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Report on the individual review of the annual submission of Switzerland submitted in 2021*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual review of the 2021 annual submission of Switzerland, conducted by an expert review team in accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol”. The review took place from 6 to 11 September 2021 remotely.

* In the symbol for this document, 2021 refers to the year in which the inventory was submitted, not to the year of publication.



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Abbreviations and acronyms

2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>
AAU	assigned amount unit
AD	activity data
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	“Guidelines for review under Article 8 of the Kyoto Protocol”
CaO	calcium oxide
CER	certified emission reduction
CH ₄	methane
CM	cropland management
CO ₂	carbon dioxide
CO ₂ eq	carbon dioxide equivalent
Convention reporting adherence	adherence to the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”
CP	commitment period
CPR	commitment period reserve
CRF	common reporting format
DBH	diameter at breast height
dm	dry matter
EEA	European Environment Agency
EF	emission factor
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
ERT	expert review team
ERU	emission reduction unit
FM	forest management
FMRL	forest management reference level
FOEN	Swiss Federal Office for the Environment
GE	gross energy intake
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF	activities under Article 3, paragraphs 3–4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
MgO	magnesium oxide
MMS	manure management system(s)
MSW	municipal solid waste
N	nitrogen
N ₂ O	nitrous oxide
NA	not applicable
NE	not estimated
Nex	nitrogen excretion
NF ₃	nitrogen trifluoride

NIR	national inventory report
NMVOC	non-methane volatile organic compound
NO	not occurring
NR	not reported
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
R	reported
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF ₆	sulfur hexafluoride
SIAR	standard independent assessment report
UNFCCC Annex I inventory reporting guidelines	“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”
UNFCCC review guidelines	“Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”
VS	volatile solid(s)
WDR	wetland drainage and rewetting
Wetlands Supplement	<i>2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands</i>

I. Introduction

1. This report covers the review of the 2021 annual submission of Switzerland, organized by the secretariat in accordance with the Article 8 review guidelines (adopted by decision 22/CMP.1 and revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the “UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention” (annex to decision 13/CP.20). The review took place from 6 to 11 September 2021 remotely¹ and was coordinated by Lisa Hanle, Claudia do Valle and Nalin Srivastava (secretariat). Table 1 provides information on the composition of the ERT that conducted the review for Switzerland.

Table 1

Composition of the expert review team that conducted the review for Switzerland

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Mausami Desai	United States
	Marius Țăranu	Republic of Moldova
Energy	Hiroshi Ito	Japan
	Carmen Teresa Meneses Lopez	Bolivarian Republic of Venezuela
	Benon Bibbu Yassin	Malawi
	Niculina Mihaela Balanescu	Romania
IPPU	Jet Chong	Australia
	Valentina Idrissova	Kazakhstan
	Olga Gavrilova	Estonia
Agriculture	Bernard Hyde	Ireland
	Asia Adlan Mohamed Abdalla	Sudan
	Valentin Bellassen	France
LULUCF and KP-LULUCF	Koki Okawa	Japan
	Amanda Thomson	United Kingdom
	Qingxian Gao	China
Waste	Takefumi Oda	Japan
	Igor Ristovski	North Macedonia
Lead reviewers	Mausami Desai	
	Marius Țăranu	

2. The basis of the findings in this report is the assessment by the ERT of the Party’s 2021 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines.

3. The ERT has made recommendations that Switzerland resolve identified findings, including issues² designated as problems.³ Other findings, and, if applicable, the encouragements of the ERT to Switzerland to resolve related issues, are also included in this report.

¹ Owing to the circumstances related to the coronavirus disease 2019, the review had to be conducted remotely.

² Issues are defined in decision 13/CP.20, annex, para. 81.

³ Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

4. A draft version of this report was communicated to the Government of Switzerland, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.
5. Annex I presents the annual GHG emissions of Switzerland, including totals excluding and including LULUCF, indirect CO₂ emissions, and emissions by gas and by sector, and contains background data on emissions and removals from KP-LULUCF, if elected by the Party, by gas, sector and activity.
6. Information to be included in the compilation and accounting database can be found in annex II.

II. Summary and general assessment of the Party's 2021 annual submission

7. Table 2 provides the assessment by the ERT of the Party's 2021 annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2

Summary of review results and general assessment of the 2021 annual submission of Switzerland

Assessment		Issue/problem ID#(s) in table 3 or 5 ^a	
Date of submission	Original submission: NIR, 12 April 2021; CRF tables (version 1), 12 April 2021; SEF tables (SEF-2020-CP1, SEF-2020-CP2), 12 April 2021		
Review format	Centralized review conducted remotely		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and the Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	No	
	(b) Selection and use of methodologies and assumptions?	No	
	(c) Development and selection of EFs?	No	
	(d) Collection and selection of AD?	Yes	L.4
	(e) Reporting of recalculations?	No	
	(f) Reporting of a consistent time series?	No	
	(g) Reporting of uncertainties, including methodologies?	No	
	(h) QA/QC?	QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)	
	(i) Missing categories, or completeness? ^b	Yes	W.5
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37 (b) of the UNFCCC Annex I inventory reporting guidelines?	Yes	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	
Supplementary information under the Kyoto Protocol	Have any issues been identified related to the following aspects of the national system:		
	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	

Assessment	Issue/problem ID#(s) in table 3 or 5 ^a
Have any issues been identified related to the national registry:	
(a) Overall functioning of the national registry?	No
(b) Performance of the functions of the national registry and the adherence to technical standards for data exchange?	No
Have any issues been identified related to the reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the SIAR?	No
Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of the reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	No
Have any issues been identified related to the following reporting requirements for KP-LULUCF:	
(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	No
(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	No
(c) Reporting requirements of decision 6/CMP.9?	No
(d) Country-specific information to support provisions for natural disturbances in accordance with decision 2/CMP.7, annex, paragraphs 33–34?	No
CPR	Was the CPR reported in accordance with decision 18/CP.7, annex; decision 11/CMP.1, annex; and decision 1/CMP.8, paragraph 18? Yes
Adjustments	Has the ERT applied any adjustments under Article 5, paragraph 2, of the Kyoto Protocol? No
	Has the Party submitted a revised estimate to replace a previously applied adjustment? NA Switzerland does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for assessing conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties? Yes
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review? No
Questions of implementation	Did the ERT list any questions of implementation? No

^a Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

^b Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

III. Status of implementation of recommendations included in the previous review report

8. Table 3 compiles the recommendations from previous review reports that were included in the most recent previous review report, published on 9 April 2020,⁴ and had not been resolved by the time of publication of the report on the review of the Party's 2019 annual submission. The ERT has specified whether it believes the Party had resolved, was addressing or had not resolved each issue or problem by the time of publication of this review report and has provided the rationale for its determination, which takes into consideration the publication date of the most recent previous review report and national circumstances.

Table 3

Status of implementation of recommendations included in the previous review report for Switzerland

ID#	Issue/problem classification ^{a, b}	Recommendation made in previous review report	ERT assessment and rationale
General			
G.1	CPR (G.3, 2019) Transparency	Correct the references regarding the values of the CPR and the assigned amount to document FCCC/IRR/2016/CHE.	Resolved. In its NIR (section 12.5, p.550), the Party corrected the references to document FCCC/IRR/2016/CHE regarding the values of the CPR and the assigned amount. The ERT finds that the values and corresponding references are consistent.
Energy			
E.1	1.A.1.a Public electricity and heat production – other fossil fuels – CH ₄ (E.3, 2019) (E.3, 2017) (E.10, 2016) (E.10, 2015) Transparency	Either estimate and include in the inventory CH ₄ emissions from waste incineration on the basis of the study conducted by the Swiss Federal Laboratories for Material Testing and Research in 2013, or report emissions as “NE” instead of “NA” and provide a justification in the NIR, consistently with the UNFCCC Annex I inventory reporting guidelines, of why these emissions are considered insignificant.	Resolved. In its review of the 2019 submission, the previous ERT determined that this issue was resolved but noted that the Party continued to report CH ₄ emissions from waste incineration as “NO” in CRF table 9. In its 2021 submission, Switzerland revised CRF table 9, reporting “NE” instead of “NO” for CH ₄ emissions from waste incineration, indicating that these emissions are below the detection limit and thus considered insignificant (see also NIR table 10-1, p.491).
E.2	1.A.3.b Road transportation – liquid and gaseous fuels – N ₂ O (E.8, 2019) (E.20, 2017) Accuracy	Estimate cold-start excess emissions of N ₂ O using the Swiss road transportation model and describe in the NIR the method and assumptions used.	Resolved. Switzerland estimated cold-start excess emissions using the road transportation model and recalculated N ₂ O emissions for the entire time series using EFs from the <i>EMEP/EEA air pollutant emission inventory guidebook 2019</i> . Information on the method and assumptions used is provided in the NIR (section 3.2.9.2.2, pp.167–168; and annex 3.1.2, p.569).

