Germany's Initial Report

under Article 7, Paragraph 4 of the Convention

Report on the Determination of the Assigned Amount

- Berlin, 27 December 2006 -

Imprint

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This report was drawn up as part of the work of the Single National Entity with overall responsibility for emissions reporting at the Federal Environment Agency.

Further information on greenhouse gas inventories and the emissions data in the Common Reporting Format (CRF) they contain is provided on the Internet site of the Federal Environment Agency: www.umweltbundesamt.de/emissionen/publikationen.htm

Introduction

Since 1994, as a Party to the *United Nations Framework Convention on Climate Change*, Germany has been required to prepare, publish and regularly update national inventories of greenhouse gas emissions. When the *Kyoto Protocol* entered into force in February 2005, it was the first time the international community had been obliged to set binding goals for action and create instruments for the implementation of global climate protection measures. This has given rise to far-reaching obligations with regard to the preparation, reporting and review of emissions inventories. As a result of the European implementation of the *Kyoto Protocol* with the adoption of *Decision 280/2004/EC*,[1] these requirements became legally binding on Germany in spring 2004.

Commission Decision 2005/166/EC[2] laid the foundations for the implementation of Decision .../CMP 1 Modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol at European level. These provisions were applied in the preparation of this report. In particular, it is necessary to report on the measures taken to satisfy the following requirements:

(a) the presentation of the complete inventories of emissions of greenhouse gases and removals by sinks;

(b) the identification of the base year for HFCs, PFCs and SF_6;

(c) the proposed figures for the determination of the assigned amounts of CO_2-equivalent emissions in the light of the provisions of the *Kyoto Protocol* and *EU Decision 2002/358/EC*;

(d) the calculation of the *Kyoto Protocol* commitment period reserve;

(e) the adoption of forestry definitions;

(f) the decision as to which of the measures set out in Article 3(4) of the *Kyoto Protocol* are to be used;

(g) the decision as to whether activities under Articles 3(3) and 3(4) of the *Kyoto Protocol* are to be accounted for annually or for the first commitment period as a whole;

(h) a description of the national system under Article 5(1) of the *Kyoto Protocol*;

(i) a description of the national registry in accordance with the guidelines on Article 7 of the *Kyoto Protocol*.

[1] *Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol*.
[2] *Commission Decision of 10 February 2005 laying down rules implementing Decision No 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol*.

1. Presentation of the complete inventories of emissions of greenhouse gases and removals by sinks

Annual reports on the greenhouse gas emissions inventories are drawn up in compliance with the existing European obligations (*Decision 280/2004/EC*). The complete inventories for Germany for the years since 1990 were forwarded to the Commission together with the National Inventory Report in February 2006. There are no plans to submit more extensive declarations and descriptions.

2. Identification of the base year for HFCs, PFCs and SF_6

In line with the specifications and options set out in *the Kyoto Protocol*, Germany's CO_2, CH_4 and N_2O emissions in 1990 and HFC, PFC and SF6 emissions in 1995 have been taken as the basis for the fulfilment of the reduction commitment.

3. Proposed figures for the determination of the assigned amounts in CO_2-equivalent emissions in the light of the provisions of the Kyoto Protocol *and* Decision 2002/358/EC

The emissions figures for the base year used as the basis for the calculations are attached in the form of a summary table as Appendix 1a. The assigned amounts were calculated in accordance with the provisions of the Kyoto Protocol.

Base year emissions:	**1,232,536.951**	**Gg ee**	**Total CO_2-equivalent emissions without land-use change and forestry**
	6,162,684.753	**Gg ee**	**Base year emissions times 5**
Assigned amounts:	**4,868,520.955**	**Gg ee**	**Assigned amounts reduced by 21 % reduction commitment due to EU burden-sharing agreement**

The total "assigned amounts" for the Federal Republic of Germany are calculated at **4,868,520.955 Gg** equivalent emissions.

4. Calculation of the Kyoto Protocol *commitment period reserve*

The "commitment period reserve" is found from the figure calculated for the assigned amounts:

Commitment period reserve:	**4,381,668.860**	**Gg ee**	**90 % of assigned amounts**

5. Adoption of forestry definitions

"The following forest definition has been adopted in conformity with the FAO forest definition:"

- Stocking level/tree crown cover: at least 10 %
- Minimum area: 0.1 ha
- Potential minimum height of trees: 5 metres

6. *Decision as to which of the measures set out in Article 3(4) of the* Kyoto Protocol *are to be implemented*

Germany has chosen to account for forest management under the elective activites of Article 3 (4) of the Kyoto Protocol.

7. *Decision as to whether activities under Articles 3(3) and 3(4) of the* Kyoto Protocol *are to be accounted for annually or for the first commitment period*

Germany intends to use entire commitment period accounting for the activities under Articles 3(3) and 3(4) of the Kyoto Protocol.

8. *Description of the national system under Article 5(1) of the* Kyoto Protocol

The description of the national system is attached as Appendix 2.

9. *Description of the national registry in accordance with the guidelines on Article 7 of the* Kyoto Protocol

The description of the national registry is attached as Appendix 3.

APPENDICES

Appendix 1a	Base year inventory
Appendix 1b	1990 inventory
Appendix 1c	1995 inventory
Appendix 2	Description of the national system
Appendix 3	Description of the national registry

Appendix 1a: Base year inventory

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS Germany

(Sheet 1 of 1) baseyear

2006

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [1]	**1.004.189,27**	**99.794,73**	**84.783,50**	**6.555,50**	**1.749,60**	**7.223,76**	**1.204.296,34**
1. Energy	**948.297,30**	**31.775,85**	**7.827,11**				**987.900,25**
A. Fuel Combustion (Sectoral Approach)	948.297,29	4.527,66	7.827,11				960.652,06
1. Energy Industries	416.934,61	176,24	4.530,34				421.641,19
2. Manufacturing Industries and Construction	152.737,44	235,95	1.574,05				154.547,45
3. Transport	162.486,47	1.285,25	671,65				164.443,38
4. Other Sectors	204.312,79	2.593,40	986,64				207.892,83
5. Other	11.825,99	236,81	64,42				12.127,22
B. Fugitive Emissions from Fuels	0,00	27.248,19	IE				27.248,20
1. Solid Fuels	NE	20.240,11	NO				20.240,11
2. Oil and Natural Gas	0,00	7.008,09	IE				7.008,09
2. Industrial Processes	**84.507,68**	**4,17**	**23.776,44**	**6.555,50**	**1.749,60**	**7.223,76**	**123.817,14**
A. Mineral Products	22.973,09	NE	NE				22.973,09
B. Chemical Industry	11.822,65	0,25	23.776,44	NO	NO	NO	35.599,34
C. Metal Production	49.711,94	3,92	NO		1.551,70	197,10	51.464,66
D. Other Production	NO						0,00
E. Production of Halocarbons and SF_6				4.218,50	0,00	167,30	4.385,80
F. Consumption of Halocarbons and SF_6				2.337,00	197,90	6.859,35	9.394,25
G. Other	NO	NO	NO	NO	NO	NO	NO
3. Solvent and Other Product Use	**NE**		**2.088,54**				**2.088,54**
4. Agriculture	**IE**	**29.823,60**	**48.478,74**				**78.302,34**
A. Enteric Fermentation		24.424,26					24.424,26
B. Manure Management		6.071,37	4.127,65				10.199,02
C. Rice Cultivation		NO					NO
D. Agricultural Soils [2]	IE	-672,04	44.351,09				43.679,06
E. Prescribed Burning of Savannas		NO	NO				NO
F. Field Burning of Agricultural Residues		NO	NO				NO
G. Other		NO	NO				NO
5. Land-Use Change and Forestry [1]	**-28.615,71**	**NE**	**375,10**				**-28.240,61**
6. Waste	**NE**	**38.191,11**	**2.237,57**				**40.428,68**
A. Solid Waste Disposal on Land	NE	35.964,89					35.964,89
B. Wastewater Handling		2.226,21	2.223,53				4.449,74
C. Waste Incineration	NO	NO	NO				NO
D. Other	NO	NO	14,04				NO
7. Other *(please specify)* ...	NO	NO	NO	NO	NO	NO	NO
							NO
Memo Items:							
International Bunkers	**19.569,19**	**18,51**	**137,04**				**19.724,74**
Aviation	11.589,36	3,29	72,83				11.665,48
Marine	7.979,83	15,22	64,21				8.059,27
Multilateral Operations	**NE**	**NE**	**NE**				**NE**
CO_2 Emissions from Biomass	**7.564,26**						**7.564,26**

[1] For CO_2 emissions from Land-Use Change and Forestry the net emissions are to be reported. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).

