CLIMATE CHANGE RESEARCH AND COOPERATION CENTRE

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Fugitive Emissions from Fuels in Mongolia and Comparison between Reference and Sectoral Approaches

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Content

- National GHG Inventories of Mongolia
- Total GHG emissions of Mongolia (tentative result)
- Fugitive emissions from solid fuels and oil production
- Comparison of RA & SA - The 2006 IPCC GLs
- Comparison of RA & SA - Mongolia's case - Overview
- Comparison of RA & SA - Differences in solid fuels
- Comparison of RA & SA - Differences in liquid fuels
- Challenges when entering data into the Software
- Challenges during the preparation of AD and data input to the Software
- Solving the issues

National GHG Inventories of Mongolia

1. National GHG Inventory 1990-1998
   - Short-term advisory team using the Revised 1996 IPCC GLs
   - → Initial National Communication (2001)

2. National GHG Inventory 1990-2006
   - Short-term advisory team using the Revised 1996 IPCC GLs
   - → Mongolian Assessment Report on Climate Change – MARCC 2009
   - → Second National Communication (2010)

3. National GHG Inventory 1990-2012
   - CCCO[1] GHGI team using the Revised 1996 IPCC GLs
   - → Mongolian Assessment Report on Climate Change – MARCC 2014

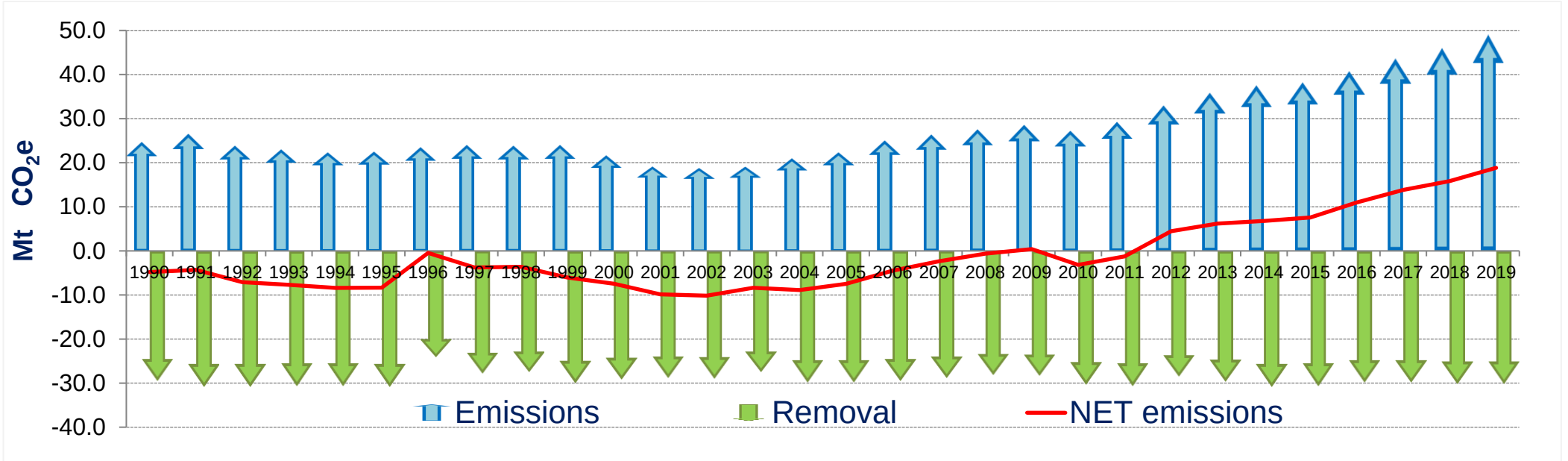
4. National GHG Inventory 1990-2014
   - CCPIU[2] GHGI team using the 2006 IPCC GLs
   - → Initial Biennial Update Report (2017)
   - → Third National Communication (2018)

4. National GHG Inventory 1990-2019
   - CCRCC[3] GHGI team using the 2006 IPCC GLs
   - → Second Biennial Update Report (2022)
   - → Fourth National Communication (2022)

