Review NIR 2022

Energy sector (CRF 1)

CE Delft

Committed to the Environment

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This report was prepared by:
Sjoerd van der Niet, Chris Jongsma and Reinier van der Veen

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Further information on this study can be obtained from the contact person Sjoerd van der Niet (CE Delft)

Content

1 Introduction

Each country annually submits a national inventory report (NIR) and common reporting format tables (CRF tables). The NIR contains detailed descriptive and numerical information and the CRF tables contain all greenhouse gas (GHG) emissions and removals, implied emission factors and activity data. The Netherlands Enterprise Agency (RVO) asked CE Delft to review the Energy sector (CRF 1) in the NIR 2022.

1.1 Review request

Besides the regular checks by the joint experts at the GHG trend analysis meetings, according to the QA/QC plan for the Netherlands, a basic peer review should be implemented at the annual draft CRF/NIR before submission to the UNFCCC. This review of the NIR 2002 will be based on the version of the CRF/NIR that are to be sent on 15 March 2022 to the EU. The comments made during the peer review will be taken into account - as far as possible – in the final CRF/NIR2023 by 15 March 2023.

The purpose of the peer review is to ensure that the inventory's results, assumptions and methods are reasonable and clear. Main tasks of the review are:
- execute an objective review to assess the quality of the inventory;
- identify (potential) problem areas respectively areas where improvement could be made;
- suggest corrections, where appropriate.

In performing these tasks, priority will be given to key sources and sources with significant recent changes in methods and data. The peer review should focus on:
- the appropriateness of the methods applied relative to the applicable guidelines;
- the proper allocation of sources to IPCC categories;
- the calculations and assumptions made;
- the background documentation available and referred to.

Attention should also be given to whether recommendations from the UNFCCC review teams have been addressed properly. Netherlands Enterprise Agency (RVO) will provide these reports to the peer reviewers.

1.2 Scope

The scope of this review is the energy sector (Chapter 3/CRF 1), excluding the reference approach (Section 3.2.1) and the transport sector (Section 3.2.6/CRF 1A3).

1.3 Independence

Neither CE Delft in general, nor in particular the experts who performed the review, have been involved in the Dutch CRF/NIR preparations. CE Delft conducted reviews before on the NIR 2014 and the NIR 2018.

1.4 Documents reviewed

CE Delft received the following documents for the review:

a NIR 2022 as open document:
final draft NIR 2022 v15_3_clean.docx.
b NIR 2022 as pdf:
NLD NIR 2022 15 march.pdf.
c CRF tables 2022 about 2020:
NLD_2022_2020_10032022_232502_started.xlsx.
d CRF tables 2022 about 2019:
NLD_2022_2019_10032022_232348_started.xlsx.
e UNFCCC report on NIR 2021:
ReportDocument_2021_NLD.pdf.
f Methodology report by Honig et al (2022):
2022 (RIVM) Methodology report Energy Industry and Waste ER 1990-2020.pdf.
g List of fuels 2022 by Zijlema (2022):
the Netherlands_ list of fuels version January 2022_final.pdf.

Note that page numbers in the open document (a) and pdf (b) versions of the NIR 2022 as received by CE Delft, do not correspond. In this review report, we refer to the open document and its page numbers.

Note further that the NIR 2022 is subject to review here. The other documents haven been considered auxiliary and have been reviewed only insofar this proved relevant for the review of the NIR 2022.

1.5 Process of reviewing

Documents were provided to CE Delft on 16 March 2022. On 18 March a digital meeting was arranged in which CE Delft asked for a brief oral introduction to these documents. CE Delft also inquired about any major methodical changes in the NIR 2022 compared to previous editions; none were reported.

The sections of the NIR 2022 within scope were reviewed in two rounds by the CE Delft review team. This ensured that each section was reviewed twice, and that comments made by the first reviewer could be checked. Main findings were discussed among the review team on 28 March and 7 April 2022.

The draft review was sent to RVO on 14 April 2022. Reactions from RVO were received on 5 May and 11 May 2022, and were discussed with RVO on 12 May 2022. After that, we finalised this review report. Where appropriate, we added an elucidation of the issue, provided a suggestion, or stated the response. None of the issues were removed.

1.6 Review criteria

CE Delft applied the TACCC criteria in this review, i.e. we focused on Transparency, Accuracy, Consistency, Comparability and Completeness. Hereafter we represent how these criteria are introduced in the UNFCCC *Guide for Peer Review of National GHG Inventories*.[1] Besides, comments on spelling, grammar or other text edits have also been communicated to RVO, categorised as 'Text edit', but those have been omitted in this report.

Transparency

There is sufficient and clear documentation such that all involved can understand how the inventory was compiled and can assure themselves that it meets the good practice requirements for national GHG emissions inventories.

Accuracy

National GHG inventories should contain neither over- nor under-estimates so far as can be judged. This means making all endeavours to remove bias from the inventory estimates.

Consistency

Estimates for different inventory years, gases and categories are made in such a way that differences between years and categories reflect real differences in emissions. Inventory annual trends, as far as possible, should be calculated using the same method and data sources in all years. They should aim to reflect the real annual fluctuations in emissions or removals and not be subject to changes resulting from methodological differences.

Comparability

The national GHG inventory is reported in a way that allows it to be compared with national GHG inventories for other countries. This comparability should be reflected in appropriate identification of key categories; in the use of the reporting guidance and tables; and use of the classification and definition of categories of emissions and removals.

Completeness

National, calendar year estimates are reported for all sources and sinks, and gases. Where elements are missing their absence should be clearly documented together with a justification for exclusion.

[1] https://unfccc.int/files/national_reports/non-annex_i_natcom/application/pdf/final_guide_for_peer_review_report_final_webupload.pdf

2 Main findings

In general, the NIR is found to be a solid exposition of the Dutch greenhouse gas emissions and how these figures have been established. The review team considers the NIR 2022 to be transparent, accurate (that is, to the extent that the review team assessed the underlying documentation), consistent, comparable and complete.