[2] See footnote 4 to Summary 1.A of this common reporting format.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 removals	Net CO_2 emissions / removals	CH_4	N_2O	Total emissions
Land-Use Change and Forestry	CO_2 equivalent (Gg)					
A. Changes in Forest and Other Woody Biomass Stocks	IE	IE	IE			IE
B. Forest and Grassland Conversion	IE		IE	NE	NE	IE
C. Abandonment of Managed Lands	IE	IE	IE			IE
D. CO_2 Emissions and Removals from Soil	IE	IE	IE			IE
E. Other	IE	IE	IE	NO	NO	IE
Total CO_2 Equivalent Emissions from Land-Use Change and Forestry	IE	IE	-28.615,71	NE	375,10	-28.240,61

Total CO_2 Equivalent Emissions without Land-Use Change and Forestry [a]	1.232.536,95
Total CO_2 Equivalent Emissions with Land-Use Change and Forestry [a]	1.204.296,34

[a] The information in these rows is requested to facilitate comparison of data, since Parties differ in the way they report emissions and removals from Land-Use Change and Forestry. Note that these totals will differ from the totals reported in Table 10s5 if Parties report non-CO2 emissions from LUCF.

Appendix 1b: 1990 inventory

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS Germany

(Sheet 1 of 1) 1990

2005

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [1]	**1.004.189,27**	**99.794,73**	**84.783,50**	**4.368,78**	**2.707,58**	**4.785,03**	**1.200.628,88**
1. Energy	**948.297,30**	**31.775,85**	**7.827,11**				**987.900,25**
A. Fuel Combustion (Sectoral Approach)	948.297,29	4.527,66	7.827,11				960.652,06
1. Energy Industries	416.934,61	176,24	4.530,34				421.641,19
2. Manufacturing Industries and Construction	152.737,44	235,95	1.574,05				154.547,45
3. Transport	162.486,47	1.285,25	671,65				164.443,38
4. Other Sectors	204.312,79	2.593,40	986,64				207.892,83
5. Other	11.825,99	236,81	64,42				12.127,22
B. Fugitive Emissions from Fuels	0,00	27.248,19	IE				27.248,20
1. Solid Fuels	NE	20.240,11	NO				20.240,11
2. Oil and Natural Gas	0,00	7.008,09	IE				7.008,09
2. Industrial Processes	**84.507,68**	**4,17**	**23.776,44**	**4.368,78**	**2.707,58**	**4.785,03**	**120.149,67**
A. Mineral Products	22.973,09	NE	NE				22.973,09
B. Chemical Industry	11.822,65	0,25	23.776,44	NO	NO	NO	35.599,34
C. Metal Production	49.711,94	3,92	NO		2.489,41	188,81	52.394,08
D. Other Production	NO						0,00
E. Production of Halocarbons and SF_6				4.329,00	80,11	119,50	4.528,61
F. Consumption of Halocarbons and SF_6				39,78	138,06	4.476,72	4.654,55
G. Other	NO	NO	NO	NO	NO	NO	NO
3. Solvent and Other Product Use	**NE**		**2.088,54**				**2.088,54**
4. Agriculture	**IE**	**29.823,60**	**48.478,74**				**78.302,34**
A. Enteric Fermentation		24.424,26					24.424,26
B. Manure Management		6.071,37	4.127,65				10.199,02
C. Rice Cultivation		NO					NO
D. Agricultural Soils[2]	IE	-672,04	44.351,09				43.679,06
E. Prescribed Burning of Savannas		NO	NO				NO
F. Field Burning of Agricultural Residues		NO	NO				NO
G. Other		NO	NO				NO
5. Land-Use Change and Forestry[a]	**-28.615,71**	**NE**	**375,10**				**-28.240,61**
6. Waste	**NE**	**38.191,11**	**2.237,57**				**40.428,68**
A. Solid Waste Disposal on Land	NE	35.964,89					35.964,89
B. Wastewater Handling		2.226,21	2.223,53				4.449,74
C. Waste Incineration	NO	NO	NO				NO
D. Other	NO	NO	14,04				NO
7. **Other *(please specify)*** ...	NO	NO	NO	NO	NO	NO	NO
							NO
Memo Items:							
International Bunkers	**19.569,19**	**18,51**	**137,04**				**19.724,74**
Aviation	11.589,36	3,29	72,83				11.665,48
Marine	7.979,83	15,22	64,21				8.059,27
Multilateral Operations	**NE**	**NE**	**NE**				**NE**
CO_2 Emissions from Biomass	**7.564,26**						**7.564,26**

[1] For CO_2 emissions from Land-Use Change and Forestry the net emissions are to be reported. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).

[2] See footnote 4 to Summary 1.A of this common reporting format.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 removals	Net CO_2 emissions / removals	CH_4	N_2O	Total emissions
Land-Use Change and Forestry	CO_2 equivalent (Gg)					
A. Changes in Forest and Other Woody Biomass Stocks	IE	IE	IE			IE
B. Forest and Grassland Conversion	IE		IE	NE	NE	IE
C. Abandonment of Managed Lands	IE	IE	IE			IE
D. CO_2 Emissions and Removals from Soil	IE	IE	IE			IE
E. Other	IE	IE	IE	NO	NO	IE
Total CO_2 Equivalent Emissions from Land-Use Change and Forestry	IE	IE	-28.615,71	NE	375,10	-28.240,61

Total CO_2 Equivalent Emissions without Land-Use Change and Forestry [a]	1.228.869,49
Total CO_2 Equivalent Emissions with Land-Use Change and Forestry [a]	1.200.628,88

[a] The information in these rows is requested to facilitate comparison of data, since Parties differ in the way they report emissions and removals from Land-Use Change and Forestry. Note that these totals will differ from the totals reported in Table 10s5 if Parties report non-CO2 emissions from LUCF.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS Germany

(Sheet 1 of 1) 1995

2005

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [1]	**888.618,21**	**81.748,37**	**77.682,96**	**6.555,50**	**1.749,60**	**7.223,76**	**1.063.578,39**
1. Energy	**839.508,52**	**23.967,49**	**7.097,49**				**870.573,50**
A. Fuel Combustion (Sectoral Approach)	839.508,52	1.688,21	7.097,49				848.294,22
1. Energy Industries	356.637,03	126,00	3.866,20				360.629,23
2. Manufacturing Industries and Construction	111.833,36	120,02	1.059,37				113.012,75
3. Transport	176.676,87	649,23	1.502,06				178.828,16
4. Other Sectors	190.399,58	776,71	644,34				191.820,64
5. Other	3.961,69	16,24	25,52				4.003,45
B. Fugitive Emissions from Fuels	IE	22.279,28	IE				22.279,28
1. Solid Fuels	NE	14.742,98	NO				14.742,98
2. Oil and Natural Gas	0,00	7.536,30	IE				7.536,30
2. Industrial Processes	**80.646,42**	**2,41**	**25.277,87**	**6.555,50**	**1.749,60**	**7.223,76**	**121.455,55**
A. Mineral Products	23.169,45	NE	NE				23.169,45
B. Chemical Industry	12.661,76	0,21	25.277,87	NO	NO	NO	37.939,84
C. Metal Production	44.815,21	2,20	NO		1.551,70	197,10	46.566,21
D. Other Production	NO						0,00
E. Production of Halocarbons and SF_6				4.218,50	0,00	167,30	4.385,80
F. Consumption of Halocarbons and SF_6				2.337,00	197,90	6.859,35	9.394,25
G. Other	NO	NO	NO	NO	NO	NO	NO
3. Solvent and Other Product Use	**NE**		**1.672,86**				**1.672,86**
4. Agriculture	**IE**	**25.865,94**	**40.963,15**				**66.829,08**
A. Enteric Fermentation		20.954,01					20.954,01
B. Manure Management		5.562,02	2.918,96				8.480,98
C. Rice Cultivation		NO					NO
D. Agricultural Soils [2]	IE	-650,09	38.044,19				37.394,10
E. Prescribed Burning of Savannas		NO	NO				NO
F. Field Burning of Agricultural Residues		NO	NO				NO
G. Other		NO	NO				NO
5. Land-Use Change and Forestry [1]	**-31.536,73**	**NE**	**375,10**				**-31.161,63**
6. Waste	**NE**	**31.912,53**	**2.296,50**				34.209,03
A. Solid Waste Disposal on Land	NE	31.024,72					31.024,72
B. Wastewater Handling		887,81	2.187,97				3.075,77
C. Waste Incineration	NO	NO	NO				NO
D. Other	NO	NO	108,53				NO
7. Other *(please specify)* ...	NO	NO	NO	NO	NO	NO	NO
							NO
Memo Items:							
International Bunkers	**20.420,40**	**16,41**	**139,84**				**20.576,65**
Aviation	13.887,08	3,94	87,26				13.978,28
Marine	6.533,32	12,47	52,58				6.598,37
Multilateral Operations	**NE**	**NE**	**NE**				**NE**
CO_2 Emissions from Biomass	**7.033,40**						**7.033,40**

[1] For CO_2 emissions from Land-Use Change and Forestry the net emissions are to be reported. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).