United Nations Framework Convention on Climate Change

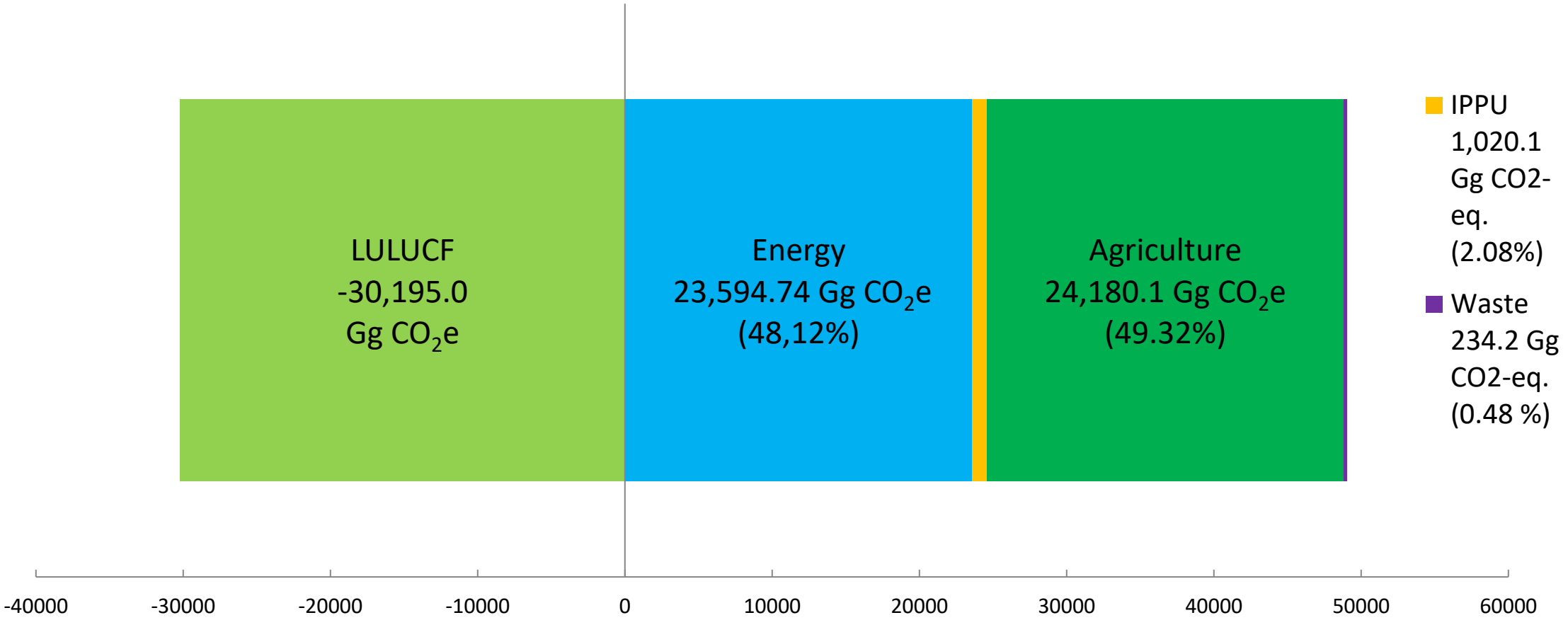
1 Climate Change Coordination Office (CCCO) of the Ministry of Green Development and Environment
2 Climate Change Project Implementing Unit (CCPIU) under the Ministry of Environment and Tourism
3 Climate Change Research and Cooperation Centre (CCRCC) under the MET

Total GHG emissions of Mongolia (tentative)



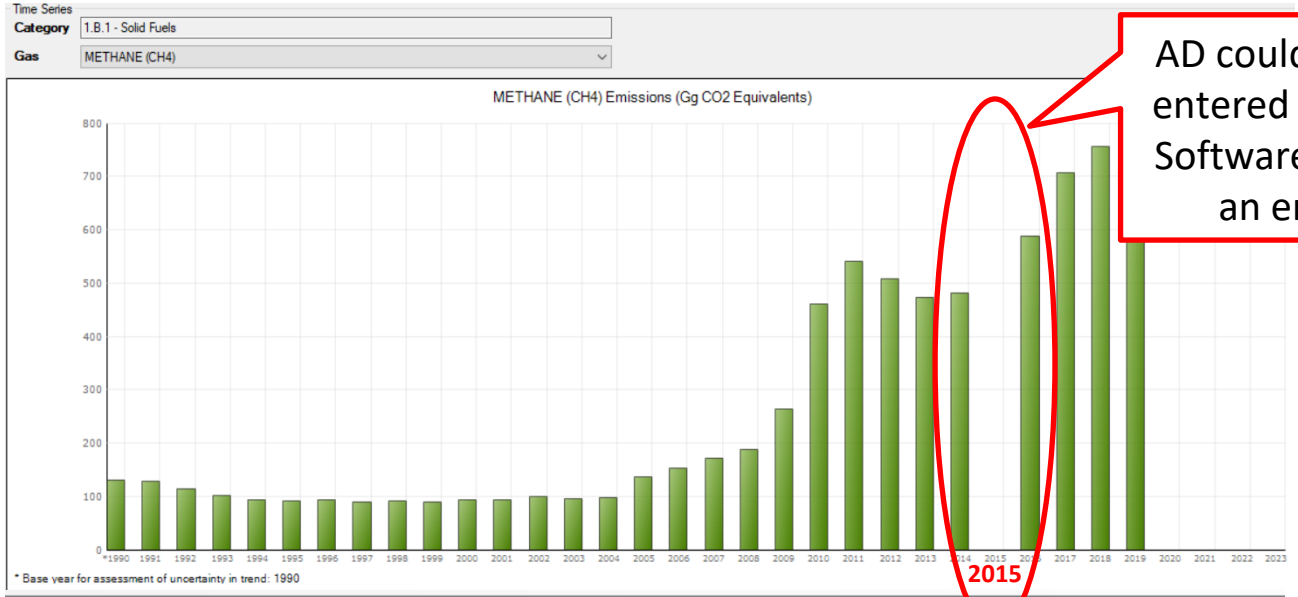
Sector	Emissions and removals, (Gg CO_2e)		Change from 1990 (Gg CO_2e)	Change from 1990 (%)
	1990	2019		
Energy	12,717.27	23,594.74	10,877.46	85.53%
IPPU	284.41	1,020.13	735.72	258.69%
Agriculture	11,625.78	24,180.07	12,554.29	107.99%
Waste	55.62	234.34	178.72	321.32%
Total (excluding LULUCF)	**24,683.08**	**49,029.28**	**24,346.20**	**98.64%**
LULUCF	-29,480.35	-30,195.04	-714.69	2.42%
Net total (including LULUCF)	**-4,797.27**	**18,834.24**	**23,631.51**	**-492.60%**

Total GHG emissions of Mongolia (tentative 2019)