Below we highlight issues that we would like to draw attention to and also discuss the response to comments from the UNFCCC review of the NIR 2021. These main findings are presented in order of appearance; the order does not represent significance.

Introducing facts and explanations – Transparency (#11 inter alia)

Multiple times in the report a fact is brought up and immediately explained or used as an explanation. Consider for example issue #11: "The decrease in liquid fuel combustion in 2020 is mainly caused by the reduced vehicle use" (Page 71). Reduced vehicle use had not previously been introduced. Removal of the article 'the' could partially solve the issue partially. Also, no reference to data showing reduced vehicle use is given here, although it is accounted for by the remainder of the sentence: "as a result of the measures taken during the COVID19 pandemic." It is good practice to first introduce the fact, and then provide the explanation for it or use it as explanation for something else. E.g.: "There has been reduced vehicle use [reference to data, if possible], as a result of measures taken during the COVID19 pandemic. The decrease in liquid fuel combustion in 2020 is mainly caused by the reduced vehicle use."

Table 3.1 – Transparency (#14)

CRFs 1C and 1D do not figure in Table 3.1, because these are information elements. However, this is not clear from the text or table caption.

International bunkering fuels – Comparability/Transparency (#22)

International bunkering (1D) is treated in Section 3.2.2, and hence under 3.2, which is about CRF 1A. Also, in the IPCC Guidelines, international bunker fuels are listed under 1A3ai and 1A3di for aviation and navigation respectively. RVO indicated that the outline is taken from UNFCCC *Reporting instructions*[2] and we acknowledge that the outline corresponds to this instruction. Hence, we approve of this order of presentation. We recommend to add a reference to account for it.

Congruence between tables, charts and text – Transparency (#24, #66 inter alia)

Multiple times in the report the text does not correspond exactly to the categories in tables and charts. Consider for example issue #24 concerning the paragraph about fuel deliveries for international aviation (Page 79). Here the connection with jet kerosene, the relevant

[2] www.unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf

category in Figure 3.3, is not explicitly established. Consider also Table 3.7 and the explanations below (Page 88), where solid biomass is not addressed (issue #66).

Non-energy use of coal in industry – Accuracy (#37)

Section 3.2.3 mentions that coal is used in a non-energy application in the iron and steel sector. This appears to be incorrect. The CBS national energy balance[3] shows 2,8 PJ/y of coal non-energy use, of which 0,3 PJ/y in '10 Voedingsmiddelenindustrie' and 2,5 PJ/y in '27 Elektrische apparatenindustrie'. There is no non-energy use of coal products in the iron and steel sector, because this sector's coal consumption is listed as final energy use.

Share of coal in Dutch electricity generation – Accuracy (#40)

The text mentions that the Dutch electricity sector has a large share of coal-fired power stations (Page 82). It is advised to clarify by what measure it is considered large. It could be large in comparison to other fuels used in Dutch power generation, or large in comparison to the share of coal-fired power stations in other countries. In the latter case, the statement would not be supported by publicly available data on electricity generation in EU member states.[4] The average share of coal in the electricity mix of EU member states was 17% in 2020, while The Netherlands had a coal share of 6%. Electricity generation from coal was much higher in 2015 and 2016, but has strongly declined since, especially so in 2020.

Electricity and heat production from waste – Transparency (#48)

Emissions from waste incineration are included under Public electricity and heat production (1A1a). This is explained in the report, but the treatment of waste incineration is integrated in the discussion of the rest of 1A1a, while the process, installations and relevant considerations for waste incineration are quite different from the rest of the sector. Explanations are relegated to Chapter 7.

Consider creating a separate subsection for waste incineration, with a brief explanation of the process, a clear explanation of the method (including any references to background reports) and a structured discussion of relevant trends in activity data, emission factors and resulting emissions. Or consider, more concisely, adding a paragraph that makes explicit the fact that heat from waste incineration is quite different from other categories within 1A1a, together with relevant references. E.g.:

"The public electricity and heat production source sub-category also includes all emissions from large-scale waste incineration facilities. Emissions from waste incineration are included here, rather than in Category 5C (Waste incineration), since all municipal waste incineration facilities in the Netherlands also produce electricity and/or heat for energy purposes. According to the 2006 IPCC Guidelines, these activities should be included in Category 1A1a (Public electricity and heat production). The waste incinerated in these installations are allocated under other fuels (fossil part of waste) and biomass (biogenic part of waste). More background about activity data and EFs can be found in Chapter 7, especially Section 7.4. The methodology is described in detail in the methodology report (Honig et al., 2022), see also the reference in Annex 7."

[3] www.opendata.cbs.nl/statline/#/CBS/nl/dataset/83989NED/table?ts=1649680894816

[4] www.ec.europa.eu/eurostat/databrowser/view/NRG_BAL_PEH__custom_2313984/default/table?lang=en

Confusion between solid/liquid/gaseous fuels – Transparency/ Comparability (#52 inter alia)

On several occasions the categorisation of a fuel as either solid, liquid or gaseous could cause confusion. E.g. blast furnace gas is listed under solid fuel, and refinery gas is listed under liquid fuel. We recognise that this is in line with IPCC Guidelines. It would be helpful to add the official categorisation to Table 3.4, as suggested by RVO to the review team.

CH_4 emission factor for stationary installations – Transparency (#59)

Methane emissions from stationary combustion installations are estimated using emission factors from Scheffer (1997).[5] It is not clear which emission factors are used in the end. The Scheffer report lists many emission factors for varying installations, configurations, fuel types and load levels. Besides, the emission factors are given in mg CH_4 per cubic meter or per kg of fuel, whereas the NIR format uses emission factors per unit of energy. Because of these confusing aspects, it is not clear which emission factor is used where. We advise to make this traceable, either by including it in the NIR itself or in a referenced document.