[2] See footnote 4 to Summary 1.A of this common reporting format.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 emissions	CO_2 removals	Net CO_2 emissions / removals	CH_4	N_2O	Total emissions
Land-Use Change and Forestry	CO_2 equivalent (Gg)					
A. Changes in Forest and Other Woody Biomass Stocks	IE	IE	IE			IE
B. Forest and Grassland Conversion	IE		IE	NE	NE	IE
C. Abandonment of Managed Lands	IE	IE	IE			IE
D. CO_2 Emissions and Removals from Soil	IE	IE	IE			IE
E. Other	IE	IE	IE	NO	NO	IE
Total CO_2 Equivalent Emissions from Land-Use Change and Forestry	IE	IE	-31.536,73	NE	375,10	-31.161,63

Total CO_2 Equivalent Emissions without Land-Use Change and Forestry [a]	1.094.740,02
Total CO_2 Equivalent Emissions with Land-Use Change and Forestry [a]	1.063.578,39

[a] The information in these rows is requested to facilitate comparison of data, since Parties differ in the way they report emissions and removals from Land-Use Change and Forestry. Note that these totals will differ from the totals reported in Table 10s5 if Parties report non-CO2 emissions from LUCF.

Appendix 2

NaSE - National System of Emissions Inventories

Report on the Establishment of the National System

under Article 5(1) of the Kyoto Protocol in Germany

Federal Environment Agency

- Dessau, 17 January 2006 -

Contact details

This report was drawn up as part of the work of the Single National Entity with overall responsibility for emissions reporting at the Federal Environment Agency.

Further information on greenhouse gas inventories and the emissions data in the Common Reporting Format (CRF) they contain is provided on the Internet site of the Federal Environment Agency: www.umweltbundesamt.de/emissionen/publikationen.htm

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0 SUMMARY

Since 1994, as a Party to the *United Nations Framework Convention on Climate Change*, Germany has been required to prepare, publish and regularly update national inventories of greenhouse gas emissions. When the *Kyoto Protocol* entered into force in February 2005, it was the first time the international community had been obliged to set binding goals for action and create instruments for the implementation of global climate protection measures. This has given rise to far-reaching obligations with regard to the preparation, reporting and review of emissions inventories. As a result of the European implementation of the *Kyoto Protocol* with the adoption of *Decision 280/2004/EC*,[3] these requirements became legally binding on Germany in spring 2004.

The requirements to be satisfied are not limited solely to the preparation of inventories, but encompass the whole process, from data collection to reporting, archiving and the activities accompanying inventory reviews. At the same time, quality management and the continuing improvement of the inventories have a special role to play. In this connection, it is obligatory to establish a national system for the calculation of anthropogenic emissions of all greenhouse gases not regulated by the *Montreal Protocol* from sources and the removal of such gases by sinks (Article 5[1] of the *Kyoto Protocol* and Article 4[2] of *EU Decision 280/2004/EC*).

As a matter of principle, a national system should facilitate the high-quality reporting[4] of emissions of anthropogenic greenhouse gases, in which respect it should take particular account of the following aspects:

- the legal, institutional and procedural arrangements for the preparation of a national inventory in compliance with the principles of transparency, consistency, comparability, completeness and accuracy;
- the provision of sufficient resources for the performance of all functions; and
- a Single National Entity with overall responsibility for the national inventory.

This report describes the existing National System of Emissions Inventories (NaSE) in Germany. It documents the fulfilment of the requirements to which Germany is subject and provides information about the specific national features of the implementation of international standards as well as further plans for the improvement of the system.

The institution responsible for preparing the inventories is the Federal Environment Agency (UBA). The institutional responsibility of the Federal Environment Agency as the national agency charged with coordinating emissions reporting is regulated by an in-house order on the basis of the Agency's responsibilities for emissions reporting and the performance of the functions of the Single National Entity by Section I 4.6. Furthermore, this position is to be placed on a statutory basis in 2006 by the planned *Act on Climate-Protection Statistics* (*KSSG*). The functions of the Single National Entity include the planning, preparation and archiving of the inventories and their description in the inventory reports as well as quality control and assurance during all relevant stages of the process.

[3] *Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol*.

[4] According to the specifications set out in *-/CMP.1. Guidelines for national systems for the estimation of anthropogenic green house gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol*, which is attached as an annex to *Decision 20/CP.7* in *Document FCCC/CP/2001/13/Add.3*.

For the purposes of quality assurance, a dedicated Quality System for Emissions Inventories (QSE) has been introduced that has been institutionalised within the Federal Environment Agency by an in-house order. It encompasses the processes required within the Federal Environment Agency in order to facilitate the continuous quality improvement of the greenhouse gas emissions inventories. This involves the definition of responsibilities and quality targets with regard to the selection of methods, data collection, the calculation of emissions and the determination of uncertainties, as well as the recording of the quality checks carried out and their results (confirmation that a target has been met or, where targets have not been met, specification of the measures planned to remedy this in future). The quality control procedures have been developed with the involvement of external experts in accordance with the guidelines of the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* issued by the Intergovernmental Panel on Climate Change (below: *IPCC Good Practice Guidance*), with particular consideration being given to the organisational structures of the Federal Environment Agency and general aspects of quality assurance. Other authorities, institutions and inventory experts will be involved in quality management by the *Act on Climate-Protection Statistics* planned for 2006.

The data sources used for the inventories have been selected with due regard to the following aspects:

- long-term availability;
- the institutionalisation of data provision;
- good documentation;
- the performance of quality control and quality assurance (QC/QA) measures by data providers;
- the identification of uncertainties;
- the representativeness of the data; and
- the completeness of the data to be expected.

The *Act on Climate-Protection Statistics* planned for 2006 will provide for arrangements with regard to source and sink categories in which these criteria are fulfilled either insufficiently or not at all that will improve existing data sources or make new sources available for the first time and result in the collection of important data that are not currently available.

Hitherto, the official discussion and approval of inventories for the purposes of quality assurance have been undertaken by means of interministerial coordination between all the federal ministries concerned, with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety taking on the lead role in this process. Under the *Act on Climate-Protection Statistics* that is planned for 2006, this function will be performed by a body to be created for this purpose. To date, quality assurance measures involving public scientific debate have been implemented on one occasion by means of a workshop on the National System. This instrument proved to be very successful and should continue to be used in future.

1 INTRODUCTION

The world's states were quick to recognise that the temperature changes to be expected would pose threats to ecosystems and human civilisation because these changes would take place relatively quickly, and existing systems would not be able to adapt to the new climatic conditions without suffering damage.

The *Framework Convention on Climate Change* was adopted at Rio de Janeiro in 1992 by nearly all the nations of the world. Since 1994, the countries listed in Annex I of the Framework Convention on Climate Change have been required to submit annual inventories of the six greenhouse gases, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6), to the Secretariat of the Framework Convention on Climate Change for 15 April of each year. These inventories must include data on emissions and sinks for the base year (1990 for CO_2, N_2O and CH_4; 1995 for HFCs, PFCs and SF_6) and for all years up to the year prior to the preparation of the report.