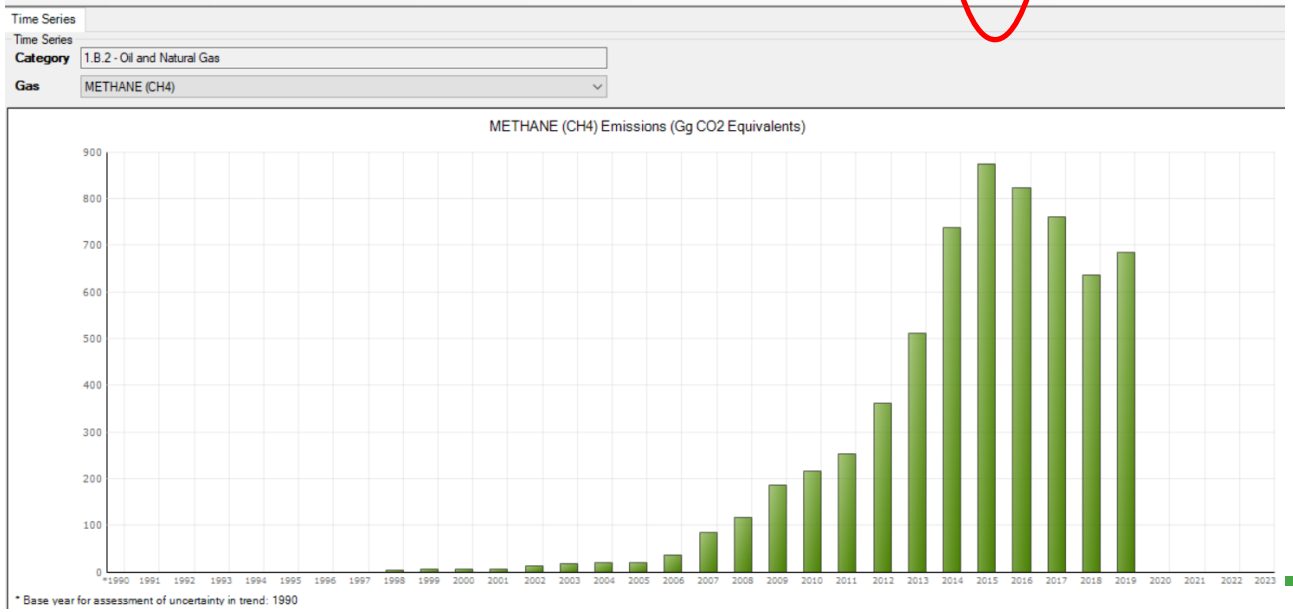
GHG emissions/removals by sectors, Gg CO_2e

Fugitive emissions from solid fuels and oil production



AD could not be entered into the Software due to an error.

2015



<u>ge of the estimation of fugitive emissions:</u>

itive emissions have been calculated in 2 subcategories:

- 1.a.ii – Surface mining
- 2.a.iii.2 – Oil production and upgrading

- In the previous BUR1 submission, only the above 2 categories were calculated and since fugitive emissions are key, the international review experts proposed to include emissions from oil flaring (1.B.2.a.ii) and distribution of oil products (1.B. 2.a.iii.5).
- For BUR2, fugitive emissions from oil flaring were included, but fugitive emissions from the distribution of oil products could not be estimated due to lack of data.

<u>AD needed for the estimation of fugitive emissions:</u>

- For category 1.B.1.a.ii, the total coal production numbers (in “tons” unit) of the Surface mining are used as the AD for the software.
- For category 1.B.2.a.ii, the total crude oil production numbers in “10^3 m^3” units.
- For category 1.B.2.a.iii.5, the total distribution numbers of each oil products, e.g. gasoline, diesel and jet kerosene, in “10^3 m^3” units.