Uncertainty estimation in emissions from ETS companies – Accuracy (#68)

The accuracy of both activity data and emission factors are based on expert judgment. More precise accuracy figures are available for EU-ETS companies. The accuracy of both activity data and emission factor is regulated under ET-ETS. The Monitoring and Reporting Regulation (MRR)[6] specifies minimum accuracy levels, which are mandatory to report in the monitoring report of the company. This means that for each individual ETS installation, the accuracy in both activity data and emission factor is known and does not have to be estimated. Accuracy figures for multiple EU-ETS companies in a sector can be calculated from the figures of individual companies.

Consider basing the reported uncertainty on data from the monitoring reports rather than on estimates.[7] If these data are not available to the NIE, the requirements for uncertainty in EU-ETS monitoring could also hold cues. Those are 7,5% for Category A installations, 5,0% for Category B and 2,5% for Category C, as specified in the MRR Article 22c, with the categories defined in Article 19(2).

Iron and steel – Consistency (#77)

Table 3.9 states that the solid fuel use in Iron and steel (CRF 1A2a) amounted to 83.9 PJ in 2019 and 82.1 PJ in 2020 for solid fuels. According to the CRF tables, this should be 82.1 PJ in 2019 and 71.1 PJ in 2020. That brings the trend in fuel use in Iron and Steel into line with the trend in GHG emissions from Iron and steel, as reported in Table 3.8.

[5] www.repository.tudelft.nl/islandora/object/uuid%3Ac4b9e0cb-0952-4a05-9aad-e5d245a1b810

[6] www.eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02018R2066-20210101&from=EN

[7] www.ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en

Volatile Organic Substances – Accuracy (#135)

Volatile Organic Substances (VOCs) in Sector 1B2a5 (Distribution of oil products; refineries, distributors, filling stations) are considered not applicable (Page 128, 7th bullet in list). As the reason for this classification, it is stated that all possible emission sources are equipped with abatement measures, as demanded by Dutch emission regulation.

For this statement to be true, it is required that:
1. All emission sources are known.
2. All emission sources are equipped with abatement measures.
3. Emission abatement measures are 100% effective, so no emissions remain at all.

These are rather steep requirements and the text offers no substantiation whether these conditions are met in practice. Consider to offer a more elaborate argumentation or to indicate the uncertainties, or else consider to change the notation key for the emissions from 'NA' (not applicable) to 'NE' (not estimated).

Relevance of previous methods – Transparency (#139 inter alia)

Explanations are sometimes provided for changes made in earlier NIRs, without stating the relevance of this explanation for the current year. E.g. issue #139: it is mentioned that the method for fugitive emissions of gaseous fuels was improved for the NIR 2016 (Page 129). Does that imply that this improved method still applies? What is the relevance of knowing that methods were different in NIRs before 2016? We advise to remove such references.

Response to UNFCCC comments

Issue E.3 is purportedly addressed in NIR 2022, however it is not clear for which years the liquid fuels in 1A3c have now been included. In the 2022 CRF tables about both 2019 and 2020 this entry solely states 'NO'.

Issue E.6 seems to be, at least partly, about different interpretations of what allocations are allowed by the IPCC Guidelines. This is elaborated on in the main text on Page 92. We advise to add cross-references.

Issue E.7 is not resolved. This seems to be a matter of priority rather than of conflicting views. It could be helpful to add under which conditions it could become a priority.

Issue E.12 seems to be resolved by marking 'NA' in the CRF tables when there are no activity data because there is no such activity in the Netherlands. This has been consistently applied throughout all CRF tables, as far as we have been able to check. The CRF tables have been available to the review team concerning 2020 and 2019 only.

Issues E.13, E.14 and E.15 concerning recalculations seem to be resolved.

Issue E.17 is considered to be sufficiently accounted for by the explanation in the new methodology report by Honing et al (2022). It is acknowledged that disaggregation of CH_4 emissions is commendable, but it also made clear that it is not entirely feasible because of the underlying data.

3 Table of issues

Table 1 comprises an exhaustive list of issues identified by the review team. Each is tagged with an ID, the relevant page number in the open document, a quote or reference to the section under concern, and the criteria (TACCC).

Table 1 – List of issues identified by the review team

ID	Page	Section	Text under concern	Criteria	Issue description
5	69	3.1.1	"Emissions from fuel combustion are consistent with national energy statistics."	Transparency	Where can we find this? Does this refer to the SA vs RA comparison? A reference to the relevant section would be helpful.
6	70	3.1.2	"a very large share"	Accuracy	Please quantify 'very large'.
7	70	3.1.2	"Power generation, Industrial processes and Other"	Transparency	These are not official subsector names.
8	70	3.1.2	"Oil products are primarily used in transport, refineries and the petrochemical industry"	Transparency	In this juxtaposition with transport, it is not clear whether refineries and petrochemichal industry are included as processing oil products or as end users.
9	70	3.1.2	"a 53% decrease in solid fuel consumption, a 2% increase in gaseous fuel consumption and a 2% increase in solid fuel consumption"	Transparency	Solid fuels are mentioned twice, while liquid fuels are missing.
10	71	3.1.2	"due to a decrease of 36% for solid fuel combustion, a 3% decrease in liquid fuel combustion and a 2% decrease in gaseous fuel combustion."	Transparency	The downward trend in liquid fuel consumption is subsequently explained, while the others are not. Please include an explanation for the trends in solid and gaseous fuel consumption.
11	71	3.1.2	"the reduced vehicle use"	Transparency/ Text edit	Reduced vehicle use has not been introduced before. Suggested correction: 'reduced vehicle use'.
12	71	3.1.2	"The decrease in solid fuel consumption between 2016-2019 was due to the closure of three old coal-fired power plants in these years."	Accuracy	Hemweg closed in 2020, so part of solid fuel decrease in 2019-2020 is due to that closure, not just of the three (5?) older coal-fired plants (Amer 8, Borsele and Gelderland plants in 2015, Maasvlakte I & II plants in 2017).
13	71	3.1.2	"The years 1996 and 2010 both had a cold winter compared to the other years. […]"	Completeness	How would 2020 be characterised?
14	71	Table 3.1		Completeness	1C and 1D are not included in this table. Is that because 1C is non-