Legally binding obligations concerning the limitation and reduction of emissions were defined for the first time at the Third Conference of the Parties to the Climate Change Convention in Kyoto. Under the *Kyoto Protocol*, the industrialised nations are required to reduce their emissions of the six greenhouse gases by an average of 5.2 percent by 2012. Within the framework established by the *Kyoto Protocol*, the European Union has made a commitment to reduce its greenhouse gas emissions by 8% compared to 1990 by the 2008-2012 period. Within the EU, this commitment has been apportioned between the Member States by means of a burden-sharing arrangement,[5] under which Germany is called upon to make a substantial contribution with a 21 % reduction in emissions compared to the base year. In consequence, the measures taken by Germany in this area and its calculations relating to reductions in emissions are being followed with considerable interest.

The effectiveness of the *Kyoto Protocol* as a means of reducing global greenhouse gas emissions will depend on two critical factors: whether the Parties abide by the rules of the *Protocol* and meet their obligations, and whether the emissions data used to control compliance are reliable. National reporting and the subsequent international review of emissions inventories therefore have a key role to play.

Article 5(1) of the *Kyoto Protocol* requires the establishment of national systems for the preparation of greenhouse gas inventories. Under this provision, the industrialised states (Annex I countries) have committed themselves to establish national systems that can be used for the determination of greenhouse gas emissions from sources and the removal of greenhouse gases by sinks by 2007 at the latest. As a result of the *Decision of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol* (*Decision 280/2004/EC),* Germany was also obliged to create national inventory systems under the *Kyoto Protocol* by 31 December 2005 at the latest.

[5] Adopted by *Council Decision 2002/358/EC*.

The *Guidelines for National Systems* (*UNFCCC Decision 20/CP.7*) define the requirements for national systems that are to be complied with under the *Kyoto Protocol* and *Decision 280/2004/EC* (the original wording can be found in Annex: *Guidelines for National Systems*).

The main requirements placed on national systems are set out in Chapter 2. Chapter 3 describes how these requirements have been satisfied in Germany.

2 REQUIREMENTS WITH REGARD TO NATIONAL SYSTEMS

2.1 Requirements under the *Kyoto Protocol*

The purpose of national systems is to ensure, by means of continual quality management and ongoing inventory improvement, the extensive application of the methodological provisions of the *IPCC Guidelines* and the *IPCC Good Practice Guidance*. These systems comprise all the institutional, legal and procedural facilities and agreements that have been put in place in Annex 1 countries under the *Framework Convention on Climate Change* for the calculation and reporting of emissions, as well as the archiving of all inventory information.

The National System

A national system should involve all state institutions that are capable of making highly competent contributions to the preparation of emissions inventories.

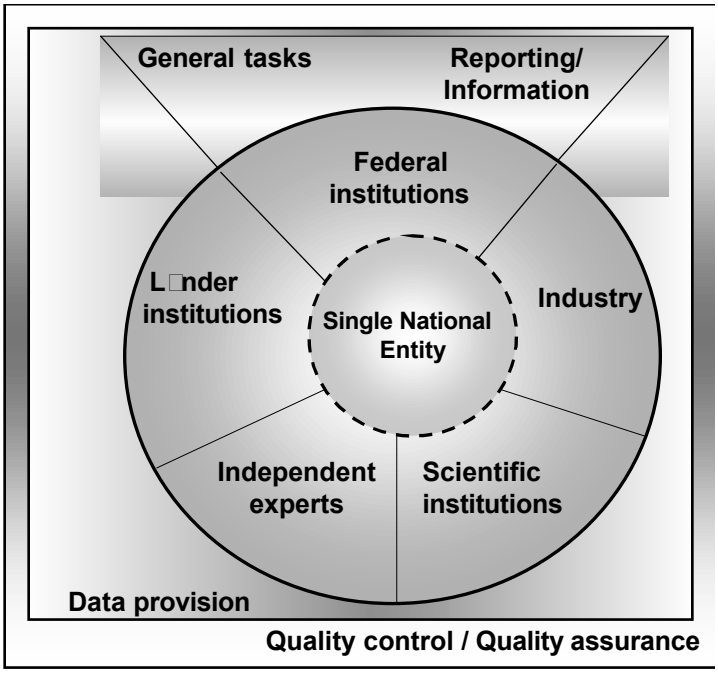

Figure 1: Functions of the German National System and institutions to be involved

A national system should involve all state institutions that are capable of making highly competent contributions to the preparation of emissions inventories. It is necessary for the following functions to be performed:

- the establishment of a Single National Entity to coordinate emissions reporting
  - as a central point of contact,
  - to put in place a framework for inventory planning,
  - to ensure the flow of information and
  - to coordinate the review process;
- the establishment/documentation of
  - institutional facilities,
  - legal agreements and
  - procedures for the calculation and reporting of emissions;
- the archiving of all inventory information; and
- the initiation of measures to improve emissions inventories (incl. QC/QA).

The States Parties are allowed extensive scope for discretion with regard to the specific form in which their national systems are institutionalised. Table 1 gives an overview of the functions it is necessary to ensure are performed and the institutions to be involved in the implementation of the German National System.

2.2 Requirements under *Decision 280/2004/EC*

Article 4(2) of *Decision 280/2004/EC* regulates the establishment of a Community inventory system. According to this provision, the Commission shall, "in accordance with the procedure referred to in Article 9(2), and taking into account the national systems of the Member States, adopt by 30 June 2006 at the latest, a Community inventory system for ensuring the accuracy, comparability, consistency, completeness and timeliness of national inventories with regard to the Community greenhouse gas inventory." This system should encompass "a quality assurance/quality control programme including the establishment of quality targets and an inventory quality assurance and control plan. The Commission shall provide assistance to Member States for the implementation of quality assurance/quality control programmes." Furthermore, the system should include "a procedure for the estimation of data missing from a national inventory, including consultation with the Member State concerned." This means the Commission is also able to independently compensate for quality deficiencies in the national inventories of its Member States by means of defined procedures.

Paragraph 4 also places obligations on the Member States: "Member States shall, as early as possible and in any case by 31 December 2005 at the latest, establish national inventory systems under the Kyoto Protocol for the estimation of anthropogenic emissions of greenhouse gases by sources and removals of carbon dioxide by sinks."

2.3 Requirements with regard to quality control and assurance systems

Essentially, the requirements with regard to quality control and quality assurance measures are defined by the *IPCC Good Practice Guidance* and the results of the independent reviews of the inventories.

2.3.1 Quality control

According to the definition given in the *IPCC Good Practice Guidance*, quality control measures (QC measures) comprise a system of regular quality controls and measurements of the inventory intended to ensure that

- the data are characterised by their integrity, correctness and completeness;
- errors and omissions are identified and addressed;
- all data are documented and archived; and
- all quality control activities are recorded.

By analogy to the methods for the determination of the emissions from source categories, which are differentiated into various "approaches" by the *IPCC Good Practice Guidance* (Tier 1: basic approach; Tier 2, Tier 3: more detailed approaches), there is also a corresponding differentiation in the field of quality control:

- Tier 1 QC measures are (general) measures to be carried out on a routine basis.
- Tier 2 QC measures are source category-specific measures that differ between the individual source categories as appropriate.

2.3.2 Quality assurance

The IPCC understands quality assurance (QA) as review procedures that are to be carried out by independent third parties. The purpose of these independent reviews is to ensure that

- the quality of the data corresponds to the quality targets that have been set;
- the inventory sets out the best-possible estimates of emissions and sinks, given the current state of scientific knowledge and the data available;
- the effectiveness of the quality control activities is supported and improved.

2.3.3 IPCC requirements with regard to QC/QA systems

The main elements of a QC/QA system that satisfies the minimum requirements of the *IPCC Good Practice Guidance* (see Chapter 8.3 of IPCC GPG) are:

- the designation of an inventory agency to coordinate the QC/QA system;
- the implementation of an organisational structure with clearly regulated responsibilities and powers;
- the preparation of, and adherence to, a QC/QA plan;
- the introduction and description of the requisite general and source category-specific QC procedures (Tier 1 + Tier 2);
- the introduction and description of the necessary internal and external QA procedures (independent reviews, audits);
- the definition of recording, documentation and reporting duties and the introduction of a procedure for the management of documents;
- procedures for the control, evaluation and modification of the QC/QA system for the purpose of continuous improvement;
- the documentation of the system in a suitable form (manual, handbook, instructions).