⁴ FCCC/ARR/2019/CHE. The ERT notes that the report on the individual inventory review of Switzerland's 2020 annual submission has not been published yet owing to insufficient funding for the review process. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2019 annual submission.

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
IPPU			
I.1	2.A.1 Cement production – CO ₂ (I.8, 2019) Transparency	Clarify in the NIR the assumptions on the CaO and MgO content of clinker used in the base EF which forms the basis for the country-specific EF.	Resolved. The Party provided in its NIR (section 4.2.2.1, p.206) an explanation of the assumptions on the CaO and MgO content of clinker used as the basis for estimating the country-specific EF.
I.2	2.A.4 Other process uses of carbonates – CO ₂ (I.9, 2019) Transparency	Report CO ₂ emissions for category 2.A.4.b as “NE” in CRF table 2(I).A-Hs1 and explain in CRF table 9 that the emissions are considered insignificant.	Resolved. The Party reported CO ₂ emissions for category 2.A.4.b as “NE” in CRF table 2(I).A-Hs1 and included an explanation in CRF table 9 to justify that the emissions are below the level of significance for Switzerland (equating to 23.11 kt CO ₂ eq for 2019).
I.3	2.A.4 Other process uses of carbonates – CO ₂ (I.9, 2019) Transparency	Add a description to the NIR (section 4.2.2.4) explaining in quantitative terms (i.e. using approximated AD and IPCC default EFs) that these emissions are below the significance threshold defined in decision 24/CP.19, annex I, paragraph 37(b).	Resolved. The Party reported in its NIR (section 4.2.2.4, p.213) that it was not known whether net imports of soda ash amounting to approximately 11.6 kt were emissive. As indicated in the NIR, by applying a default EF from the 2006 IPCC Guidelines (vol. 3, chap. 2, table 2.1) (0.41 t CO ₂ /t soda ash), the Party conservatively estimated that the emissions amounted to 4.8 kt CO ₂ , which is below the level of significance for Switzerland (equating to 23.11 kt CO ₂ eq for 2019).
I.4	2.C.1 Iron and steel production – CO ₂ (I.3, 2019) (I.14, 2017) Comparability	Allocate CO ₂ emissions from limestone used in cupola furnaces under category 2.C.1.	Resolved. The Party reported CO ₂ emissions from limestone used in cupola furnaces under category 2.C.1 in CRF table 2(I).A-Hs2 and explained changes in the allocation of emissions in the NIR (sections 4.2.2.4 and 4.4.2.1, pp.211 and 228, respectively, of the 2021 submission and sections 4.2.5 and 10.1.1, pp.216 and 500, respectively, of the 2020 submission).
I.5	2.D.3 Other (non-energy products from fuels and solvent use) – CO ₂ (I.11, 2019) Transparency	Improve the transparency of the reporting of CO ₂ emissions from post-combustion of NMVOC emissions by including sufficient information on the EFs and methodology used for the estimation.	Resolved. The Party reported additional information on the methodology, AD and EFs used to estimate CO ₂ emissions from post-combustion of NMVOC emissions in its NIR (section 4.5.2.2, pp.238–240). The ERT considers that the information provided is sufficiently transparent.
Agriculture			
A.1	3.C Rice cultivation – CH ₄ (A.8, 2019) Accuracy	Correct the error in CRF table 3.C regarding the harvested area of upland rice.	Resolved. Switzerland corrected the error regarding the harvested area of upland rice and reported the updated values (0.00077 and 0.0009 × 10 ⁹ m ² for 2017 and 2019, respectively) in CRF table 3.C. The ERT noted that the Party recalculated the historical area of upland rice on the basis of internal (confidential) comments contained in the Swiss Emission Information System database and the area is no longer considered constant. No errors were identified in the updated area of upland rice.
A.2	3.G Liming – CO ₂ (A.9, 2019) Transparency	Either document in the NIR how the expert judgment used to estimate AD on the use of lime and dolomite was sourced or make this information available in background documents.	Resolved. The Party provided a detailed explanation of the sources and assumptions for the AD on the use of lime and dolomite in its NIR (section 5.8.2.2, p.327).

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
A.3	3.G Liming – CO ₂ (A.10, 2019) Transparency	Provide a brief explanation in the documentation box in CRF table 3.G-I on why dolomite use in 1993 is reported as “NO”.	Resolved. The Party provided the rationale for reporting emissions from dolomite use as “NO” for 1993 in the documentation box of CRF table 3.G-I.
LULUCF			
L.1	Land representation (L.6, 2019) Convention reporting adherence	Correct the reporting of other land and unmanaged land in CRF table 4.1 to ensure consistency between the NIR and the CRF tables.	Resolved. The Party corrected the reporting of other land and unmanaged land in CRF table 4.1, reporting unmanaged forest land, grassland and wetlands as “NO”, and total unmanaged land (the sum of unmanaged forest, grassland and wetlands) as “NA”. This is consistent with the statement in the NIR (section 6.1.3.1, p.335) that all land besides other land in Switzerland is considered to be managed.
L.2	4.A Forest land – CO ₂ (L.4, 2019) (L.9, 2017) Transparency	Improve the description of how stumps after cutting are included in the dead organic matter pool and subsequently transferred as input to the Yasso07 model.	Resolved. The Party improved the description in its NIR (sections 6.4.2.1, 6.4.2.4 and 6.4.2.5, pp.358, 361 and 368, respectively), explaining that stump biomass is included in stemwood, and described how stumps are dealt with after harvesting or natural mortality as part of the deadwood input to the Yasso07 model.
L.3	4.A Forest land – CO ₂ (L.7, 2019) Transparency	Correct the typographical errors in table 6-16 of the 2019 NIR (i.e. update the chapter numbering for references to Herold et al. (2019) and update the number of trees used in the original estimate of parameters for branches reported in Herold et al. (2019)).	Resolved. The Party corrected the typographical errors in table 6-16 of its 2020 NIR (p.372). This table was not included in the 2021 NIR and the Party stated during the review that a detailed overview of the allometric biomass functions applied and corresponding scientific references for tree components are from a different publication (Didion et al., 2020a; table 2).
L.4	4.A Forest land – CO ₂ (L.8, 2019) Accuracy	Either include trees with a DBH of below 12 cm with branches, foliage and roots, in addition to non-tree understory vegetation, including shrubs, ferns, grasses, sedges and herbs, in the estimates of living biomass, deadwood and litter, or provide justification as to why these small trees and non-tree vegetation are not included in the calculation of living biomass, deadwood and litter.	Addressing. The Party provided a justification for omitting above-ground biomass in trees with a DBH of below 12 cm and non-tree vegetation in the NIR (section 6.4.2.1, p.360), namely because of their negligible effect on the carbon stock and carbon stock change estimates of productive forests in Switzerland. However, the ERT considers that the recommendation from the previous ERT has not yet been fully addressed because the Party has not yet included estimates of litter and deadwood from trees with a DBH of below 12 cm and non-tree understory vegetation in stratum CC12 (productive forest), or justified their omission. The Party used tier 1 approaches for estimating carbon stock changes in deadwood and litter for the strata CC13 (unproductive forest) and CC11 (afforestation) and justified their use in the NIR (sections 6.4.2.7 and 6.4.2.8, pp.379 and p.381, respectively). The ERT notes that the Party’s planned improvements for the 2023 submission include accounting for the contribution of litter from trees with a DBH of below 12 cm and non-tree understory vegetation (NIR section 6.4.6, p.390).
Waste			
W.1	5.C Incineration and open burning of waste – CH ₄ and N ₂ O	Align the reporting on sewage sludge between the agriculture and waste sectors. In particular, address the inconsistency regarding the historical practices for sewage	Resolved. The Party reported in the NIR (section 7.1.2, p.443) that sewage sludge has not been used as a fertilizer in agriculture since 2009; this is consistent with the information reported in table 5-23 of the NIR (p.315) for the agriculture sector. The Party also transparently reported in the NIR (p.443) that since 2010 all sewage sludge

<i>ID#</i>	<i>Issue/problem classification^{a, b}</i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
	(W.6, 2019) Transparency	sludge application by explaining how the last year of sewage sludge application to agricultural soils was 2008, while the first year when all sewage sludge was incinerated was 2010.	has been incinerated without energy recovery or used as alternative fuel in the cement industry.
KP-LULUCF			
No previous issues identified.			