ID	Page	Section	Text under concern	Criteria	Issue description
					key and 1D is not to be counted in the National total emissions?
15	71	Table 3.1	"1 Energy, N_2O, 2019 and 2020: *0,58%*"	Consistency	Two digits, whereas other figures have one digit.
16	71	Table 3.1	"1A Fuel combustion, CH_4 and N_2O, 2020 vs 1990: *90.5%* and *67.5%*"	Transparency	Why have CH_4 and N_2O emissions from fuel combustion increased? We can retrace it to 1A4C, but the increase isn't addressed in 3.2.7 either.
17	71	Table 3.1	"Total national emissions (excluding LULUCF)"	Transparency	This table is about the Energy sector (CRF 1), so 'Total national emissions' doesn't seem appropriate and '(excl. LULUCF)' irrelevant.
20	72	3.1.4	"Figure 3.2 show the contributions of the subcategories and emissions trends in the Energy sector. Most of the CO_2 emissions from fuel combustion stem from the combustion of natural gas, followed by liquid fuels and solid fuels."	Transparency	Please briefly describe the contribution of different subcategories, and perhaps also the link with fuel combustion in these subcategories.
21	73	Table 3.2		Completeness/ Transparency	Section 3.2 comprises a subsection about CRF 1D, which does not figure in this table though. Is that because 1D is not to be counted in the National total emissions?
22	79	3.2.2	"3.2.2 International bunker fuels (1D)"	Comparability/ Transparency	Section 3.2.2 is about CRF 1D, while Section 3.2 is about CRF 1A. This is confusing. Also, in the IPCC Guidelines 2006 (Vol. 2, Ch. 1) bunker fuels are listed under 1A3ai and 1A3di.
24	79	3.2.2.1	"Figure 3.3 shows that fuel deliveries for international aviation more than doubled between 1990 and 1999, stabilised between 1999 and 2003 and increased again by 14% between 2003 and 2008."	Transparency	Fuel deliveries for international aviation is not a category in the chart. Please make clear that this corresponds to jet kerosene, or change the subject of this sentence, e.g. 'fuel deliveries for international aviation (jet kerosene)'. Note that the last sentence in this paragraph is about other fuels for aviation, giving rise to further conflation of categories.
25	79	3.2.2.1	"In 2019, the fuel consumption"	Transparency	Suggested correction: 'In 2019, the aviation fuel consumption'.
26	79	3.2.2.1	"In 2020, the fuel consumption"	Transparency	Suggested correction: 'In 2020, the aviation fuel consumption'.
27	79	3.2.2.1	"biomass for international aviation"	Transparency	'Biokerosene' would be more specific than 'biomass'.

ID	Page	Section	Text under concern	Criteria	Issue description
28	79	3.2.2.1	"the Energy Balance"	Transparency	Please introduce the Energy Balance or provide an appropriate reference (e.g. to Annex 4).
30	79	3.2.2.1	"Fuel deliveries for international navigation (residual fuel oil, gas/diesel oil, lng and biodiesel) increased by 57% between 1990 and 2007, but then decreased by 31% to 493 PJ in 2020."	Transparency	A short separate description of the development of the deliveries of lng and biodiesel would be interesting. These cannot be read from Figure 3.3.
32	79	3.2.2.1	"more stringent sulphur regulation in the North Sea"	Transparency	It would be more precise like this: 'more stringent regulations on sulphur oxides emissions from ships in the North Sea area'. Also, for an outsider it is not clear how these regulations would lead to a doubling of diesel oil deliveries for maritime navigation.
33	80	3.2.2.3	"4.758 TJ"	Accuracy	This should be '4,758 TJ'.
36	80	3.2.3	"These fuels were mainly used as feedstock in the petrochemical industry (naphtha) and the carbon is stored in many products (bitumen, lubricants, etc.)."	Accuracy	Products made from naphtha are mainly plastics rather than bitumen, lubricant etc.
37	80	3.2.3	"A fraction of the gross national consumption of natural gas (mainly in ammonia production) and coal (mainly in iron and steel production) was also used in non-energy applications."	Accuracy	The remark about coal use in parentheses is not correct. The CBS national energy balance shows 2,8 PJ/y of coal non-energy use, of which 0,3 PJ/y in '10 Voedingsmiddelenindustrie' and 2,5 PJ/y in '27 Elektrische apparatenindustrie'. There is no non-energy use of coal products in the iron and steel sector, because this sector's consumption is listed as final energy use.
38	80	3.2.3	"and hence the gas/coal was not directly oxidised"	Transparency/ Text edit	Suggested correction: 'and hence this gas/coal was not directly oxidised'.
39	81	Table 3.6	"1A1a liquids"	Accuracy	This category is no longer key and can be omitted from the table.
40	82	3.2.4.1 Public electricity and heat production (1A1a)	"it has a large share of coal-fired power stations"	Accuracy	This statement is not supported by data. Share of coal in NL power generation (6%) is below EU average of 17%.
41	82	3.2.4.1 Public electricity and heat production (1A1a)	"increase in CO_2 emissions from fossil fuel combustion by power plants"	Accuracy	We would say there was an increase only from 1990 to 2005, it was stable from 2005 to 2015, and decreased after 2015.