3 THE NATIONAL SYSTEM OF EMISSIONS INVENTORIES

Germany began taking the necessary steps for the establishment of its National System of Emissions Inventories (NaSE) in 2002. It has been designed to function as a network of all federal and Länder institutions, research institutes, associations and organisations that are capable of assisting in the improvement of the inventory calculations. The System also takes account of the requirements imposed by Germany's reporting duties under the *UNECE Geneva Convention on Long-range Transboundary Air Pollution* and its protocols, as well as the EU *NEC Directive*.

The following Chapters describe the German Single National Entity with overall responsibility for emissions reporting (see Chapter 3.2), the instruments for the implementation of the general requirements placed on national systems (see Chapter 3.3) and the institutional and legal arrangements that have been put in place (see Chapter 3.4). The details of the quality control and quality assurance procedures are set out in Chapter 3.5. In order to convey a better understanding of the organisation of the National System, these accounts are preceded by a brief description of the inventory preparation process (see Chapter 3.1). A source category-specific overview of the contributors to the National System is found in Annex: Further information on the preparation of inventories.

3.1 Inventory preparation process

Emissions' reporting is a process that is carried out regularly each year. Since it is conducted by a range of parties on a decentralised basis, the measures taken can vary widely between different parts of the inventory. The process was therefore investigated and analysed thoroughly in 2003 prior to the introduction of the QSE. It can be divided up into the main processes listed below:

- the definition of the basis for the calculations;
- data collection;
- data preparation and emissions calculation; and
- reporting.

These main processes can be subdivided into subprocesses (see Figure 2). The inventory preparation process is coordinated closely with the preparation of the National Inventory Report and the performance of quality assurance procedures.

It has proved to be the case that the procedure used for inventory planning and preparation can have a major impact on the quality of the inventories, so the sequence in which activities are carried out is not insignificant for the quality of the inventory. Appropriate QC/QA measures have therefore been assigned to each subprocess, not just in order to examine the end quality of the inventory data when quality checks are carried out, but also to ensure the results of each check are always viewed in the context of its position in the process chain. This also makes it possible for periodic internal evaluations of the inventory preparation process under Paragraph 15(d) of the *Guidelines for National Systems* to be conducted easily.

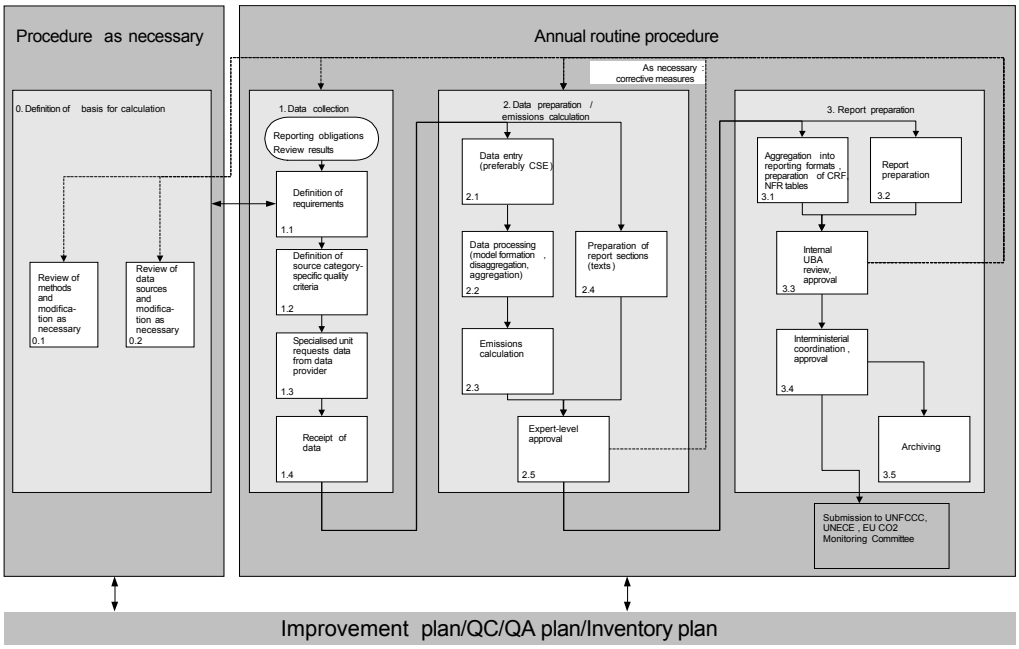

Figure 2: Chart showing the overall emissions reporting process

A more precise description of the procedure followed when inventories are prepared is given in Annex: Further information on the preparation of inventories. This procedure, including QC/QA measures, meets the requirements with regard to the preparation of inventories set out in Paragraphs 14(a) to (f) of the *Guidelines for National Systems*.

3.2 Single National Entity

The inventories are prepared under the leadership of the Single National Entity with overall responsibility for the National System of Emissions Inventories. The Single National Entity, the designation of which is required by Paragraphs 10(c) and 12(a) of the *Guidelines for National Systems*, is Section I 4.6 of the Federal Environment Agency. This arrangement is regulated by *Federal Environment Agency In-House Order 11/2005* (see Chapter 3.4.2), and corresponding provisions have also been included in the draft of the planned *Act on Climate-Protection Statistics* (see Chapter 3.4.4).

The submission of this report fulfils the obligation to make the postal and electronic addresses of the national entity responsible for the inventory publicly available as laid down in Paragraph 12(b) of the *Guidelines for National Systems*:

Single National Entity
FG I 4.6
Federal Environment Agency
Wörlitzer Platz 1
06844 Dessau, Germany

www.umweltbundesamt.de/emissionen/publikationen.htm

The Single National Entity serves as a central point of contact, coordinating and informing all participants in the National System. During 2003-05, the Single National Entity made it a priority to develop new sources of data and identify new institutional facilities to be incorporated into the National System. Among other things, this was done through a workshop on the National System held at the end of 2004 (see Chapter 3.4.6). Other significant work related to the introduction of the Quality System for Emissions Inventories (see Chapter 3.5) and action to push ahead with the institutionalisation of the *National System* (see Chapter 3.4).

3.3 Institutions involved in the National System

Apart from the Single National Entity, the institutions involved in the National System include the Quality System for Emissions Inventories (QSE), which is used for the administration of quality control and assurance activities and the Central System for Emissions Data (CSE), which is the central, national database for the calculation and reporting of emissions.

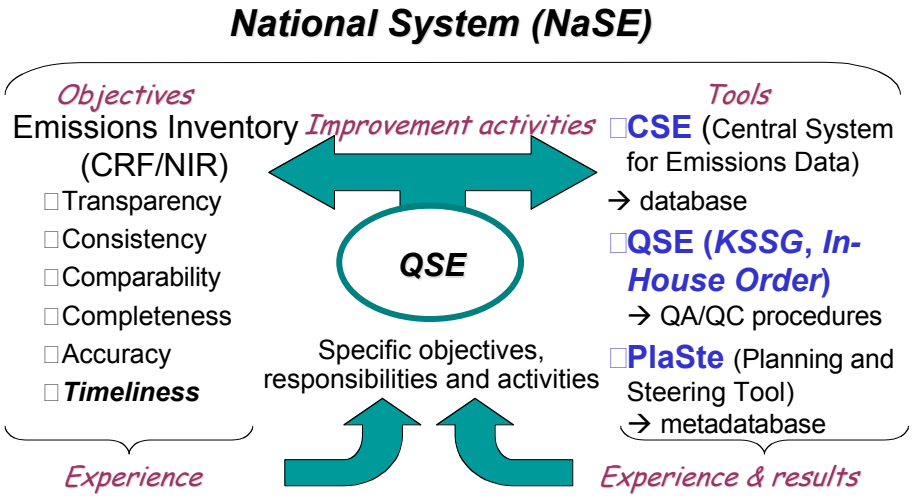

Figure 3: Objectives and instruments of the National System

The Federal Environment Agency's Central System for Emissions Data (CSE) database is used for the central storage of all information required in the calculation of emissions (methods, activity rates, emission factors). The CSE is the main documentation and quality assurance instrument at the data level.

The QSE is described in detail in Chapter 3.5. A searchable Access database – the Planning and Steering Tool (PlaSte) serves as the main instrument for performance monitoring within the QSE. PlaSte stores all national tabular QC/QA documents (QC/QA plan, checklists, lists of responsible staff, etc.). In addition to this, it contains all the tabular correspondence on the inventory reviews since the 2004 reporting year, including German responses.