^a References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue or problem was raised. Issues are identified in accordance with paras. 80–83 of the UNFCCC review guidelines and classified as per para. 81 of the same guidelines. Problems are identified and classified as problems of transparency, accuracy, consistency, completeness or comparability in accordance with para. 69 of the Article 8 review guidelines in conjunction with decision 4/CMP.11.

^b The report on the review of the 2020 annual submission of Switzerland was not available at the time of this review. Therefore, the recommendations reflected in this table are taken from the 2019 annual review report. For the same reason, 2018 is excluded from the list of review years in which issues could have been identified.

IV. Issues and problems identified in three or more successive reviews and not addressed by the Party

9. In accordance with paragraph 83 of the UNFCCC review guidelines, and as documented in table 4, the ERT assessed that there were no issues identified in three or more successive reviews that had not been addressed by the Party.

Table 4

Issues and/or problems identified in three or more successive reviews and not addressed by Switzerland

<i>ID#</i>	<i>Previous recommendation for issue</i>	<i>Number of successive reviews issue not addressed^a</i>
General	No issues identified.	
Energy	No issues identified.	
IPPU	No issues identified.	
Agriculture	No issues identified.	
LULUCF	No issues identified.	
Waste	No issues identified.	
KP-LULUCF	No issues identified.	

^a Reports on the reviews of the 2018 and 2020 annual submissions of Switzerland have not yet been published. Therefore, 2018 and 2020 were not included when counting the number of successive years for this table. In addition, as the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive reviews and 2015/2016 is counted as one year.

V. Additional findings made during the individual review of the Party's 2021 annual submission

10. Table 5 presents findings made by the ERT during the individual review of the 2021 annual submission of Switzerland that are additional to those identified in table 3.

Table 5

Additional findings made during the individual review of the 2021 annual submission of Switzerland

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem? ^a
General			
G.2	QA/QC and verification	<p>The ERT noted a few inconsistencies between the data provided in CRF table 8s4 and in the NIR (tables 10-4 and 10-5, pp.506 and 510, respectively). Specifically, according to the information provided in the NIR, the “Total including LULUCF” reported in the 2021 submission amounts to 45,591 kt CO₂ eq for 2018, while the corresponding figure reported in the 2020 submission is 45,039 kt CO₂ eq. However, according to CRF table 8s4, the “Total CO₂ eq emissions with LULUCF” reported in the 2021 submission amount to 45,593.99 kt CO₂ eq for 2018, while the corresponding figure reported in the 2020 submission is 45,041.48 kt CO₂ eq. During the review, the Party clarified that there are errors in NIR tables 10-4 and 10-5. The formulas used to calculate N₂O emissions from LULUCF (for the 2020 and 2021 submissions) contain incorrect references for the reported years. The Party confirmed that these errors will be corrected in the 2022 submission.</p> <p>The ERT recommends that Switzerland ensure consistency in the data reported on recalculations of total emissions of CO₂ eq including LULUCF between section 10 of the NIR and CRF table 8s4.</p>	Yes. Convention reporting adherence
G.3	Notation keys	<p>The ERT noted many blank cells in the CRF tables of the Party's annual submission, specifically in CRF tables 1.A(a)s1, 1.A(a)s3, 1.A(a)s4, 1.A(b), 1.A(d), 1.B.2, 2(I)s2, 2(I).A-Hs2, 2(II), 2(II)B-Hs14, 4(I), 4(II), 4(V), 4.Gs1, Summary 1.As1, Summary 2, 4(KP) and 4(KP-II)4. During the review, the Party explained that the blank cells in these CRF tables were identified as a problem regarding CRF Reporter and that the blank cells generally correspond to activities that do not occur in Switzerland and should therefore be interpreted as “NO” (to the extent possible, explanatory information was provided in the NIR and in the documentation boxes of the CRF tables as to why the cells were blank). In its response to questions raised during the review, the Party mentioned that it will consider filling in the blank cells in the CRF tables for the LULUCF sector and KP-LULUCF activities in the next annual submission. The ERT acknowledges the Party's response regarding the blank cells in CRF tables 2(I)s2 and 2(II) and the corresponding cells in the CRF summary tables, as this is a known challenge that applies to all Parties reporting through CRF Reporter.</p> <p>The ERT encourages the Party to use notation keys to fill in the blank cells in CRF tables 1.A(a)s1, 1.A(a)s3, 1.A(a)s4, 1.A(b), 1.A(d), 1.B.2, 2(I)s2, 2(I).A-Hs2, 2(II), 2(II)B-Hs14, 4(I), 4(II), 4(V), 4.Gs1, Summary 1.As1, Summary 2, 4(KP) and 4(KP-II)4 to facilitate the assessment of the completeness of its inventory.</p>	Not an issue/problem
Energy			
No findings for the energy sector additional to those included in table 3 were made by the ERT during the review.			
IPPU			
No findings for the IPPU sector additional to those included in table 3 were made by the ERT during the review.			