ID	Page	Section	Text under concern	Criteria	Issue description
42	82	3.2.4.1 Public electricity and heat production (1A1a)	"30% of the total electricity production in 2020"	Transparency	What is the source of this information? Please consider adding a reference.
44	83	3.2.4.1 Public electricity and heat production (1A1a)	"Waste oils (waste oil, waste lubricant, waste solvent, etc.) are collected by certified waste management companies"	Transparency/ Accuracy	Distinguish between fossil waste oils (lubricant/solvent etc) and biogenic waste oils (used cooking oil, animal fat etc). These have different collection methods and different end uses.
45	83	3.2.4.1 Public electricity and heat production (1A1a)	"The recycling part (feedstock for chemical plants, clean-up and or distillation)"	Transparency	Suggested revision: 'The recycling part of waste oils…'. In the current sentence, 'the recycling part' could refer to e.g. plastics recycling, and this is confusing to the reader.
46	83	3.2.4.1 Public electricity and heat production (1A1a)	"therefore, these emissions are also allocated to this category"	Transparency	Which category is 'this category'? 1A1a Public electricity and heat generation, or a category referring to landfill?
47	83	3.2.4.1 Public electricity and heat production (1A1a)	"CO_2 emissions from the waste incineration of fossil carbon increased from 1990 until 2017, since then there is a decrease."	Transparency	What caused the decrease?
48	83	3.2.4.1 Public electricity and heat production (1A1a)	"From 1990, an increasing amount of waste was combusted instead of being deposited in landfills"	Transparency	The data processing of waste in the energy sector is rather unclear and hard to follow for an outsider. Activity data are hard to find in the CRF tables and not thoroughly explained in this report.
49	83	3.2.4.1 Public electricity and heat production (1A1a)	"The increase in the CO_2 EF for other fuels between 2004 and 2010 is due to the increase in the share of plastics (which have a high carbon content) in combustible waste."	Transparency	Please consider to first introduce the fact and then provide the explanation.
50	83	3.2.4.1 Public electricity and heat production (1A1a)	"The increase in the CO_2 EF for other fuels between 2004 and 2010 is due to the increase in the share of plastics (which have a high carbon content) in combustible waste."	Transparency	Has the emission factor since been constant, decreased or increased further and what caused this?
51	83	3.2.4.1 Public electricity and heat production (1A1a)	"The decrease in the implied emission factor (IEF) for CO_2 from biomass in the period 1990-2000"	Transparency	Please consider to first introduce the fact and then provide the explanation.
52	84	3.2.4.1 Public electricity and heat production (1A1a)	"The strong increase in liquid fuel use in 1994 and 1995 was due to the use of chemical waste gas in joint venture electricity"	Transparency	A strong increase in **liquid** fuel use due to use of waste **gas** - this is confusing and unclear.

ID	Page	Section	Text under concern	Criteria	Issue description
53	84	3.2.4.1 Public electricity and heat production (1A1a)	"This also explains the somewhat lower IEF for CO_2 from liquids since 1995."	Transparency	How does this explain the lower IEF? Also, it is unclear which emission factor exactly is meant by 'the somewhat lower IEF': the total IEF for liquids in the whole of 1A1, or some subsector?
54	84	3.2.4.1 Petroleum refining (1A1b)	"The combustion emissions from this sub-category should be viewed in relation to the fugitive emissions reported under Category 1B2."	Transparency	Why should the combustion emissions be viewed in relation to the fugitive emissions? Why is this comment added?
55	85	3.2.4.1 Petroleum refining (1A1b)	"refinery gas in total liquid fuel"	Transparency/ Accuracy	How is refinery gas a liquid fuel?
56	85	3.2.4.1 Manufacture of solid fuels and other energy industries (1A1c)	"CO_2 emissions from this source sub-category increased from 2008 onwards, mainly due to […] to gas consumption."	Transparency	Explanation is not complete. An increase in CO_2 emission could also be caused by more activity rather than just by less efficient activity.
57	85	3.2.4.1 Manufacture of solid fuels and other energy industries (1A1c)	"Fuel combustion emissions from coke production by the iron and steel plant are based on a mass balance."	Transparency	Consider treating the emissions from coke production first, i.e. before emissions from combustion of own fuel, so the text treats the topics in the same order as the bullets.
58	85	3.2.4.2	"The emissions from this source category are calculated in two steps:"	Transparency	Consider adding a flow chart so the reasoning is more transparent and easier to follow.
59	86	3.2.4.2 Emission calculation Step 1	"The CH_4 EFs are taken from Scheffer (1997), except for the use of natural gas in gas engines (see Paragraph 2.1 of the ENINA methodology report (Honig et al., 2022) for more details on the CH_4 EF of gas engines) and except for waste."	Transparency	The emission factor for CH_4 is hard to track. The Scheffer report mentions multiple values for each fuel, depending on installation type and size. Besides, the emission factors are given in g/m^3 or g/kg fuel instead of g/TJ.
60	86	3.2.4.2 Emission calculation Step 2	"emissions data from the AERs and the reporting under the ETS from selected companies are used"	Transparency	How are these companies selected? Is this at random, does it include all companies with different EFs, only the largest x% of CO_2 emitters or something else?
61	86	3.2.4.2 Emission calculation Step 1	"The reported CO_2 emissions of a company are combined with energy use, as recorded in energy statistics for that specific company, to derive a company-specific EF. For each selected company, a different company-specific EF is derived and is used to calculate the emissions."	Transparency	The CO_2 emissions are calculated using a company specific emission factor based on reported CO_2 emissions and energy use. Why not use the reported emissions directly?
62	87	3.2.4.2 Emission calculation Step 2	"Phosphor gas: Since 2006, company-specific EFs have been derived for the single company and	Transparency	Note that the single company (Thermphos Vlissingen) has ceased operations in 2012 and