Figure 3 shows how these instruments interact when quality measures are being implemented during the preparation of inventories.

3.4 Institutional and legal arrangements

It was possible for decisive progress to be made in 2005 with regard to the institutionalisation of the *National System* in Germany. This came in the form of an in-house order of the Federal Environment Agency (see Chapter 3.4.2), the ministerial draft of the *Act on Climate-Protection Statistics* (see Chapter 3.4.4) and a draft standard text for agreements between the Single National Entity and non-governmental organisations (see Chapter 3.4.5).

3.4.1 Working Group on Emissions Inventories

The work of the Single National Entity – particularly on emission factors – is supported to a significant extent by other organisational units within the Federal Environment Agency. In this respect, the first step has always been to draw up an in-house solution for all arrangements that are required, which is then intended to serve as a model that can be applied to the whole National System.

A Working Group on Emissions Inventories was established in 2003 to coordinate the work done within the Federal Environment Agency. Since then, all Federal Environment Agency personnel concerned with the preparation of inventories have been involved through this body. Apart from events held by the Working Group, the information they need is also made available via an Intranet page on emissions reporting.

3.4.2 Federal Environment Agency In-House Order 11/2005

In 2005, the Federal Environment Agency used *In-House Order 11/2005* to establish the Quality System for Emissions Inventories within the Federal Environment Agency, creating the necessary framework for compliance with good inventory practice and the performance of routine quality assurance. It is structured in accordance with the requirements of the *IPCC Good Practice Guidance* and adapted to national circumstances in Germany as well as the internal structures and procedures of the Federal Environment Agency as a reporting institution. *In-House Order 11/2005* defines binding arrangements with regard to the assignment of responsibilities within the Federal Environment Agency, the sequence of deadlines for the individual stages in the preparation of inventories and the quality control and assurance checks to be carried out. The original wording can be found in Annex: *Federal Environment Agency In-House Order 11/2005*.

The *In-House Order* laid down the institutional and procedural arrangements required under Paragraph 10(a) of the *Guidelines for National Systems* and the definition of specific responsibilities required under Paragraph 12(c) at the Agency level. The provision of sufficient capacities for timely performance to be ensured under Paragraph 10(b) could only be addressed indirectly with the instrument of an in-house order and only to a certain extent by setting priorities.

3.4.3 Budgetary title, environmental research projects and Federal Environment Agency product planning

The expertise of research institutions is incorporated into the preparation of the inventories by means of research and development projects conducted under the environmental research plan (UFOPLAN). This is done through work on specific issues and general projects, which primarily help to harmonise the individual results for the overall inventory as well as identifying omissions or filling in gaps in incomplete lists of emission-relevant activities. Since the 2002 UFOPLAN, the Single National Entity has been operating a framework project on the *Updating of Emissions Calculation Methods* with the aim of initiating measures for the continuous improvement of its inventories. Individual measures to improve inventories are initiated and financed by means of the establishment of subprojects.

The average length of time required for a project commissioned through UFOPLAN from the identification of the problem (project initiation) to its solution (acceptance of final report) is currently 3.5 years. However, as the inventories are reviewed annually by independent experts at the FCCC Secretariat, and since improvements in response to deficiency reports need to be set in train promptly, it is necessary to take action within a year when priority deficiencies are remedied. For this reason, a separate budgetary title for the National System was established within the Federal Environment Agency in 2005 (Title 526 02, Chapter 1605, No. 4.15) in addition to the funding allocated for research. This title can be used to fund short-term projects commissioned to improve the inventories for which the Agency is responsible.

It has at least been possible to make temporary use of product planning, an instrument that is relevant for capacity planning, to provide additional resources within the Federal Environment Agency for the performance of the work required when inventories are being prepared. Overall, however, it is to be noted that the resources made available within the Federal Environment Agency through UFOPLAN, the budgetary title and product planning have not as yet been sufficient to ensure the provision of sufficient capacities for timely performance, as required by Paragraph 10(b) of the *Guidelines for National Systems*, during the establishment of the National System.

In this connection, it has to be pointed out that, to date, resources of this kind have been made available almost exclusively within the Federal Environment Agency – hitherto, other supporting institutions have not paid the necessary attention to the question of the provision of resources. On the whole, the likelihood that adequate resources will be provided in good time can only be assessed as rather poor at a time of ever greater staffing cutbacks.

3.4.4 Planned Act on Climate-Protection Statistics

With the *framework interministerial agreement* of 2 April 2001 between the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) on the exchange of data and information and the operation of a joint database of emissions from agriculture, a first interministerial agreement regarding cooperation on the calculation of emissions was concluded. As this agreement was no longer considered to be adequate, even for the exchange of data between the two ministries in question, and no comparable agreements had been put in place with other federal authorities, a ministerial draft for the planned *Act on*

Climate-Protection Statistics (*KSSG*) was drawn up in 2005. This legislation is intended to involve other German authorities in the National System.

The definition of ministerial responsibilities planned under the *Act on Climate-Protection Statistics* is intended to ensure interministerial cooperation on all source and sink categories in future. Specifications concerning the minimum extent of QC/QA activities, the implementation of which should be specific to each authority, are set out in accordance with the *IPCC Good Practice Guidance*. The *Act* is to be enacted in 2006 and will implement measures to satisfy the requirements contained in Paragraphs 10(a) to (c) and 12(a) to (c) of the *Guidelines for National Systems*.

Until now, Working Group VI on Emissions Reporting of the Interministerial Working Group on CO_2 Reduction,[6] which was founded in 2002, has been responsible for the implementation of the requirements placed on emissions reporting by federal authorities. It is a forum for the interministerial discussion of the priority tasks that have been identified in the field of emissions inventories. Its work is coordinated by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Until now, the official consideration and approval procedures required by Paragraph 12(e) of the *Guidelines for National Systems* have been implemented through interministerial coordination between all the federal ministries involved. Once the *Act on Climate-Protection Statistics* has entered into force, these functions will be performed by a coordinating committee that is to be established by the Act.

3.4.5 Standard text for agreements on cooperation with non-governmental organisations

To date, the involvement of associations and other independent organisations has been secured primarily by the sections responsible for specific issues within Divisions I and II of the Federal Environment Agency. The Single National Entity supports the specialised sections when reporting requirements are being discussed and the requisite data flows defined with associations.

In 2005, to ensure non-governmental organisations contribute to the National System, a standard text for agreements was drafted that is intended to involve relevant actors in the preparation of inventories on a compulsory basis in future.

3.4.6 Workshop on the National System

The Federal Environment Agency held the first workshop on the National System of Emissions Inventories in November 2004. This created a forum that did a great deal to encourage the involvement of associations and other independent organisations and contributed to the implementation of Paragraph 15(b) of the *Guidelines for National Systems*, which requires that the inventories be reviewed by independent third parties.

The participants in the workshop were informed about the latest developments in emissions reporting on greenhouse gases as well as the requirements relevant in this field. The event also discussed existing problems and weaknesses, as well as developing and identifying approaches to the resolution of problems and the improvement of the inventories and inventory reporting. The other issues discussed included methodological approaches to

6 The Working Group on CO_2 Reduction, in which the Federal Ministry for the Environment, Nature Protection and Nuclear Safety (BMU) plays the lead role, was established by a decision of the Federal Government of 13 June 1990. Its purpose is to further develop and implement an overall concept for the reduction of CO_2 emissions and climate protection at national level.

various sectors and source categories, the data foundations for the greenhouse gas inventory, the coordinated preparation of a balanced, coherent National Inventory Report (NIR) and general topics relating to the preparation of inventories, such as quality assurance, quality control, uncertainties and data confidentiality.

Actors who already make contributions, provide data for the national greenhouse gas inventory or are potentially likely to do so in future were invited to this event. They included the sections of the Federal Environment Agency involved in inventory preparation, contributing units within the ministries and their subordinate authorities, representatives of the Länder, associations, working groups, research institutions and the Federal Statistical Office (DESTATIS).

The workshop was divided into a general session for all participants and sector-specific sessions on energy, industrial processes, agriculture and land-use change and forestry. The sector-specific sessions formed four working groups that deliberated in parallel on selected issues relating to particular source categories in each sector. The results of the workshop, which will be used directly to improve the inventories, have been summarised in a workshop report.