<i>ID#</i>	<i>Finding classification</i>	<i>Description of finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?^a</i>
Agriculture			
A.4	3.A.1 Cattle – CH ₄	<p>In its NIR (section 5.2.2.2.1, p.279), Switzerland reported that the estimates of CH₄ emissions from enteric fermentation of growing cattle are based on energy intake calculations that rely on the animal's weight, daily growth rate, daily feed intake (dm), daily feed energy intake, and energy required for milk production and pregnancy for the respective subcategories of growing cattle. In NIR table A-15 (p.578), Switzerland reported data on the performance parameters (including data on weight for each subcategory) used to estimate the enteric fermentation EFs for each subcategory of growing cattle. However, the ERT noted that in CRF table 3.As2, Switzerland reported the data on the performance parameters for growing cattle (i.e. weight) as "NA" for the entire time series. During the review, Switzerland stated that weight values for the growing cattle category could only be estimated as weighted mean values of the respective subcategories and explained that this would not be indicative since the weight values would not correspond to an actual cattle category.</p> <p>The ERT encourages Switzerland to calculate the weighted average weight values for the growing cattle population and report the values in CRF table 3.As2 for the entire reporting period.</p>	Not an issue/problem
A.5	3.B.1 Cattle – CH ₄ and N ₂ O	<p>In its NIR (section 5.3.2.2.1, p.297), Switzerland stated that the data on the MMS distribution for cattle used to estimate CH₄ emissions from MMS are different from those used to calculate N₂O emissions from MMS for the same livestock category (i.e. by subcategory of cattle) for the entire reporting period. During the review, the Party stated that the CH₄ and N₂O emissions from MMS are estimated using a tier 3 approach and clarified that the data on the use of MMS are inconsistent between the estimates of CH₄ and N₂O emissions, as VS are excreted mainly in dung and N mainly in urine, and the proportion of VS stored as solid manure is higher compared with the proportion of N contained in manure; different data sets were therefore applied to estimate CH₄ and N₂O emissions from MMS. The Party explained that the amounts of N and VS stored and treated in different MMS are estimated based on a material balance approach that tracks N and VS throughout the different MMS. In addition, the Party clarified that identical data on the percentage allocation of pasture, range and paddock MMS were used to estimate CH₄ and N₂O emissions for all subcategories of cattle. The ERT did not identify any concerns related to the method applied by Switzerland but noted that in accordance with the 2006 IPCC Guidelines (vol. 4, chap. 10, p.10.53) and paragraph 12 of the UNFCCC Annex I inventory reporting guidelines, a country-specific method should be well documented, clearly describing the estimation procedures used.</p> <p>The ERT recommends that the Party clearly explain the mass balance approaches developed to track VS and N flows excreted by cattle (by subcategory) and handled in each MMS and transparently describe the methods used to estimate CH₄ and N₂O emissions from manure management for cattle (for each subcategory) in the NIR.</p>	Yes. Transparency
A.6	3.B.1 Cattle – N ₂ O	<p>In its NIR (section 5.3.2.5.2, p.300), Switzerland stated that data on the Nex rates per animal category were obtained from Kupper et al. (2018), without any further clarification of how these Nex rates were determined. In response to a question raised by the ERT during the review regarding clarification of how the data on the performance parameters for cattle (by subcategory) used to evaluate the Nex rates are consistent with those used to develop the values for the GE and VS of cattle (by subcategory), the Party clarified that the evaluation of the Nex rates for cattle (by subcategory) was based on Richner et al. (2017); nevertheless, in some cases, the Nex rates were "corrected" in the Agrammon model (Kupper et al., 2018) in accordance with developments in animal performance and/or feeding regimes. The Party further clarified during the review that the Nex rates per animal category were evaluated on the basis of a large number of feeding trials; however, the results and background information used to derive the Nex rates have never been officially published. The Party</p>	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem? ^a
A.7	3.D.a.4 Crop residues – N ₂ O	<p>indicated, however, that it will make efforts to describe the algorithms and background input data used to evaluate the Nex rates for cattle (by subcategory) in the next NIR.</p> <p>The ERT recommends that Switzerland provide information in the NIR on the algorithms and background input data (e.g. crude protein intake, milk protein content and N retention, to the extent possible) used to evaluate the Nex rates for cattle (by subcategory).</p> <p>The Party reported in its NIR (section 5.5.2.2.2, p.313) the use of a country-specific model to estimate N₂O emissions from crop residues left on fields. The ERT noted that the NIR does not include any references for the model used by the Party. Moreover, the data sources and calculation parameters used were not reported transparently by the Party. For example, it is not clear from the NIR:</p> <ul style="list-style-type: none"> (a) (a) Whether the parameter for determining the amount of fresh matter crop harvest for a specific crop refers to the total amount of a specific crop produced or the amount of a specific crop harvested from 1 ha land in a respective year; (b) (b) What reference source was used for the respective statistics on crop harvest; (c) (c) Whether the yield data for meadows and pastures are assumed to be constant over the reporting period or whether dynamic data for grass yields were used for the estimates. <p>During the review, the Party acknowledged that the description of the data and parameters used is not transparently presented and stated that it would clarify the methodological approach in its next annual submission, including the data and parameters used to estimate direct N₂O emissions from crop residues left on fields. Specifically, the Party noted that the parameter for determining the amount of fresh matter crop harvest for a specific crop refers to the total amount of a specific crop type, based on statistics on the amounts of crop type harvested that are published annually by the Swiss Farmers Union. The Party further noted that the statistics on grassland yields are weighted, taking into account annual data on area of various grassland categories.</p> <p>The ERT recommends that the Party further clarify the model used to estimate N₂O emissions from crop residues left on fields by including in the NIR information on the reference source for the model, the data sources and the calculation parameters used.</p>	Yes. Transparency
A.8	3.D.b.1 Atmospheric deposition – N ₂ O	<p>The N₂O IEF reported by Switzerland for atmospheric deposition for the entire time series (increasing from 0.025 kg N₂O-N/kg N for 1990 to 0.026 for 2019) is well above the IPCC default value from the 2006 IPCC Guidelines (0.01 kg N₂O-N/kg N) (vol. 4, chap. 11, table 11.3) and one of the highest among reporting Parties (ranging from 0.003 to 0.026 kg N₂O-N/kg N for 2019), only comparable with the value reported by Liechtenstein (0.026 kg N₂O-N/kg N for 2019). During the review, the Party specified that the EF for N₂O emissions from atmospheric deposition was derived by calculating an area-weighted mean of the IPCC default value for managed land and the country-specific EFs for volatilized and re-deposited N in semi-natural forest ecosystems (deciduous and coniferous forests) and semi-natural grassland and wetlands (based on values provided in Bühlmann et al., 2015; and Bühlmann, 2014). The ERT further noted that the Party stated in its NIR (pp.381 and 421) that no N fertilizer is applied to forest land or wetlands but might be applied to settlements (see ID# L.7 below). Nevertheless, owing to the inability to further disaggregate fertilizer use across managed lands (NIR p.52), the Party reported N₂O emissions from atmospheric deposition of N volatilized from all categories of managed land in CRF table 3.D. The ERT therefore concludes that it is unclear from the NIR how the mean values of the N₂O IEF for atmospheric deposition over the entire time series have been calculated, which may lead to an overestimation of total indirect N₂O emissions from agricultural soils.</p>	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem? ^a
<p>The ERT recommends that the Party justify the use of the country-specific N₂O EF for atmospheric deposition by including information in the NIR on the calculation of the mean N₂O EF for atmospheric deposition (e.g. reporting in tabular format the areas of land-use categories that were subject to N inputs and the relevant N₂O EF for atmospheric deposition for each category of managed land) or use the IPCC default EF for N₂O emissions from atmospheric deposition of N inputs to soil and water provided in table 11.3 of the 2006 IPCC Guidelines (vol. 4, chap. 11).</p>			
LULUCF			
L.5	4.C.2 Land converted to grassland – CO ₂	<p>The Party reported in its NIR (section 6.6, p.403) that grassland types with woody biomass (shrub vegetation (CC32), vineyards, low-stem orchards and tree nurseries (CC33), copse (CC34) and orchards (CC35)) have stable carbon stocks in living biomass and mineral soils in the grassland remaining grassland category. In the land converted to grassland subcategories, the change in biomass carbon stocks for these land-use types with woody biomass is calculated following the stock-difference method of the 2006 IPCC Guidelines (vol. 4, chap. 2), using a one-year conversion period and the stable biomass carbon stocks used for the grassland remaining grassland category (NIR table 6.3, p.340). The approach used by Switzerland does not appear to account for the fact that land-use categories with woody biomass take more than one year to reach a stable carbon stock. During the review, the Party clarified that land-use change to vineyards, low-stem orchards and tree nurseries (CC33) and orchards (CC35) has taken place almost exclusively on cropland or grassland since 1990. New planting of these crops is usually done with already established plants (except for tree nurseries, which are negligible in terms of area), thereby justifying the use of a one-year conversion period. The Party also provided a justification for the use of a one-year conversion period for instances of other land converted to grassland, which is mainly due to the shift of vegetation zones in the mountainous regions as a result of climate change. The ERT accepted the justification.</p> <p>The ERT recommends that the Party include a justification for the use of a one-year conversion period for land converted to woody grassland types in its NIR.</p>	Yes. Transparency
L.6	4(I) Direct N ₂ O emissions from N input to managed soils – N ₂ O	<p>The Party reported direct N₂O emissions from N inputs to managed soils as “IE” in CRF table 4(I) for settlements. Footnote 5 to CRF table 4(I) states that if a Party is not able to separate the N inputs applied to land-use categories, other than cropland and grassland, it may report all N₂O emissions from N inputs to managed soils in the agriculture sector and that this should be explicitly indicated in the documentation box. The Party did not include such documentation, although it did specify that fertilization of forests and wetlands is prohibited in Switzerland (see also ID# A.8 above) and explained its use of the notation key “IE” in CRF table 9.</p> <p>The ERT encourages the Party to include text in the documentation box of CRF table 4(I) indicating that direct N₂O emissions from the fertilization of settlements are included under subcategories 3.D.a.1 (inorganic N fertilizers) and 3.D.a.7 (other).</p>	Not an issue/problem
L.7	4(IV).1 Atmospheric deposition – N ₂ O	<p>Similar to the finding in ID# L.6 above, Switzerland reported atmospheric deposition from N fertilization as “IE” in CRF table 4(IV). According to footnote 1 to CRF table 4(IV), if the sources of N cannot be separated other than between cropland and grassland, they should be included in the agriculture sector and reported in CRF table 3.D, and this should be explicitly indicated in the documentation box. The ERT acknowledges that the use of the notation key “IE” is explained in CRF table 9.</p>	Not an issue/problem