Comparison of Reference and Sectoral Approaches according to 2006 IPCC GLs

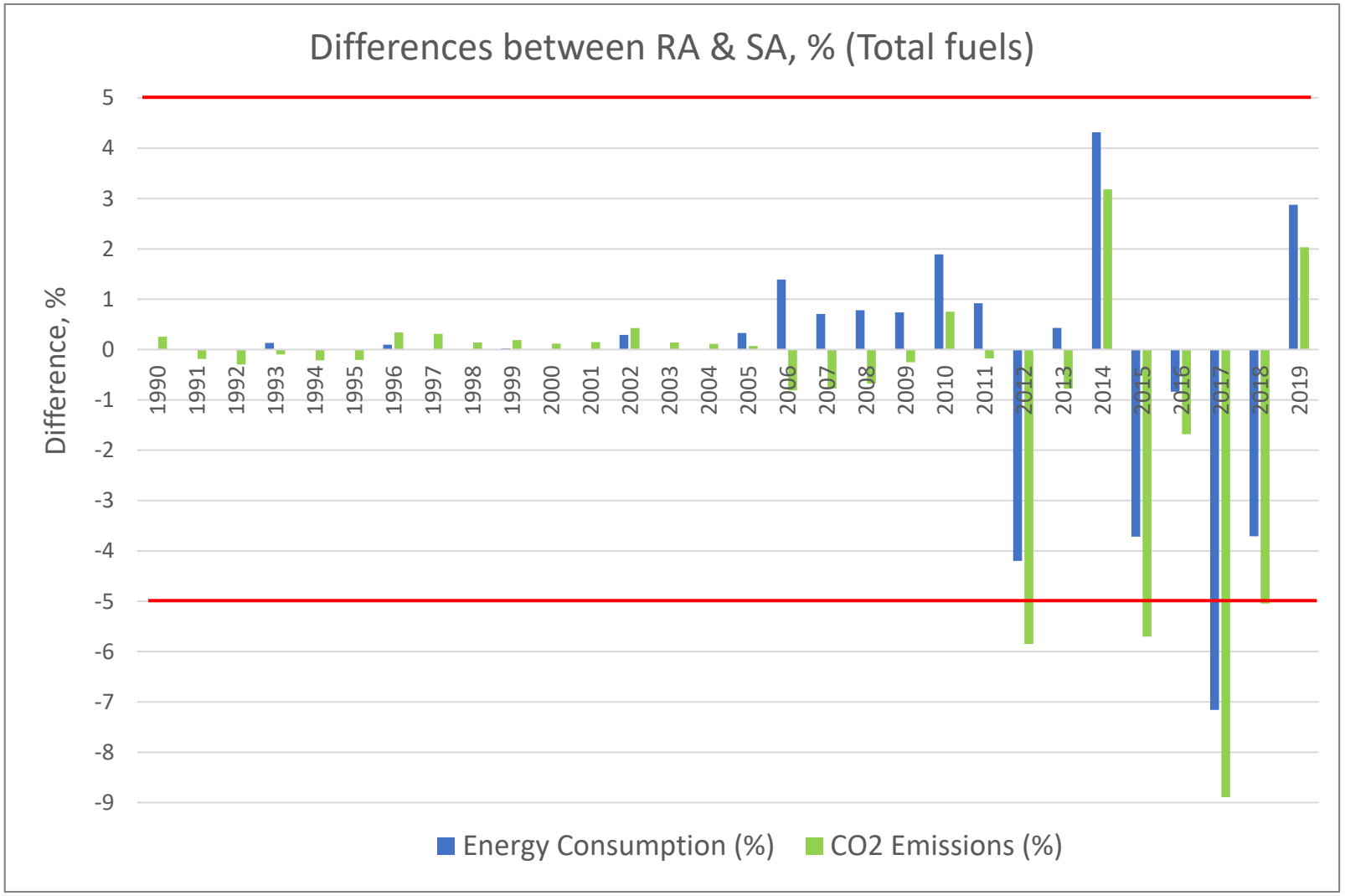
• Main reasons for occurences of significant discrepancies and/or large time-series deviation are listed below (2006 IPCC GLs):

- Large **statistical differences** between the energy supply and the energy consumption.
- Significant **mass imbalances** between crude oil and other feedstock entering refineries and the petroleum products manufactured.
- The use of **approximate net calorific and carbon content values** for primary fuels which are converted rather than combusted.
- The **misallocation of the quantities of fuels used for conversion into derived products or quantities combusted in the energy sector**.
- **Missing information on combustion of certain transformation outputs**.
- **Simplifications in the Reference Approach**. There are small quantities of carbon which should be included in the RA because their emissions fall under fuel combustion. These quantities have been excluded where the flows are small or not represented by a major statistic available within energy data.
- High **distribution losses** for gas and coal will cause the RA to be higher than the SA.
- Missing **information on the stock changes** that may occur at the consumer level.

Comparison of Reference and Sectoral Approaches Mongolia's case - Overview

- Energy sector is key sector → BUR2 Tier 2
  - Country specific NCVs and CO_2 EFs for coal types such as coking coal, other bituminous coal and lignite (developed by local experts in 2021)
- The AD preparation of energy sector:
  - AD source is IEA energy balance tables in "TJ"
  - IEA requests data from Mongolian National Statistics Office (NSO) and make estimations for some data disaggregation
  - Unit conversion from "TJ" to "kt" → IEA's NCVs (partially old CS values and IPCC defaults)
  - Emission estimation using the 2006 IPCC Software → Tier 2 → CS NCVs and CO_2 EFCs
  - The CS NCVs and CO_2 EFs have been calculated lower than the IPCC default values by local experts
- Challenges in the data input to the Software:
  - **Large statistical differences** between the energy supply and the energy consumption (coal and crude oil)
  - **Other transformation** of coking coal and coke oven gas data
  - Data allocation is not clear
  - Rounding of the data