3.4.7 Cross-country review

A cross-country review of the key source categories in energy and agriculture was conducted for the first time in 2004 with Finland. This review was very helpful for the improvement of the inventories and attracted a great deal of attention across the EU. Like the workshop on the National System, this instrument will be used again in future because it makes it possible to respond effectively to the requirements with regard to more intensive independent reviewing of the key source categories set out in Paragraph 15(c) of the *Guidelines for National Systems*.

3.5 Quality control and quality assurance procedures

Since 2002, the Single National Entity has been working on the development and implementation of a QC/QA system, the Quality System for Emissions Inventories (QSE). The QSE takes account of the requirements of the *IPCC Good Practice Guidance*, national circumstances in Germany and the internal structures and procedures of the Federal Environment Agency as the institution responsible for reporting. The QSE's procedures are organised with sufficient flexibility to ensure that it will also be possible to respond to changing requirements in future on a routine basis. The scope of the QSE encompasses the entire process of emissions reporting.

The QSE covers all participants in the NaSE. Its binding status within the Federal Environment Agency was established by *Federal Environment Agency In-House Order 11/2005* (see Chapter 3.4.2). Detailed provisions regulating the arrangements to make it binding on other NaSE participants are to be put in place under the planned *Act on Climate-Protection Statistics* (see Chapter 3.4.4).

3.5.1 Organisational structure of the Quality System for Emissions Inventories

Within the QSE framework, a concept for its organisational structure was developed that defines binding responsibilities for the Federal Environment Agency with regard to the implementation of the requisite QC and QA measures. The roles and responsibilities defined are intended to facilitate effective exchanges of information and the performance of QC and QA activities in conformity with requirements (see Table 1).

Minimum QC/QA requirements for other participants in the National System are to be specified by the planned *Act on Climate-Protection Statistics*.

Table 1: Roles and responsibilities in the QSE

Role	Function	Responsible
QC/QA coordinator (QSEK)	General QC and QA throughout the reporting process Maintenance and further development of the QSE Administration and updating of QC and QA plans, QC checklists and the *QSE Manual* Description of quality targets Administration and updating of the improvement plan and lead role in its incorporation into the inventory plan	A designated staff member within the Single National Entity
NaSE coordinator (NaSEK)	Action to ensure timely reporting in conformity with requirements Initiation and implementation of general measures drawn from the inventory plan Establishment/documentation of institutional facilities, legal agreements Archiving of all inventory information, central archiving of inventory information Preparations for the performance and post-processing of inventory reviews	A designated staff member within the Single National Entity
Specialised contact (source-category specific) at the Single National Entity (FAP)	Supervision of specialised support (inventory work and reporting) First stage of independent QC/QA on the supporting work done by the sections	A designated staff member within the Single National Entity
Contacts in Federal Environment Agency departments	Multipliers in departments and sections who communicate information and requirements relating to emissions reporting	A designated staff member in each relevant department within the Federal Environment Agency
QC/QA manager (QKV)	QC on data and report sections to be delivered to the Single National Entity Approval of report sections Action to ensure that necessary inventory work, QC measures and documentation activities are carried out at the operational level Definition of specialised responsibilities for emissions reporting within the section and action to ensure they are performed	All heads of relevant sections
Specialised representative at the operational level (FV)	Data collection, data entry and calculation in keeping with the methods prescribed Definition of source category-specific quality and check criteria Execution of QC measures Decentralised archiving of source category-specific inventory information	All staff members designated by the head of section
CSE administrator (ZSEK)	General QC and QA throughout the inventory process Approval of check criteria in the CSE Action to ensure the integrity of databases Emissions calculation and aggregation into report formats	A designated staff member within the Single National Entity
Report coordinator (NIRK)	Contact for NIR supporting work Coordination of supporting work (collection of work from sections and distribution within Single National Entity) NIR reporting	A designated staff member within the Single National Entity

3.5.2 Procedural structure for the Quality System for Emissions Inventories

The procedure for the QC and QA measures in the QSE is oriented towards the emissions-reporting process as it is described in Chapter 3.1. At the same time, quality management has to be directly integrated into the various stages of the inventory process. Suitable QC measures have been allocated to each stage in the process and assigned to the various actors (see Figure 4).

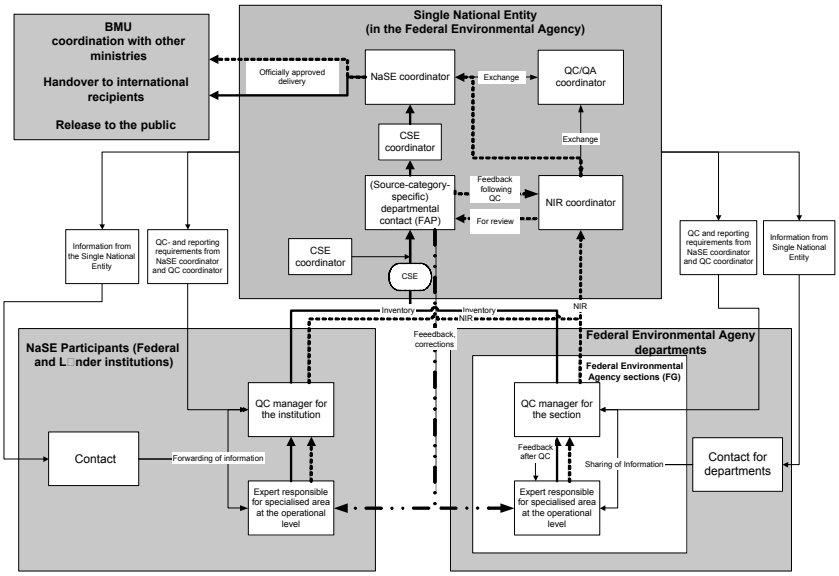

Figure 4: Roles and functions in the QSE

The Tier 1 QC checks to be conducted under Paragraph 14(g) of the *Guidelines for National Systems* were first carried out in 2005. QC checklists were sent to the specialists as accompanying sheets with the requests for data and were then completed as appropriate while the supporting work was being carried out. The QC checks are not defined in terms of review activities, but quality targets; in each case, it is necessary to either confirm that the targets have been met or state reasons for the failure to meet them.

3.5.3 Documentation in the Quality System for Emissions Inventories

The QSE will be used to introduce the QC/QA measures required by the *IPCC Good Practice Guidance* for the entire process of emissions reporting. QC/QA measures are largely performed, described and documented in conjunction with the relevant inventory contributions. A documentation concept for the QSE has been developed that represents measures of both types in an integrated manner tailored to specific target groups and tasks. The individual components of the documentation concept are shown in Figure 5.

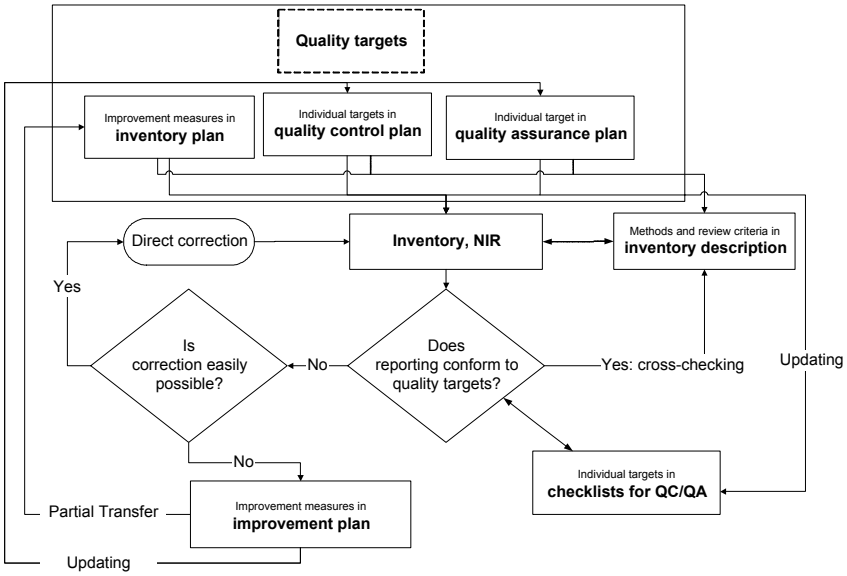

Figure 5: Management and documentation in the NaSE and the QSE

A general description of the **quality targets** is provided in the *QSE Manual* and is derived from the *IPCC Good Practice Guidance*. In addition to this, operational quality control and quality assurance targets for the individual source categories are to be generated by comparing the requirements set out in the *IPCC Good Practice Guidance*, the results of the independent inventory review and the reality of the inventories.