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem? ^a
		The ERT encourages the Party to include text in the documentation box of CRF table 4(IV) indicating that indirect N ₂ O emissions from managed soils (atmospheric deposition) from the fertilization of settlements are reported in CRF table 3.D under subcategory 3.D.b.1 (atmospheric deposition).	
Waste			
W.2	5.B.1 Composting – CH ₄	<p>The Party estimated CH₄ emissions from composting of MSW using a country-specific CH₄ EF of 1.00 g/kg waste for the entire time series, which is much lower than the default EF of 4 g/kg waste in the 2006 IPCC Guidelines (IPCC range: 0.03–8 g/kg waste (vol. 5, chap. 4, table 4.1)), without providing any justification in the NIR (section 7.3.2.1, pp.449–450). During the review, the Party explained, referring to Schleiss (2017), that the practice in Switzerland is to sort input waste to the process for composting of MSW under conditions that are as aerobic as possible to produce marketable compost, leading to lower CH₄ emissions.</p> <p>The ERT recommends that Switzerland describe in the NIR the process for composting of MSW to justify the low country-specific CH₄ EF of 1.00 g/kg.</p>	Yes. Transparency
W.3	5.B.1 Composting – CH ₄	<p>The Party reported comparable values in both CRF table 5.B and the NIR (p.452) for the AD for composting of MSW, even though these values are based on different units (i.e. 643.86 kt dm in CRF table 5.B and 644 kt (wet) in NIR table 7-12 for 2019). During the review, the Party explained that the AD in CRF table 5.B were reported on a wet-weight basis and that this was indicated in the documentation box of CRF table 5.B. The Party also indicated that it intends to report AD on a dry-weight basis in the next annual submission. The estimates of CH₄ emissions were not affected by the AD used.</p> <p>The ERT recommends that the Party report correct AD for composting of MSW on a dry-weight basis (kt dm) in CRF table 5.B, instead of on a wet-weight basis, to ensure comparability of the resulting IEF across reporting Parties.</p>	Yes. Convention reporting adherence
W.4	5.C.1 Waste incineration – N ₂ O	<p>The Party reported estimates of N₂O emissions from sewage sludge incineration in CRF table 5.C using a country-specific N₂O EF (4.10 kg/t waste dm), which is much higher than the value used in the previous annual submission (0.80 kg/t waste dm), which was based on information provided in the IPCC <i>Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories</i> for Germany (chap. 5, table 5.7). However, the NIR does not provide a clear explanation of how the Party obtained the EF, which is much higher than the default value (0.99 kg/t waste dm) in the 2006 IPCC Guidelines (vol. 5, chap. 5, table 5.6). During the review, the Party explained, referring to Meier (2016), Wunderlin (2013) and Joss (2020), that the N₂O EF is based on several measurements gathered at two different plants.</p> <p>The ERT recommends that the Party improve the transparency of its reporting by referencing the sources used to obtain the country-specific N₂O EF of 4.10 kg/t waste for sewage sludge incineration.</p>	Yes. Transparency
W.5	5.D.1 Domestic wastewater – CH ₄	<p>In the NIR (p.463), the Party reported CH₄ emissions only from wastewater discharged to the public sewer system, without taking into account potential emissions from wastewater of unconnected inhabitants, amounting to approximately 3 per cent of the population since 2006. Alternative treatment systems for wastewater not connected to the public sewer system consist of systems that are very similar to centralized wastewater treatment plants often under aerobic conditions, as well as simpler systems (e.g. septic tanks with at least three chambers) that are typically buried. During the review, the Party explained that it assumes that simpler systems such as septic tanks are very rare, and that alternative systems very similar to centralized wastewater treatment plants amount to nearly 100 per cent of the 3 per cent of the population not connected to the public sewer system. This assumption is based on requirements under the Federal Act on the Protection of Waters</p>	Yes. Completeness

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem? ^a
		<p>and the Waters Protection Ordinance, which include state-of-the-art handling of wastewater and sludge, although Switzerland does not have quantitative data on the penetration rate of each system. The ERT considered that CH₄ is likely to be emitted, at least from the systems that are very similar to centralized wastewater treatment plants. Further, the ERT noted that the NIR does not provide a justification for not estimating these emissions, such as topographical or climatological conditions, as was provided for the simpler systems (see ID# W.6 below). On the basis of this assumption, the Party provided the ERT with a tentative estimate of CH₄ emissions from wastewater treatment systems not connected to the public sewer system of 4.63 kt CO₂ eq for 2019. The ERT notes that this estimate is below the level of significance for Switzerland (equating to 23.11 kt CO₂ eq for 2019) for inclusion of the issue in the list of potential problems and further questions raised by the ERT, in accordance with decision 22/CMP.1, annex, paragraph 80(b). Further, although CH₄ emissions from this category are very low, the ERT noted that it is necessary to justify the assumption that the alternative systems are very similar to centralized wastewater plants and amount to nearly 100 per cent of the 3 per cent of the population not connected to the public sewer system by collecting quantitative data on the penetration rate of each system.</p> <p>The ERT recommends that the Party estimate CH₄ emissions from wastewater treatment systems not connected to the public sewer system, specifically from those systems that are very similar to centralized wastewater treatment plants, and include the emissions in the national total. The ERT also encourages the Party to include in its improvement plan a study to obtain estimates on the types and penetration rate of wastewater treatment systems not connected to the public sewer system to more accurately estimate CH₄ emissions from these sources.</p>	
W.6	5.D.1 Domestic wastewater – CH ₄	<p>As mentioned in ID# W.5 above, Switzerland reported in its NIR (p.463) that simpler wastewater treatment systems (e.g. septic tanks) are used for the population not connected to the public sewer system. The ERT noted that, although the fraction of simpler systems among all alternative systems is very small, there is still a potential for CH₄ emissions from these systems. In the NIR (p.463), the Party explained that the wastewater in simpler systems buried underground reaches a constant temperature consistent with the surrounding soil, approximately corresponding to the mean annual air temperature (12.4 °C at Grono, the warmest place in Switzerland). These simpler systems present in conditions where the annual average temperature is below 15 °C are unlikely to produce CH₄ emissions in an anaerobic environment. The ERT noted that approximately 10 m below ground is where soil temperature corresponds to the mean annual air temperature, and that this depth is much deeper than that at which treatment systems are normally installed. Additionally, it is possible that wastewater temperature is warmer than soil temperature since domestic wastewater from households retains heat. Also, air temperature in the five largest cities in Switzerland (Zurich, Geneva, Basel, Lausanne and Bern) in summer (June to August) surpasses 15 °C, and it is possible that septic tanks emit CH₄ due to those conditions. To justify the assumption that CH₄ is not emitted from simpler systems in Switzerland, the ERT considers that information should be provided in the NIR to demonstrate that the wastewater temperature in simpler systems remains below 15 °C throughout the year. During the review, the Party explained, providing detailed air and soil (below 20 and 35 cm) temperature profiles for two rural areas in Switzerland (Rubigen, situated at an altitude of 594 m and Ättenberg at 1,600 m), that simpler wastewater treatment systems located in remote and rural mountainous areas above an altitude of 1,200 m are often in woody (shaded) areas, and unlikely to produce CH₄ emissions in such a cold climate. The ERT considers that the justification provided by the Party using air and soil temperature profiles in regions where simpler systems are typically installed is reasonable, although profiles of wastewater temperature in simpler systems were not provided by the Party.</p>	Yes. Transparency

