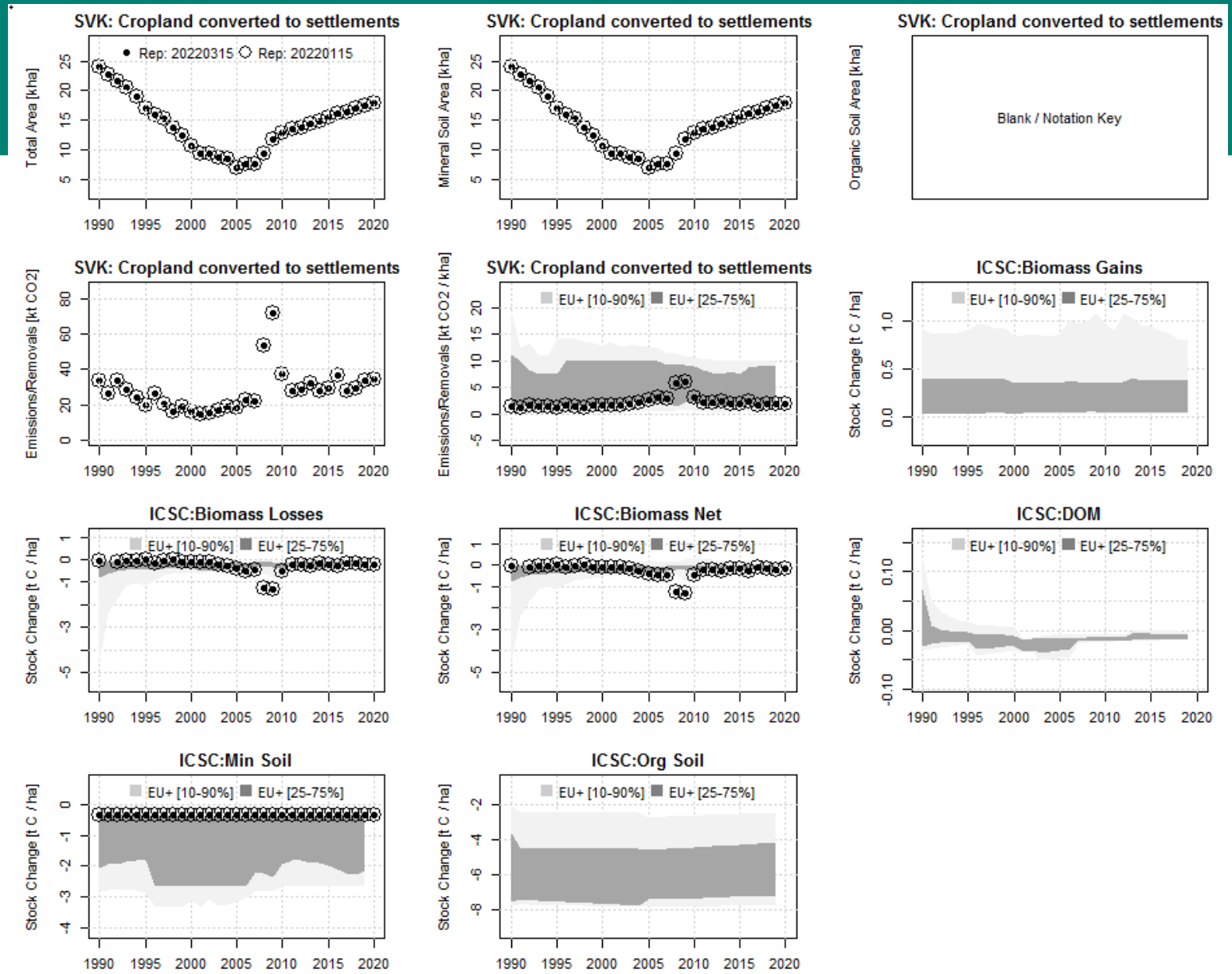
Check: Spikes

- Spikes in the time series are identified by comparing individual year to year changes to the mean and standard deviation in all year to year changes.
- If a normalised year to year change is above/below +/-3 standard deviations, the year in the time series is flagged as a spike.



Check: Visualisation of time series

- Visualisation of data from CRF tables 4.A.-4.F:
  - activity data
  - emissions/removals
  - Implied factors: emi&rem/kha and CSC/kha
- For the per kha data, the data are plotted over polygons showing the range (10th to 90th percentiles and interquartile range) in respective values reported by the EU MS plus UK, NO & IS



Important note:

- Most checks only give an indication of a potential issue!

Thank you!

ANY QUESTIONS?

Further information and contact:
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