Comparison of Reference and Sectoral Approaches

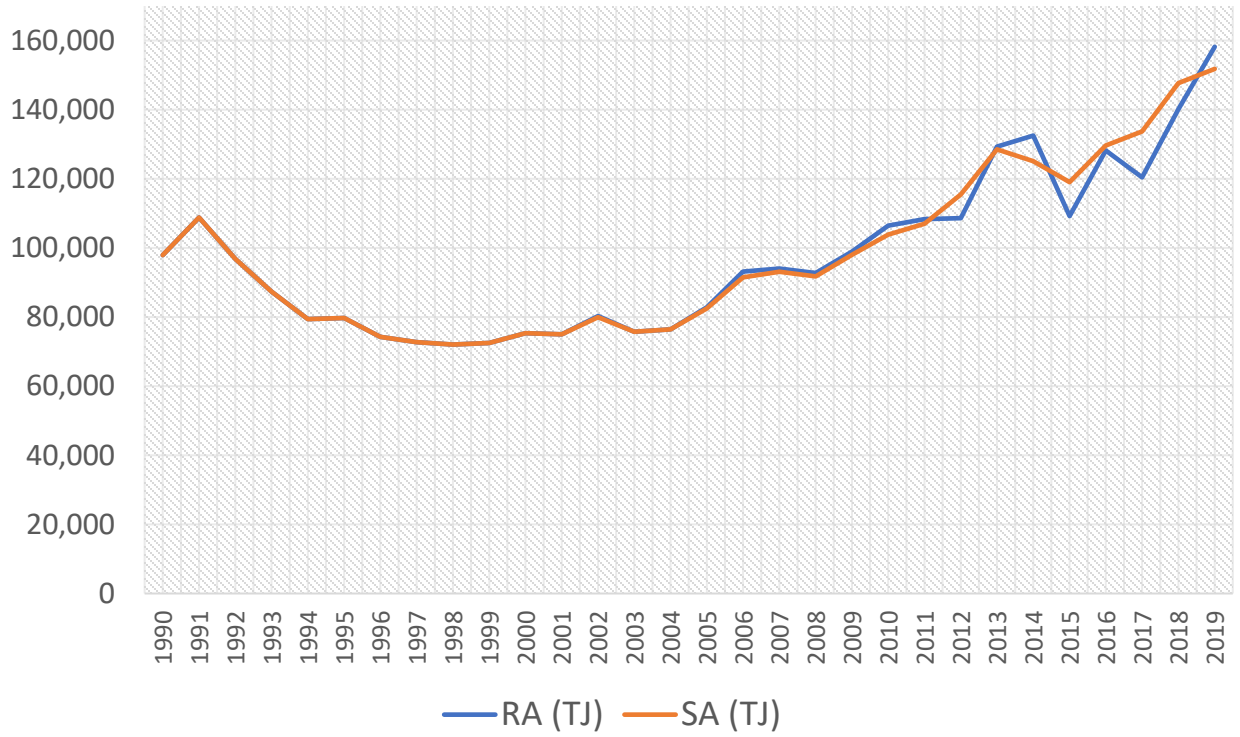


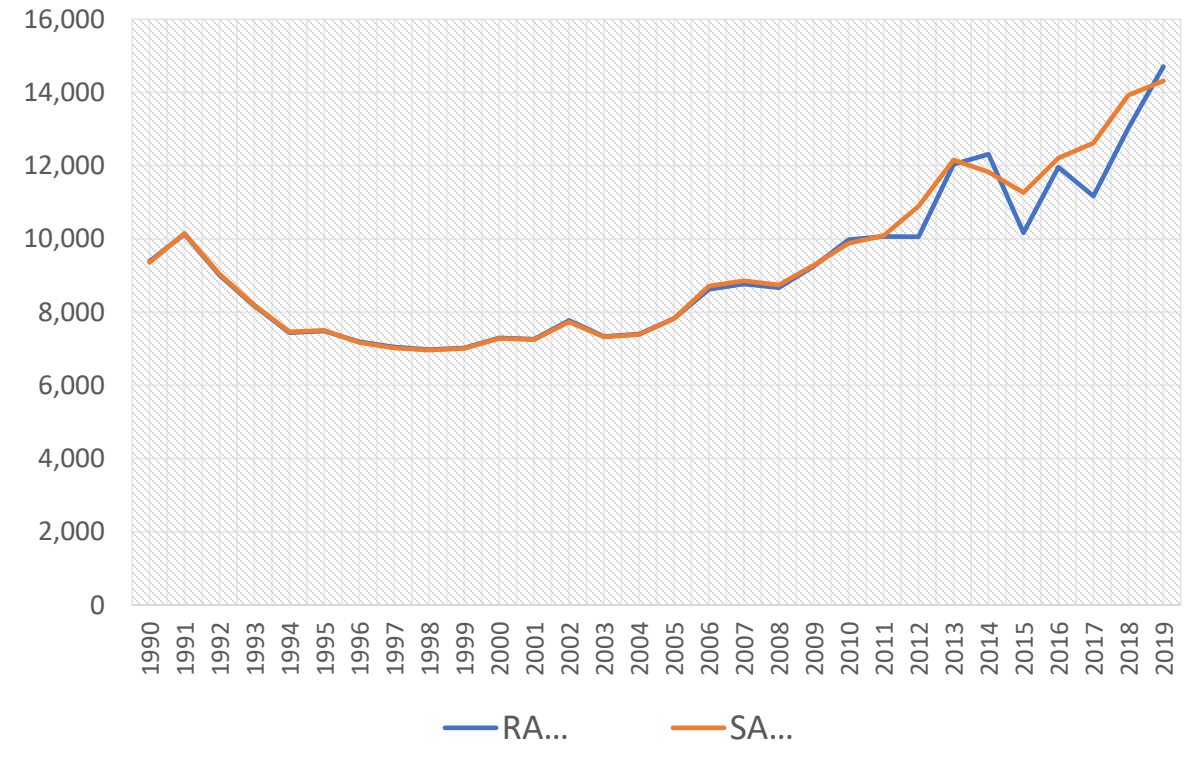
- Discrepancies due to energy balance table:
  - Starting from 2005 distribution losses have been recorded
  - Starting from 2006 COC and COG are been produced as by-products of coking coal transformation
  - Starting from 2011 occurring coal consumption in the recycling plant on NSO's coal balance table

- Discrepancies due to CS CO_2 emission factors:
  - CS CO_2 EFs were developed by local experts and their suggestion is:
  - The CS CO_2 EF of coal is not same for all subcategories → Energy Industries - 1.A.1.a.ii CHPs a bit higher than other categories, e.g. for CHPs the lignite CO2 EF is 97100 $kgCO_2/TJ$

- Large differences occurring in **solid fuel** energy consumption→CO_2 emissions, especially in 2012, 2014, 2015 and 2017