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			are used in the emissions inventory. For years prior to 2006, EFs from the Netherlands' list of fuels (Zijlema, 2022) are used."		phosphor gas is no longer used in the Netherlands.
63	87	3.2.4.2 Emission calculation Step 2	"Coal: Since 2006, company-specific EFs have been derived for most companies and for the remaining companies the default EFs are used."	Transparency	What determines whether a company falls under the category 'most companies' or the category 'remaining companies'?
64	87	3.2.4.2 Comparison of emission factors	"Since some emissions data in this sector originate from individual companies, some of the values (in Table 3.7) are IEFs."	Transparency	This doesn't seem to give an apt description of Table 3.7. It seems that only IEFs are presented in the table and that fuels are omitted in the table for which no other EF (e.g. company-specific EF) was used.
65	88	Table 3.7	"Table 3.7 Overview of EFs"	Transparency	The table seems to include IEFs only, it isn't an overview of EFs used. Also, the list doesn't cover all fuels (e.g. liquids). The reason might be sound (confidentiality?), but the caption does not signal this.
66	88	3.2.4.2 Explanation of the implied EFs	"Solid biomass"	Completeness	Solid biomass is the one category in Table 3.7 without explanation in the text below. Please consider adding a paragraph about these IEFs.
67	89	3.2.4.2 Explanation of the implied EFs	"The trend in the CO_2 IEF for gaseous fuels in 1A1c varies between 42.6 and 70.4 kg/GJ."	Transparency/ Accuracy	The variation between 42.6 and 70.4 kg/GJ should be explained by a varying proportion of wet and regular natural gas. Wet natural gas has a higher EF. How can the lower bound (42.6 kg/GJ) then be below the EF of regular natural gas (56.6 kg/GJ)?
68	89	3.2.4.3 Uncertainty	"The accuracy of data on fuel consumption in power generation and oil refineries is generally considered to be very high, with an estimated uncertainty of approximately 1-5%."	Accuracy	Uncertainty in both activity data and CO_2 emission factor is mandatory to report for larger source streams in EU ETS. We would expect a lower uncertainty when directly using these data.
69	89	3.2.4.3 Uncertainty	"Analysis of the default CO_2 EFs for coke oven gas and blast furnace gas reveals uncertainties of approximately 10% and 15%, respectively (data reported by the steel plant)."	Accuracy	The Monitoring and Reporting Regulation (MRR) of EU ETS has tiers for both activity data and emission factors. For cokes oven/blast furnace gas, the minimum sample frequency is 1x/day (MRR Annex VII), with a maximum uncertainty of 2,5% (MRR Annex VIII). How can the uncertainty in the NIR be 10-15%?

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70	90	3.2.4.3 Uncertainty	"So, for liquid fuels in these sectors"	Transparency	The sentences before and after refer to gases, so it is not clear what 'liquid fuels' are referred to here.
71	90	3.2.4.3 Time series consistency	"Company-specific data from the most relevant companies in a few years have been used to calculate an average country-specific EF."	Transparency	In which years? Unclear whether this description relates to a retroactive recalculation or an original calculation for previous years.
72	90	3.2.4.3 Time series consistency in other sectors	"Both datasets are based on data from individual companies and are therefore consistent for the complete time series."	Transparency	Both pre and post 2002 datasets are based on data from individual companies, but is the method the same?
73	91	3.2.4.5	"The energy statistics for 2015-2019 have been improved."	Transparency	Which improvements have been made? Where can more details be found?
77	94	3.2.5.1 Iron and Steel (1A2a)	"Iron and steel (1A2a)"	Consistency	Iron and steel shows a decrease in GHG emissions in 2020 w.r.t. 2019 (see Table 3.8), yet the amount of fuel used does not show a similar decrease (see Table 3.9). Please provide an explanation.
78	94	3.2.5.1 Iron and Steel (1A2a)	"The Energy Balance of Statistics Netherlands distinguishes"	Transparency	Please introduce the Energy Balance and/or add reference (e.g. to Annex 4).
79	94	3.2.5.1 Iron and Steel (1A2a)	"The Energy Balance of Statistics Netherlands distinguishes […] and 1A2a (Energy iron and steel)."	Transparency	Please explain the data flow (and what is lacking) in more detail.
80	97	3.2.5.1 Chemicals (1A2c)	"CO_2 emissions from this sub-category have decreased since 1990, mainly due to a large decrease in the consumption of natural gas during the same period."	Transparency	It seems that total emissions decreased due to a decrease in energy consumption. The current text could be understood such that energy consumption remained the same, but natural gas was replaced by a fuel with a lower emission factor.
81	98	3.2.5.1 Chemicals (1A2c)	"The increase in 2003 of the IEF for CO_2 emissions from liquid fuels"	Transparency	Please consider to first introduce the fact and then provide the explanation.
82	98	3.2.5.1 Chemicals (1A2c)	"For 16 individual plants, the residual chemical gas from the combustion of liquids was hydrogen, for which the CO_2 EF is 0."	Transparency	This sentence is not clear: it seems to imply that a liquid is combusted and hydrogen remains after the combustion. Is what is meant ithat hydrogen is combusted under the category 'combustion of liquids'?
84	100	3.2.5.2 Explanation for the IEFs	"Coke oven/Gas coke and bituminous coal"	Transparency	The heading mentions cokes as the subject. The first sentence in the paragraph is about solid fuels. The second is about solid fuels in other sectors. Also, two