ID#	Finding classification	Description of finding with recommendation or encouragement	Is finding an issue/problem? ^a
<p>The ERT recommends that the Party provide in the NIR a justification that simpler systems serving as alternatives for wastewater treatment plants not connected to the public sewer system do not produce CH₄ emissions, for example by providing air and soil temperature profiles for the regions where these systems are typically used.</p>			
W.7	5.D.1 Domestic wastewater – CH ₄	<p>In its NIR (p.463), Switzerland reported that the sewage sludge from small-scale treatment installations (see ID# W.5 above) is either dealt with by centralized wastewater treatment plants or municipal waste incineration plants. However, it is not clear from this description whether the sewage sludge includes sludge from simpler wastewater treatment systems (e.g. septic tanks). During the review, the Party confirmed that the sewage sludge principally includes all sludge from wastewater treatment systems, including septic tanks, not connected to the public sewer system under the Federal Act on the Protection of Waters and the Waters Protection Ordinance. The Party also explained that it is possible that some of the wastewater from rural areas not connected to the public sewer system is added to the slurry pit and spread to agricultural soils as a fraction of slurry. The Party further indicated that farmers not connected to the public sewer system constitute approximately 1.5 per cent of the population. The ERT noted that since almost 100 per cent of inhabitants not connected to the public sewer system operate wastewater treatment plants that are very similar to centralized plants (see ID# W.5 above), farmers also use these systems, and assumed that the practice of spreading wastewater to agricultural soils does not frequently occur. However, the ERT noted that this additional information on wastewater spread to agricultural soils is important as supplementary information on sewage sludge application.</p> <p>The ERT recommends that the Party clearly explain in the NIR that the sewage sludge treated in centralized wastewater treatment plants or municipal waste incineration plants includes all sludge from wastewater treatment systems not connected to the public sewer system. The ERT also recommends that the Party include in the NIR additional information on the fraction of wastewater in rural areas not connected to the public sewer system that is possibly spread to agricultural soils as a fraction of slurry.</p>	Yes. Transparency
KP-LULUCF			
KL.1	General (KP-LULUCF)	<p>The Party reported in CRF table NIR-1 that the litter and deadwood pools were not reported for areas of AR. In CRF table 4(KP-I)A.1, net changes in litter and deadwood carbon stocks were reported for afforestation areas more than 20 years old but were reported as “NE” for afforestation areas less than 20 years old. During the review, the Party clarified that it used the notation key “NR” for afforestation areas less than 20 years old because it reflects “young afforestation”, but agreed that multiple notation keys should be used.</p> <p>The ERT recommends that the Party use the notation key “R” or, if technically feasible, “R, NR” (which appears to be possible for reporting in CRF table NIR-1, on the basis of input provided by the secretariat during the review), as this more accurately reflects the completeness of the Party’s reporting.</p>	Yes. Comparability
KL.2	Article 3.4 activities – CO ₂ , CH ₄ and N ₂ O	<p>The Party reported in CRF table NIR-2 an area of other land converted to FM (2.07 kha in 2019). The NIR (section 11.1.3) states that the definition of FM is provided in the Party’s initial report (FOEN, 2006) but includes no additional explanation of the nature of the expansion of the FM area. During the review, the Party clarified that this area results from the natural regeneration of forest following the abandonment of agricultural land. According to the Party, this is not considered a direct human-induced activity and is therefore not included under afforestation. However, once the naturally regenerated forest has achieved the definition of forest, the area is included in the FM area as other land converted to FM. The Party mentions this land conversion in the NIR (sections 6.4.2.8, 11.2.3 and 11.6.1). The ERT notes the Party’s</p>	Yes. Transparency

<i>ID#</i>	<i>Finding classification</i>	<i>Description of finding with recommendation or encouragement</i>	<i>Is finding an issue/problem?^a</i>
		clarification; however, the origin of this area of other land converted to FM, and hence the expansion of the FM area over time, is not transparent in section 11.1.3 of the NIR.	
		The ERT recommends that the Party explain in the NIR (section 11.1.3) the reason for the expansion of the FM area over time owing to the inclusion of naturally regenerated forests that have achieved the forest definition.	
KL.3	Deforestation – CO ₂ , CH ₄ and N ₂ O	<p>The Party reported in CRF table 4(KP-I)A.2 the total area of deforestation (activity A.2) for 2019 as 11.75 kha, but the total area was reported in the information item (land areas under deforestation by land-use category in the reporting year) as 10.71 kha. This error is also apparent for 2017–2018. The deforested areas for 2017–2018 reported in CRF table 4(KP-I)A.2 are also inconsistent with the deforested areas reported in CRF table NIR-2. For example, the total area reported in CRF table 4(KP-I)A.2 for 2018 was 10.88 kha, while the corresponding area at the end of 2018 was reported in CRF table NIR-2 as 11.32 kha. During the review, the Party clarified that the area of 11.75 kha reported for 2019 was correct, and that an error in the calculation of the information item led to part of the deforestation area being omitted. The Party also clarified that the deforested areas reported for 2017 and 2018 were imported incorrectly to CRF Reporter, but the reported emissions from deforestation were correct.</p> <p>The ERT recommends that the Party correct the error in the sum of the deforested areas under the information item of CRF table 4(KP-I)A.2, and implement a QA check to ensure that the total areas reported under the information item are consistent with the total areas reported for deforestation and with the deforested areas reported in CRF table NIR-2.</p>	Yes. Convention reporting adherence

^a Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines or problems as defined in para. 69 of the Article 8 review guidelines.

VI. Application of adjustments

11. The ERT did not identify the need to apply any adjustments for the 2021 annual submission of Switzerland.

VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol

12. Switzerland elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF is not applicable to the 2021 review.

VIII. Questions of implementation

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2021 annual submission.

Overview of greenhouse gas emissions and removals and data and information on activities under Article 3, paragraphs 3–4, of the Kyoto Protocol, as submitted by Switzerland in its 2021 annual submission

1. Tables I.1–I.4 provide an overview of the total GHG emissions and removals as submitted by Switzerland.

Table I.1

Total greenhouse gas emissions and removals for Switzerland, base year–2019

(kt CO₂ eq)

	Total GHG emissions excluding indirect CO ₂ emissions		Total GHG emissions and removals including indirect CO ₂ emissions ^a		Land-use change (Article 3.7 bis as contained in the Doha Amendment) ^b	KP-LULUCF (Article 3.3 of the Kyoto Protocol) ^c	KP-LULUCF (Article 3.4 of the Kyoto Protocol)	
	Total including LULUCF	Total excluding LULUCF	Total including LULUCF	Total excluding LULUCF			CM, GM, RV, WDR	FM
FMRL								220.00
Base year ^d	51 603.30	53 618.88	52 013.76	54 029.34	NA		NA	
1990	51 603.30	53 618.88	52 013.76	54 029.34				
1995	48 758.11	52 671.90	49 057.68	52 971.48				
2000	58 119.04	52 918.43	58 332.63	53 132.03				
2010	51 881.91	54 708.98	52 023.83	54 850.89				
2011	49 454.20	50 593.02	49 593.80	50 732.63				
2012	49 541.31	51 932.23	49 678.29	52 069.20				
2013	50 945.88	52 817.12	51 078.14	52 949.38		162.70	NA	–2 967.31
2014	48 499.07	48 863.89	48 628.20	48 993.01		149.34	NA	–1 598.99
2015	46 150.52	48 403.16	46 275.54	48 528.17		137.25	NA	–3 156.98
2016	46 465.23	48 696.87	46 585.75	48 817.39		138.79	NA	–3 030.78
2017	46 058.75	47 856.28	46 179.28	47 976.81		152.41	NA	–2 929.08
2018	45 580.48	46 356.19	45 701.10	46 476.81		170.14	NA	–1 663.76
2019	44 162.34	46 095.29	44 282.89	46 215.84		169.50	NA	–2 649.06

Note: Emissions and removals reported in the sector other (sector 6) are not included in the total GHG emissions.

^a The Party reported indirect CO₂ emissions in CRF table 6.

^b The value reported in this column relates to GHG emissions from conversion of forests (deforestation) in 1990 as contained in the report on the review of the Party's report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol.

^c Activities under Article 3, para. 3, of the Kyoto Protocol, namely AR and deforestation.