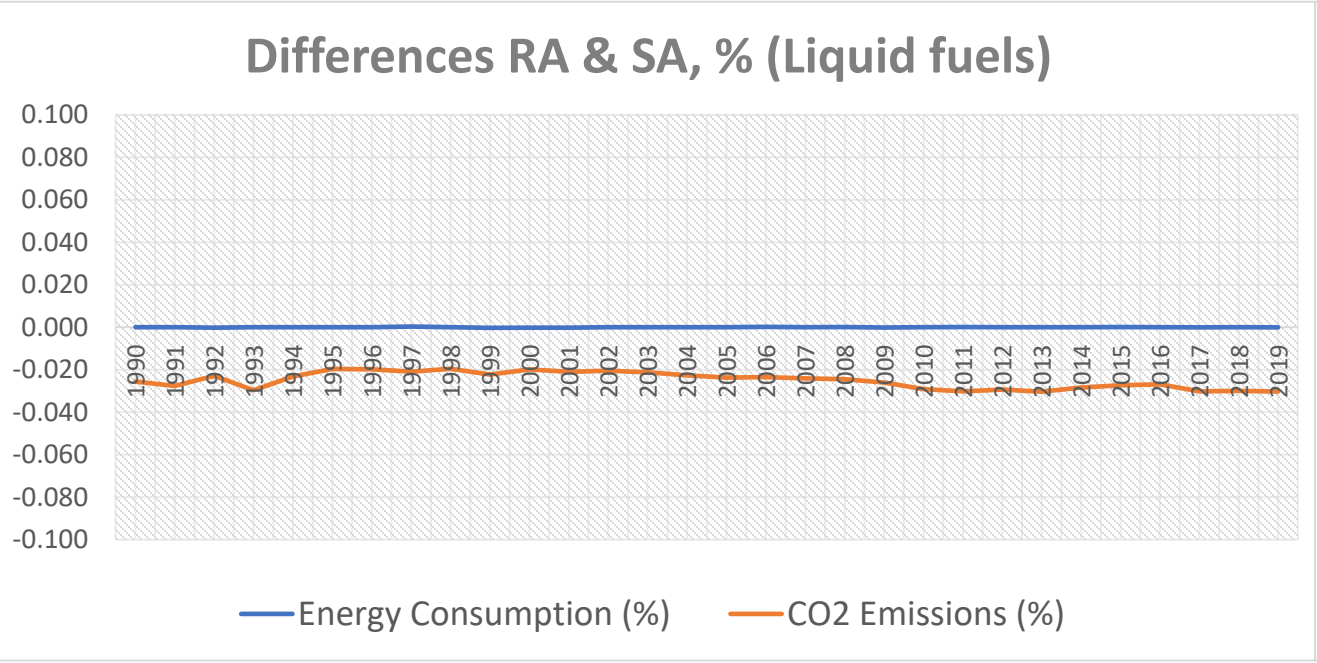
Comparison of Reference and Sectoral Approaches Differences in solid fuels

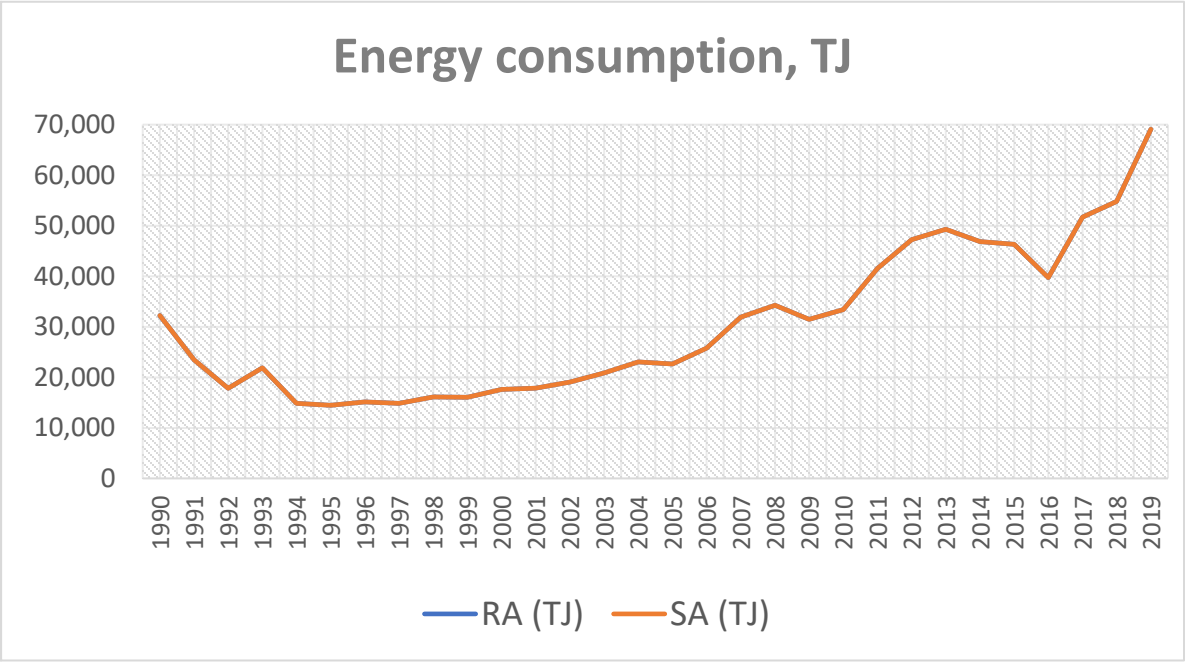




- Differences in solid fuels mostly occurring due to large statistical differences, other transformation, and lack of experience entering data into the Software.