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					paragraphs below is about solid biomass. This is confusing. Please change heading and/or state their relations.
85	100	3.2.5.2 Explanation for the IEFs	"The N_2O EF of gas/diesel oil in NRMM"	Transparency	Shouldn't this be 'IEF'?
86	100	3.2.5.2 Explanation for the IEFs	"The N_2O EF of gas/diesel oil in NRMM differs from the default N_2O EF. This results in a lower implied emission factor."	Transparency	Consider adding the values as well as an explanation for the difference.
87	100	3.2.5.2 Explanation for the IEFs	"In the iron and steel industry..."	Transparency	What is the relevance of this paragraph and the ones below under the heading 'Explanations for the IEFs'?
88	100	3.2.5.2 Explanation for the IEFs	"The fuel consumption data in 1A2g (Other) are not based on large surveys and therefore are the least accurate in this part of Sub-category 1A2."	Transparency	Please provide information about what they are based on.
89	101	3.2.5.3 Uncertainty	"The 24% uncertainty estimate"	Transparency	Please consider to first introduce the fact and then provide the explanation.
90	101	3.2.5.3 Time series consistency	"It was concluded that the EFs for combustion of chemical waste gas are based on emissions and activity data of individual companies."	Transparency	The fact that they are based on these data is one thing, but is that appropriate? Should they be?
93	103	3.2.5.5	"The fuel consumption and emissions […] has been partly reallocated to the commercial/ institutional sector (1A4aii)."	Transparency	Please give the reason for this reallocation.
97	117	3.2.7.1	"Liquids excl. 1A4c"	Transparency	This is correct but confusing. Consider reformulation.
102	118	3.2.7.1 Commercial and institutional services (1A4a)	"Energy use by NRMM used in trade increased from 3.9 PJ in 1990 to 5.9 PJ in 2020, with CO_2 emissions increasing accordingly."	Transparency	Perhaps it could be briefly explained what 'NRMM used in trade' consists of, and what its contribution is to the GHG emissions in 1A4a.
103	118	3.2.7.1 Commercial and institutional services (1A4a)	"Energy use consists mostly of diesel fuel, although some gasoline is used also and in recent years the use of biofuels is increasing"	Transparency	Suggested correction: 'Energy use by NRMM (used in trade) […]'.
106	119	3.2.7.1 Residential (1A4b)	"Energy consumption by NRMM used in residential increased from 0.5 PJ in 1990 to 1.0 PJ in 2020, with CO_2 emissions increasing accordingly."	Transparency	How much do NRMM contribute to CO_2 emissions in this subsector?
107	119	3.2.7.1 Agriculture, forestry and fisheries (1A4c)	"In addition, since the autumn of 2005, CO_2 emissions from two plants have been used for crop fertilisation in greenhouse horticulture. Total	Transparency	Are those two large CHP plants? It could be made more specific what the contribution is of this to the aforementioned decrease in CO_2 emissions in 1A4c.

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			annual amounts are approximately 0.4 Tg CO_2."		
108	119	3.2.7.1 Agriculture, forestry and fisheries (1A4c)	"GHG emissions from agricultural NRMM (1A4cii) have been constant throughout the time series at between 1.0 and 1.3 Tg CO_2 eq."	Accuracy/ Text edit	Suggested correction: '[…] 1.0 and 1.3 Tg CO_2 eq. per year.'
109	120	3.2.7.2	"Honig et al., (2022), Paragraph 2.3.2.2: Combustion of landfill gas;"	Accuracy	Has this indeed been used for sector 1A4?
111	120	3.2.7.2 Stationary combustion	"For stationary combustion, the following EFs are used: For CO_2, IPCC default EFs are used (see Annex 5) for all fuels except natural gas, gas/diesel oil, lpg and gaseous biomass, for which country-specific EFs are used."	Transparency/ Text edit	Suggested correction: 'gaseous biofuels' is more commonly used than 'gaseous biomass'.
112	120	3.2.7.2 Stationary combustion	"For natural gas in gas engines, a different EF is used (see Honig et al., 2022)."	Transparency	A different EF than the standard one for natural gas? Please clarify.
113	121	3.2.7.2 Mobile combustion	"CH_4 and N_2O emissions from NRMM are estimated using a Tier 3 methodology, using country-specific EFs."	Accuracy	How is the choice for a certain tier made? Why is Tier 3 used only (?) for CH_4 and N_2O emissions from NRMM? Is this in accordance with IPCC guidelines?
114	121	Table 3.17		Transparency	This table is not referred to in the text. It is not clear why this overview is made specifically for NRMM and fisheries, and not for other subcategories in 1A4.
115	121	3.2.7.2 General	"These mainly consist of emissions from other kerosene and lignite."	Transparency/ Text edit	'From other kerosene and lignite' is an incomplete phrase.
116	121	3.2.7.2 Explanation of the IEFs	"Gas/diesel oil: Gas/Diesel oil is used in stationary and mobile combustion, for which different EFs for CH_4 and N_2O are used."	Transparency	Are different EFs used between gas oil and diesel oil, or between stationary and mobile combustion?
117	122	3.2.7.2 Explanation of the IEFs	"Figure 3.14 shows the trend in natural gas combusted in gas engines and in other plants."	Transparency/ Completeness	A large increase in the burning of natural gas in gas engines is shown between 2005 and 2010. This is probably due to the rapid uptake of CHP units in greenhouse horticulture that occurred in this period. Please consider adding this observation and explanation.
118	123	3.2.7.3 Uncertainty	"The uncertainty in the EFs is estimated to be 2% for CO_2 (all fuels): 50%/+300% for N_2O and -40%/+250% for CH_4."	Transparency	Please clarify the meaning of '50%/+300%' and '-40%/+250%'.
119	123	3.2.7.4	"Trends in CO_2 emissions from the three sub-categories were compared to trends in related activity data: number of households, number of people	Transparency	Suggested correction: 'total surface area' instead of 'area'.