^d "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. Switzerland has not elected any activities under Article 3, para. 4, of the Kyoto Protocol. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

Table I.2

Greenhouse gas emissions and removals by gas for Switzerland, excluding land use, land-use change and forestry, 1990–2019(kt CO₂ eq)

	<i>CO₂^a</i>	<i>CH₄</i>	<i>N₂O</i>	<i>HFCs</i>	<i>PFCs</i>	<i>Unspecified mix of HFCs and PFCs</i>	<i>SF₆</i>	<i>NF₃</i>
1990	44 552.26	5 861.72	3 361.83	0.02	116.52	NA, NO	136.99	NA, NO
1995	43 701.31	5 581.00	3 334.75	243.72	17.48	NA, NO	93.21	NA, NO
2000	43 819.37	5 187.49	3 275.94	635.99	60.92	NA, NO	152.31	NA, NO
2010	45 180.00	5 060.16	3 100.67	1 308.15	37.79	NA, NO	151.46	12.67
2011	41 112.87	5 010.26	3 019.74	1 380.69	36.06	NA, NO	163.69	9.32
2012	42 378.86	4 985.84	2 992.69	1 454.45	38.78	NA, NO	218.04	0.54
2013	43 304.81	4 919.66	2 999.84	1 434.30	27.75	NA, NO	262.87	0.14
2014	39 349.85	4 913.37	2 969.25	1 471.90	22.55	NA, NO	265.50	0.60
2015	38 844.67	4 887.39	2 997.60	1 510.88	25.55	NA, NO	261.35	0.73
2016	39 301.96	4 847.37	2 950.16	1 484.31	19.52	NO, NA	213.30	0.77
2017	38 291.52	4 787.07	3 153.93	1 508.75	32.01	NO, NA	202.74	0.80
2018	36 975.94	4 756.34	3 019.54	1 530.30	36.29	NO, NA	157.90	0.50
2019	36 850.67	4 672.59	3 102.28	1 435.14	31.78	NO, NA	122.84	0.54
Percentage change 1990–2019	–17.3	–20.3	–7.7	5 791 138.7	–72.7	NA	–10.3	NA

Note: Emissions and removals reported in the sector other (sector 6) are not included in this table.

^a Including indirect CO₂ emissions as reported in CRF table 6.

Table I.3

Greenhouse gas emissions and removals by sector for Switzerland, 1990–2019(kt CO₂ eq)

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
1990	41 908.86	4 338.44	6 661.59	–2 015.58	1 120.45	13.31
1995	41 959.34	3 646.14	6 445.58	–3 913.80	920.42	13.24
2000	42 265.67	3 935.24	6 037.78	5 200.61	893.34	14.16
2010	43 244.61	4 625.92	6 116.75	–2 827.07	863.61	13.50
2011	39 184.32	4 632.88	6 073.59	–1 138.83	841.83	14.56
2012	40 577.58	4 608.33	6 071.74	–2 390.92	811.56	15.25
2013	41 497.58	4 612.83	6 016.23	–1 871.24	822.74	15.70
2014	37 449.18	4 612.38	6 122.06	–364.82	809.40	12.54
2015	37 118.73	4 559.16	6 046.47	–2 252.63	803.81	13.56

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
2016	37 514.10	4 504.95	6 003.09	–2 231.64	795.25	13.26
2017	36 527.16	4 658.30	6 006.44	–1 797.54	784.91	13.76
2018	35 231.38	4 522.15	5 958.15	–775.72	765.14	14.71
2019	35 113.92	4 480.85	5 864.25	–1 932.95	756.83	14.03
Percentage change 1990–2019	–16.2	3.3	–12.0	–4.1	–32.5	5.4

Note: Sector values include indirect CO₂ emissions reported in CRF table 6.

Table I.4

Greenhouse gas emissions and removals from activities under Article 3, paragraphs 3–4, of the Kyoto Protocol by activity, base year–2019, for Switzerland
(kt CO₂ eq)

	<i>Article 3.7 bis as contained in the Doha Amendment^a</i>	<i>Activities under Article 3.3 of the Kyoto Protocol</i>		<i>FM and elected activities under Article 3.4 of the Kyoto Protocol</i>				
	<i>Land-use change</i>	<i>AR</i>	<i>Deforestation</i>	<i>FM</i>	<i>CM</i>	<i>GM</i>	<i>RV</i>	<i>WDR</i>
FMRL				220.00				
Technical correction				–2 136.09				
Base year ^b	NA				NA	NA	NA	NA
2013		–20.21	182.91	–2 967.31	NA	NA	NA	NA
2014		–18.07	167.41	–1 598.99	NA	NA	NA	NA
2015		–19.65	156.90	–3 156.98	NA	NA	NA	NA
2016		–19.37	158.17	–3 030.78	NA	NA	NA	NA
2017		–19.19	171.60	–2 929.08	NA	NA	NA	NA
2018		–17.13	187.27	–1 663.76	NA	NA	NA	NA
2019		–19.01	188.51	–2 649.06	NA	NA	NA	NA
Percentage change base year–2019					NA	NA	NA	NA

Note: Values in this table include emissions from land subject to natural disturbances, if applicable.

^a The value reported in this column relates to 1990.

^b Switzerland has not elected to report on any activities under Article 3, para. 4, of the Kyoto Protocol. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

2. Table I.5 provides an overview of key relevant data from Switzerland's reporting under Article 3, paragraphs 3–4, of the Kyoto Protocol.

Table I.5

Key relevant data for Switzerland under Article 3, paragraphs 3–4, of the Kyoto Protocol from its 2021 annual submission

<i>Parameter</i>	<i>Data values</i>
Periodicity of accounting	(a) AR: commitment period accounting (b) Deforestation: commitment period accounting (c) FM: commitment period accounting (d) CM: not elected (e) GM: not elected (f) RV: not elected (g) WDR: not elected
Elected activities under Article 3, paragraph 4, of the Kyoto Protocol	None
Election of application of provisions for natural disturbances	No for AR; yes for FM
3.5% of total base-year GHG emissions, excluding LULUCF and including indirect CO ₂ emissions	1 879.736 kt CO ₂ eq (15 037.884 kt CO ₂ eq for the duration of the commitment period)
Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	NA
2. Deforestation	NA
3. FM	NA

Annex II

Information to be included in the compilation and accounting database

Tables II.1–II.7 include the information to be included in the compilation and accounting database for Switzerland. Data shown are from the Party's annual submission, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table II.1

Information to be included in the compilation and accounting database for 2019, including on the commitment period reserve, for Switzerland
(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
CPR	325 591 672	–	–	325 591 672
Annex A emissions				
CO ₂	36 850 669	–	–	36 850 669
CH ₄	4 672 595	–	–	4 672 595
N ₂ O	3 102 278	–	–	3 102 278
HFCs	1 435 138	–	–	1 435 138
PFCs	31 775	–	–	31 775
Unspecified mix of HFCs and PFCs	NA	–	–	NA
SF ₆	122 842	–	–	122 842
NF ₃	543	–	–	543
Total Annex A sources	46 215 839	–	–	46 215 839
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–19 011	–	–	–19 011
Deforestation	188 512	–	–	188 512
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–2 649 057	–	–	–2 649 057

Table II.2

Information to be included in the compilation and accounting database for 2018 for Switzerland
(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	36 975 941	–	–	36 975 941
CH ₄	4 756 343	–	–	4 756 343
N ₂ O	3 019 544	–	–	3 019 544
HFCs	1 530 295	–	–	1 530 295
PFCs	36 293	–	–	36 293
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	157 895	–	–	157 895
NF ₃	502	–	–	50
Total Annex A sources	46 476 814	–	–	46 476 814
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–17 131	–	–	–17 131
Deforestation	187 268	–	–	187 268
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–1 663 759	–	–	–1 663 759

Table II.3

Information to be included in the compilation and accounting database for 2017 for Switzerland(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	38 291 523	–	–	38 291 523
CH ₄	4 787 075	–	–	4 787 075
N ₂ O	3 153 926	–	–	3 153 926
HFCs	1 508 745	–	–	1 508 745
PFCs	32 005	–	–	32 005
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	202 737	–	–	202 737
NF ₃	803	–	–	803
Total Annex A sources	47 976 814	–	–	47 976 814
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–19 191	–	–	–19 191
Deforestation	171 597	–	–	171 597
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–2 929 078	–	–	–2 929 078

Table II.4

Information to be included in the compilation and accounting database for 2016 for Switzerland(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	39 301 957	–	–	39 301 957
CH ₄	4 847 368	–	–	4 847 368
N ₂ O	2 950 161	–	–	2 950 161
HFCs	1 484 310	–	–	1 484 310
PFCs	19 520	–	–	19 520
Unspecified mix of HFCs and PFCs	NO, NA	–	–	NO, NA
SF ₆	213 305	–	–	213 305
NF ₃	767	–	–	767
Total Annex A sources	48 817 388	–	–	48 817 388
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–19 374	–	–	–19 374
Deforestation	158 166	–	–	158 166
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 030 784	–	–	–3 030 784