Comparison of Reference and Sectoral Approaches Differences in liquid fuels





- Almost 0% difference in energy consumption of liquid fuels
- Difference in CO_2 emissions is under -0.05%

Challenges during the data input into the software

499												
500	**Production - 2006**	Coal and Peat										
501		Coking Coal	Coking Coal	Other Bit. Coal	Other Bit. Coal	Sub-bit. Coal	Lignite	Lignite	Coke oven coke	Coke oven coke	Coke oven Gas	Coke oven Gas
502	*Unit*	TJ	kt	TJ	kt	TJ	TJ	kt	TJ	kt	TJ	kt
503	Production	38098	1350.993	74006	2587.984	0	63676	4421.023	0	0.000	0	
504	From other sources	0	0.000	0	0.000	0	0	0.000	0		0	
505	Imports	0	0.000	0	0.000	0	0	0.000	0		0	
506	Exports	-33276	-1180.000	-36488	-1275.983	0		0.000	0		0	
507	International Bunkers	0	0.000	0	0.000	0	0	0.000	0		0	
508	Stock Changes	3215	114.007	0	0.000	0	-591	-41.033	0		0	
509	**Domestic Supply**	**8037**	**285**	**37518**	**1312.002**	**0**	**63085**	**4379.990**	**0**	**0.000**	**0**	**0**
510	**Transformation**	**-8037**	**-285.000**	**-17301**	**-605.015**	**0**	**-56805**	**-3943.970**	**5527**	**195.993**	**1243**	**32.119**
511	Electricity Plants	0	0.000	0	0.000	0	0	0.000	0		0	
512	CHP Plants	0	0.000	-17301	-605.015	0	-56805	-3943.970	0		0	
513	Heat Plants	0	0.000	0	0.000	0	0	0.000	0		0	
514	Other Transformation	-8037	-285.000	0	0.000	0	0	0.000	5527	195.993	1243	32.119
515	**Energy industry own use**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-1243**	**-32.119**
516	Losses	0	0.000	-1314	-45.950	0	0	0.000	0		0	
517	**Final Consumption**	**0**	**0**	**18903**	**661.037**	**0**	**6280**	**436.020**	**5527**	**195.993**	**0**	**0**
518	Industry	0	0.000	10495	367.009	0	720	49.990	5527	195.993	0	
519	Transport	0	0.000	1401	48.993	0	14	0.972	0		0	
520	Railways			1401	48.993		14	0.972				
521	Road				0.000			0.000				
522	Off-road transport				0.000			0.000				
523	Residential	0	0.000	2574	90.013	0	4047	280.983	0		0	
524	Commercial & public services	0	0.000	0	0.000	0	115	7.984	0		0	
525	Agriculture/Forestry	0	0.000	86	3.007	0	72	4.999	0		0	
526	Fishing	0	0.000	0	0.000	0	0	0.000	0		0	
527	Other non-specified	0	0.000	4347	152.014	0	1312	91.092	0		0	
528	Non-energy	0	0.000	0	0.000	0	0	0.000	0		0	
529	*Total consumption*	0	0	0	0	0	0	0	0	0	0	0
530												

- Tried to enter the number under 'Other Transformation' into 1.A.1.c.i – Manufacture of solid fuels

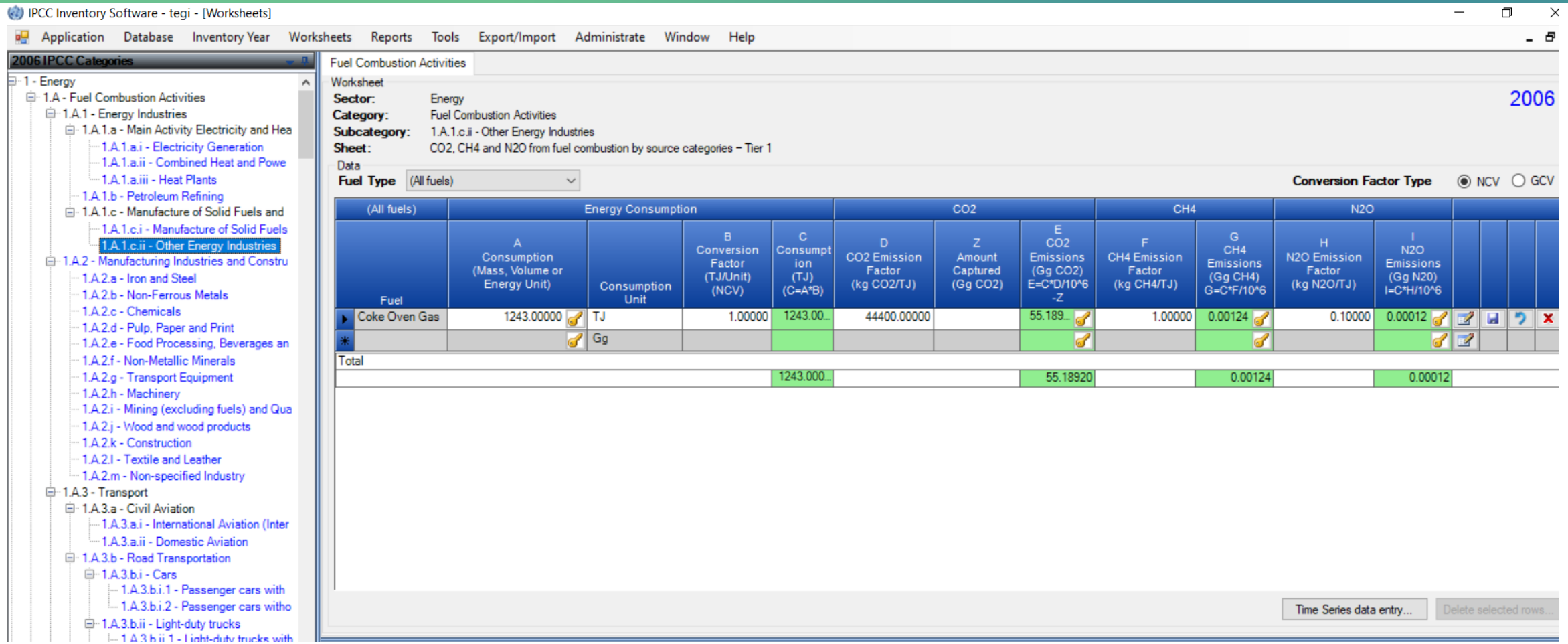
Before enter the coking coal number into the Software it should be calculated the loss during the transformation process. Carbon mass balance should be calculated outside of the Software.