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			employed in the services sector and area of heated greenhouses."		
121	124	3.2.7.5	"These changes in the energy statistics result in the following changes in fossil CO_2 emissions (in Gg CO_2):"	Transparency	We would expect to see positive volumes under 1A4bi that cancel out the negative values under 1A4ai, but this is not the case. Please clarify shortly.
122	124	3.2.7.5	"Emissions from 1A4 mobile machineries slightly increased. This is caused by an updated allocation of lpg in non-road mobile machineries. In total CO_2 emissions for non-road mobile machineries remain unchanged."	Transparency	Do the 'Emissions', which are the subject of the first sentence, only concern CO_2 emissions?
124	124	3.2.7.6	"The updates to the NRMM model described in 3.2.5.5., will"	Accuracy	The updates are described in 3.2.5.4.
126	124	3.2.8.2	"Activity data for both aviation and navigation are derived from the Energy Balance"	Transparency	In the report and Excel of Geilenkirchen et al. (2021), it is unclear which categories of the Energy Balance relate to military use, as the CBS categories are different from the IPCC categories.
127	124	3.2.8.2	"The CO_2 EFs were derived from the Ministry of Defence"	Transparency	What (type of) source from the Ministry of Defence?
128	125	Table 3.20		Transparency	Are 'g' and 'Gg' in the table in CO_2 equivalents?
129	125	Table 3.20		Transparency	The total emissions are also shown in the table. Why?
130	125	Table 3.20	"Source: Hulskotte (2004)."	Transparency	Also the Ministry of Defence, according to the main text.
132	127	3.3.1.2	"Therefore, the method has been changed and the CO_2 EF for fugitives is determined on the basis of the conservative assumption that about 1% of coke oven input is lost in the form of fugitive emissions."	Transparency	What is the source of this assumption? Could perhaps a short reflection be added on the applicability of this assumption to the coke oven in the Netherlands?
134	127	3.3.1.4	"NLD ARR 2019"	Transparency	Please write in full or add 'ARR' to the list of abbreviations.
135	128	3.3.2.1	"Due to the Dutch emission regulation for VOCs, all possible sources included in 1B2a5 (Distribution of oil products; refineries, distributors, filling stations) are equipped with abatement measures to capture any fugitive emissions. Therefore, emissions are considered as 'not applicable' (NA) and activity data 'not estimated' (NE)."	Accuracy	So it is assumed that the abatement measures are 100% effective. How certain is this?

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138	129	3.3.2.2	"Because of the availability of new sets of leakage measurements, Netbeheer Nederland commissioned an evaluation of the EFs being applied. As a result, the calculation of emissions of methane from gas distribution was improved for the NIR 2016 (KIWA, 2015)."	Transparency	Only for the NIR 2016? What is the relation with the NIR 2022?
139	129	3.3.2.2	"In earlier submissions, the IPCC Tier 3 method for methane (CH_4) emissions from gas distribution due to leakages was based on two country-specific EFs"	Transparency	Is this paragraph about NIRs from before 2016, as the last sentence before this one suggests?
141	129	3.3.2.2	"These EFs were based on the small base of 7 measurements at one pressure level of leakage per hour"	Transparency	Please make more clear.
143	129	3.3.2.2	"Using these improved EFs led to a reduction in the calculated emissions of CH_4 for the period 1990–2014."	Transparency	Is this a change that has been made in this NIR?
144	129	3.3.2.2	"The emissions of CO_2 given in the annual reports are considered to be combustion emissions and therefore reported under IPCC Category 1A1c3ei (gaseous)."	Accuracy	Shouldn't '1A1c3ei' be '1A1ciii'?
145	129	3.3.2.2	"8.8 E-7 Gg/106 m^3 of marketable gas"	Transparency/ Text edit	The '106' is not clear. If this should be 10^6, why is this factor not included in the 'E-7'?
146	130	3.3.2.2	"For the NIR 2016, emissions of methane from gas transmission were evaluated and improved"	Transparency	So these changes have been made in the NIR 2016. Is it required to keep the description of these changes in all subsequent NIRs?
147	130	3.3.2.2	"Fugitive emissions of CH_4 from refineries in Category 1B2a4 are based on a 4% share in total VOC emissions reported in the AERs of the refineries (Spakman et al., 2003) and in recent years have been directly reported in those AERs. These show significant annual fluctuations in CH_4 emissions"	Transparency	What does 'These' in the last sentence refer to?
148	130	3.3.2.2	"the allocation of the emissions to either combustion or process"	Transparency	What does 'process' refer to?
149	130	3.3.2.3	"The uncertainty in the EF of CO_2 from gas flaring and venting (1B2)"	Accuracy/ Text edit	The appropriate CRF Category is 1B2c.
150	131	3.3.2.4	"Category-specific QA/QC and verification"	Accuracy	Consider cross-checking self-reported methane emissions from industry with actual measurements, for example from satellites.

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151	378	Annex 4	"The national energy balance for 2019"	Accuracy/ Text edit	Suggested correction: 'The national energy balance for 2020'. (Also in the caption and the table itself, replace 2019 with 2020.)
152	427	Annex 10 E.3	"CH_4 and N_2O emissions of liquid fuels in 1A1c i have been reported in the CRF. NIR Paragraph 3.2.4.5 explains that *In response to recommendation xxx of the UNFCCC review 2021, also CH_4 and N_2O emissions of liquid fuels in 1A1c have been calculated and reported.*"	Transparency	It is not clear for which years these fuels are now reported. In the 2022 CRF tables about 2019 and 2020, the entry 'Liquid fuels' under 1A3c only shows 'NO'.
153	428	Annex 10 E.6	"We keep the current allocation as the Guidelines allow the current allocation."	Transparency	Please elaborate on this, as in the ERT assessment it is disputed that this is allowed by IPCC Guidelines, referring to vol. 2, Section 1.6.2.1.
154	430	Annex 10 E.7	"The NIR and Methodology report (Honig et al 2022) both mention that total emissions of CH_4 from gas transmission are included in 1B2b. Also the Methodology report mentions that there are no plans to investigate this further (for comparability)."	Transparency	This seems to be a matter of priority. Consider adding under what conditions a plan for further investigation would be considered.
155	431	Annex 10 E.12	"As the Netherlands have no emissions in the Category 1.B.2.b.6 emissions are marked as 'NO'. For the AD we now used the 'NA'."	Consistency	Has this ('NA') been consistently applied throughout the CRF tables?