Table II.5

Information to be included in the compilation and accounting database for 2015 for Switzerland(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	38 844 668	–	–	38 844 668
CH ₄	4 887 390	–	–	4 887 390
N ₂ O	2 997 601	–	–	2 997 601
HFCs	1 510 884	–	–	1 510 884
PFCs	25 546	–	–	25 546
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
SF ₆	261 352	–	–	261 352
NF ₃	730	–	–	730
Total Annex A sources	48 528 170	–	–	48 528 170
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–19 652	–	–	–19 652
Deforestation	156 904	–	–	156 904
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–3 156 982	–	–	–3 156 982

Table II.6

Information to be included in the compilation and accounting database for 2014 for Switzerland(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	39 349 849	–	–	39 349 849
CH ₄	4 913 369	–	–	4 913 369
N ₂ O	2 969 249	–	–	2 969 249
HFCs	1 471 898	–	–	1 471 898
PFCs	22 549	–	–	22 549
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF ₆	265 497	–	–	265 497
NF ₃	605	–	–	605
Total Annex A sources	48 993 015	–	–	48 993 015
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–18 068	–	–	–18 068
Deforestation	167 411	–	–	167 411
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–1 598 986	–	–	–1 598 986

Table II.7

Information to be included in the compilation and accounting database for 2013 for Switzerland(t CO₂ eq)

	<i>Original submission</i>	<i>Revised submission</i>	<i>Adjustment</i>	<i>Final value</i>
Annex A emissions				
CO ₂	43 304 814	–	–	43 304 814
CH ₄	4 919 657	–	–	4 919 657
N ₂ O	2 999 842	–	–	2 999 842
HFCs	1 434 302	–	–	1 434 302
PFCs	27 750	–	–	27 750
Unspecified mix of HFCs and PFCs	NA, NO	–	–	NA, NO
SF ₆	262 870	–	–	262 870
NF ₃	142	–	–	142
Total Annex A sources	52 949 377	–	–	52 949 377
Activities under Article 3, paragraph 3, of the Kyoto Protocol				
AR	–20 210	–	–	–20 210
Deforestation	182 906	–	–	182 906
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol				
FM	–2 967 312	–	–	–2 967 312

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

The only category for which an estimation method is included in the 2006 IPCC Guidelines that was reported as “NE” or for which the ERT otherwise determined that there may be an issue with the completeness of the reporting in the Party’s inventory is 5.D.1 domestic wastewater – CH₄ emissions from wastewater from inhabitants not connected to the public sewer system (see ID# W.5 in table 5).

Annex IV

Reference documents

A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2000. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. J Penman, D Kruger, I Galbally, et al. (eds.). Hayama: IPCC/Organisation for Economic Co-operation and Development/International Energy Agency/Institute for Global Environmental Strategies. Available at <https://www.ipcc.ch/publication/good-practice-guidance-and-uncertainty-management-in-national-greenhouse-gas-inventories/>.

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IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at <https://www.ipcc.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/>.

B. UNFCCC documents

Annual review reports

Reports on the individual reviews of the 2015, 2016, 2017 and 2019 annual submissions of Switzerland, contained in documents FCCC/ARR/2015/CHE, FCCC/ARR/2016/CHE, FCCC/ARR/2017/CHE and FCCC/ARR/2019/CHE, respectively.

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at https://unfccc.int/sites/default/files/resource/AGI_2021_Final%20Version.pdf.

Annual status report for Switzerland for 2021. Available at https://unfccc.int/sites/default/files/resource/asr2021_CHE.pdf.

C. Other documents used during the review

Responses to questions during the review were received from Michael Bock (FOEN), including additional material on the methodology and assumptions used. The following references may not conform to UNFCCC editorial style as some have been reproduced as received:

Bühlmann, T. 2014: Durch Stickstoffdeposition induzierte Emissionen von Stickoxiden und Lachgas aus (semi-)natürlichen Ökosystemen: Analyse der schweizerischen Situation mit Vorschlägen zur Umsetzung im Schweizerischen Emissionsinventar (Nitrogen oxide and nitrous oxide emissions from natural ecosystems induced by nitrogen deposition: Analysis of the Swiss situation with suggestions for Implementation in the Swiss emissions inventory. Bundesamt für Umwelt (BAFU). Bern; Switzerland [confidential/internal].

Bühlmann, T., Hiltbrunner, E., Körner, C., Rihm, B., Achermann, B. 2015: Induction of indirect N₂O and NO emissions by atmospheric nitrogen deposition in (semi-)natural ecosystems in Switzerland. *Atmospheric Environment*, 103 (0): 94-101.

Didion et al, 2020. Extending harmonized national forest inventory herb layer vegetation cover observations to derive comprehensive biomass estimates, *Forest Ecosystems* (2020) 7:16, <https://doi.org/10.1186/s40663-020-00230-7>. Available at: <https://forestecosyst.springeropen.com/articles/10.1186/s40663-020-00230-7> [23.03.2021].

- European Environment Agency, 2019. *EMEP/EEA air pollutant emission inventory guidebook 2019*. EEA Report No 13/2019. Luxembourg. Available online at: <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019>.
- FOEN 2006: Switzerland's Initial Report under Article 7, paragraph 4 of the Kyoto Protocol. Federal Office for the Environment, Bern. Including the Update following the UNFCCC review (FCCC/IRR/2007/CHE). <http://www.climate reporting.ch>.
- FOEN 2016: Switzerland's Second Initial Report under the Kyoto Protocol. Update following the in-country review by an expert review team coordinated by the UNFCCC secretariat. <http://www.climate reporting.ch>.
- Herold, et al. 2019: State and Change of Forest Resources. In: Fischer C, Traub B (eds) *Swiss National Forest Inventory – Methods and Models of the Fourth Assessment. Managing Forest Ecosystems*, vol 35. Springer International Publishing, Cham, pp 205-230. doi: 10.1007/978-3-030-19293-8_12. Available at: https://link.springer.com/chapter/10.1007%2F978-3-030-19293-8_12 [16.03.2021].
- Joss, A. 2020; Written communication on the subject of the sewage sludge incineration plants investigated in the PhD thesis by P. Wunderlin.
- Kupper 2017: Integration of nitrous oxide (N₂O), nitrogen oxides (NO_x) and diatomic nitrogen (N₂) emissions into N-flow models for the determination of ammonia emissions. Evaluation based on a literature review. Bern University of Applied Sciences, School of Agricultural, Forest and Food Sciences. Zollikofen; Switzerland. <https://agrammon.ch/assets/Documents/Bericht-N2O-NO-N2-in-Emissionsmodell-incl.-app.-subm-20170303.pdf> [26.03.2021].
- Kupper, T. et al, 2018: Ammoniakemissionen in der Schweiz: Neuberechnung 1990–2015. Prognose bis 2030 (*Ammonia emissions in Switzerland: recalculation 1990–2015. Forecast to 2030*). Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften. Zollikofen, Schweiz. <http://www.climate reporting.ch>.
- Meier, G. (2016): Praktikumsbericht (*Internship report*), FOEN: "Berechnung von Emissionsfaktoren bei der Klärschlammverbrennung (*Calculation of emission factors for sewage sludge incineration*)".
- Richner, W. et al. 2017: GRUD 2017: Grundlagen für die Düngung landwirtschaftlicher Kulturen in der Schweiz (*Principles of Fertilisation in Arable and Forage Crop Production in Switzerland*). Agroscope. Bern, Schweiz.
- Schleiss, K. 2017: Erhebung Schweizer Daten zu Mengen in der Kompostierung, im Auftrag des Bundesamtes für Umwelt (BAFU) (Collection of Swiss data on quantities in composting, on behalf of Federal Office for the Environment), Bern, 17.11.2017. <http://www.climate reporting.ch>.
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- Wüst-Galley, C., Keel, S. G., Leifeld, J. 2020: A model-based carbon inventory for Switzerland's mineral agricultural soils using RothC. Agroscope Science No. 105. Zürich. <https://doi.org/10.34776/as105e>.