→ It is not clear how to input into the Software

- Could not enter to the SA the Other transformation data of coking coal.

→ The occurrence of discrepancies ?

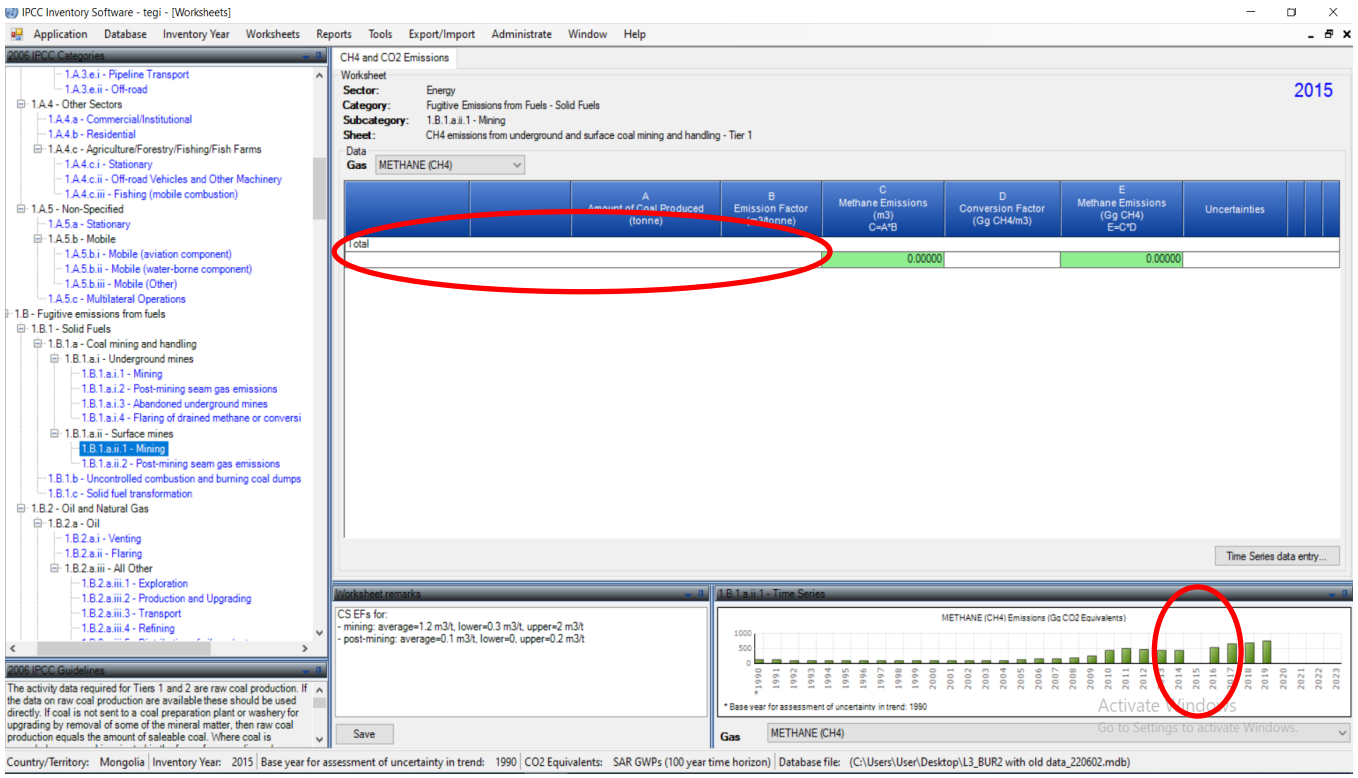
Challenges during the data input into the software



- The own-use of COG in the energy industries from the energy balance table is entered into the Software under the category 1.A.1.c.ii – Other Energy Industries.

Challenges during the preparation of AD and data input to the Software

- It is very challenging to collect, analyze and prepare the AD for 30 years.
- Occurred errors by creating the new inventory years in the Software, e.g. in year 2015 occurred an error which was not possible to input the data in the category 1.B.1.a.ii-Surface mining (see the picture)
- In this case the fugitive emissions from Surface mining for the year 2015 have been calculated on the EXCEL sheet and after that added to the summary table.
- Since Mongolia has not finished the national energy balance table, the AD is collected from the IEA website. The total numbers of fuels should be compared with the aggregated numbers of national statistics (NSO).
- Inventory team is improving the national inventory step by step.



Solving the issues

- It is very challenging to collect, analyze, and prepare the AD for 30 years.
- Discrepancies were corrected in some areas by aligning the digits after the comma.
- Found and corrected typos of NCVs in 2 cases.
- Consulted with IPCC experts and tried to solve the issue.
- The inventory compiler should endeavor to improve data collection and analysis, the development of conversion and emission factors, and emission estimation.

Thank you for your attention