In accordance with the requirements set out in the *IPCC Good Practice Guidance* and Paragraph 12(d) of the *Guidelines for National Systems*, the QC/QA measures necessary for emissions reporting are to be summarised in a QC/QA plan. At the same time, the primary purpose of the QC/QA plan is to facilitate the organisation, planning and monitoring of these measures.

A central quality assurance and control plan was drawn up for the German inventory in 2002 as part of research project 202 42 266 (Federal Environment Agency, 2004). The QC and QA plan was drawn up on the basis of a systematic evaluation of the quality of all inventory data. To permit transparent, effective management of the execution and control of the action taken to achieve the quality targets, role-specific and, where necessary, source category-specific measures are specified in the **quality control plan (QC plan)** and the **quality assurance plan (QA plan)**. Quality assurance targets may relate to the inventory, the process of reporting or the QSE itself. The quality assurance measures undertaken by external third parties continue to be scheduled in the quality assurance plan. Both plans can be characterised as specification documents for quality control activities.

The document structure combines the QC and QA plans with **quality control and quality assurance checklists**, which are used to review and document the successful execution of quality controls. The checklists do not ask for information about the execution of checks, but the achievement of specified quality targets. These quality control checklists are to be

completed by the contributors to the NaSE[7] in parallel to the preparation of inventories and are designed to provide information about the quality of the data and methods on which the inventory is based. The Federal Environment Agency used checklists to carry out systematic quality controls with NaSE contributors for the first time in 2005.

Consequently, the two plans and the QC checklists directly constitute an instrument that is used to review the fulfilment of international requirements and make it possible to manage inventory quality by initiating quality assurance measures under Paragraph 13 of the *Guidelines for National Systems*.

The **improvement plan** brings together all options for the improvement of the inventories and criticisms based on the results of the independent inventory review that have been raised in the course of each concluded cycle of emissions reporting, and correlates them with possible corrective measures. These corrective measures are categorised by the Single National Entity, prioritised and incorporated to a greater or lesser extent into the **inventory plan** in consultation with the specialised representatives. Deadlines and responsibilities are defined in the inventory plan. As an annex to the NIR, the inventory plan goes through a coordination and approval process. It is therefore a binding specification document for the improvement measures to be implemented in the forthcoming reporting year.

The Single National Entity maintains an **inventory description** administered as the central form of documentation for the individual source categories. The inventory description gives an account of all essential aspects of the preparation of the inventories. It is intended to document all source category-specific work that is relevant to the source category-specific preparation of inventories. The inventory description can be characterised as background information.

The duty to prepare the specified documentation was introduced within the Federal Environment Agency in 2004 and forms the main basis for the archiving of inventory information in accordance with the requirements set out in Paragraph 16(a) of the *Guidelines for National Systems.* In order to extend the specifications to other participants in the National System, there are plans for corresponding minimum requirements with regard to documentation and archiving that are to be stipulated in the planned *Act on Climate-Protection Statistics*.

For various reasons, however, the documentation concept deviates from Paragraph 17 of the *Guidelines for National Systems* in not providing for a single central archive. The crucial factors in this decision were:

- the extensive, decentralised data stocks on which the calculation of the German inventory is based;
- the distributed responsibilities for these data;
- aspects of confidentiality that, for legal reasons, stand in the way of the forwarding of individual data to a central body for the purposes of archiving.

The central archive will, however, make available an appropriate reference system for the data it does not hold that will indicate who has archived which data where and in what form these inventories have been aggregated.

[7] These include the specialised representatives, the specialised contact persons, the section quality control managers, the report coordinator, the NaSE coordinator, the CSE administrator and the QC/QA coordinator.

3.5.4 The QSE Manual

The international requirements with regard to the quality assurance and quality control of emissions reporting for the National System of Emissions Inventories (NaSE) in Germany have been specified in the *Handbuch zur Qualitätskontrolle und Qualitätssicherung bei der Erstellung von Emissionsinventaren und der Berichterstattung unter der Klimarahmenkonvention der Vereinten Nationen sowie der EU Entscheidung 280/2004/EG* (*Manual for Quality Control and Quality Assurance during the Preparation of Emissions Inventories and Reporting under the UN Framework Convention on Climate Change and EU Decision 280/2004/EC*; below: *QSE Manual*). This document, which is binding on the Federal Environment Agency, describes the Quality System for Emissions Inventories (QSE).

The *QSE Manual* was enacted within the Federal Environment Agency by means of an in-house order. It is published with the documents that apply in conjunction with it on the Intranet of the Federal Environment Agency. The documents that apply in conjunction with the *QSE Manual* include:

- the list of specialised contacts within the Single National Entity;
- the list of contacts within the departments;
- the list of managers within the Federal Environment Agency sections;
- the quality control plan (Tier 1);
- the quality assurance plan (Tier 1);
- the role-specific and source category-specific QC/QA checklists (Tier 1 only);
- the improvement plan;
- the reporting requirements derived from the *Guidelines*;
- the results of the inventory reviews;
- the source category-specific data stocks for each source category;
- the results of the determination of key source categories;
- the NIR;
- CRF Table 8(b) on the documentation of recalculations (template for completion);
- a guide to the calculation of uncertainties and identification of Tier 2 key source categories;
- a form for suggestions concerning the ongoing improvement of the QSE;
- instructions for the use of the QSE checklists.

3.5.5 Support for expert review teams

Apart from the in-house quality control and assurance measures, the results reached by the expert review teams when inventory reviews are carried out do a great deal to stimulate the improvement of the inventories. In this respect, it is in the Single National Entity's own interests to fulfil the requirements set out in Paragraphs 16(b) and (c) with regard to the provision of archived inventory information for the review process and to answer the questions raised by the expert review teams. These aspects were prioritised accordingly when the QSE was being designed. In consequence, since 2004 all tabular correspondence on the inventory reviews, including the German responses, has been stored in a searchable Access database that also contains the tabular national QC/QA documents. The Planning and Steering Tool (PlaSte) is the main performance monitoring instrument within the QSE.

4 REFERENCES

IPCC, 2000: Intergovernmental Panel on Climatic Change, *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC Secretariat, 16th Session, Montreal, 1-8 May 2000

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Federal Environment Agency, 2003c: Strogies, Dreher, Rimkus et al, *National Inventory Report 2003: Submission under the United Nations Framework Convention on Climate Change*, Federal Environment Agency, Berlin, June 2003; URL: http://www.umweltdaten.de/publikationen/fpdf-l/2347.pdf

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5 ANNEX: *GUIDELINES FOR NATIONAL SYSTEMS*

Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol[8]

I. APPLICABILITY

1. The provisions of these guidelines shall apply for each Party included in Annex I which is also a Party to the Kyoto Protocol. Parties' implementation of national system requirements may differ according to national circumstances, but shall include the elements described in these guidelines. Any differences in implementation shall not impair the performance of the functions described in these guidelines.

II. DEFINITIONS

A. Definition of national system

2. A national system includes all institutional, legal and procedural arrangements made within a Party included in Annex I for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and for reporting and archiving inventory information.

B. Other definitions

3. The meaning of the following terms in these guidelines for national systems[9] is the same as in the glossary of the Intergovernmental Panel on Climate Change (IPCC) good practice guidance[10], accepted by the IPCC at its sixteenth session[11]:
   (a) Good practice is a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimated as far as can be judged, and that uncertainties are reduced as far as possible. Good practice covers choice of estimation methods appropriate to national circumstances, quality assurance and quality control at the national level, quantification of uncertainties, and data archiving and reporting to promote transparency;
   (b) Quality control (QC) is a system of routine technical activities to measure and control the quality of the inventory as it is being developed. The QC system is designed to:
      (i) Provide routine and consistent checks to ensure data integrity, correctness and completeness;
      (ii) Identify and address errors and omissions;
      (iii) Document and archive inventory material and record all QC activities.

   Quality control activities include general methods such as accuracy checks on data acquisition and calculations and the use of approved standardized procedures for emission calculations, measurements, estimating uncertainties, archiving information

[8] "Article" in these guidelines refers to an Article of the Kyoto Protocol, unless otherwise specified.
[9] The guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol are referred to herein as "guidelines for national systems".
[10] The IPCC "*Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*" is referred to as the "IPCC good practice guidance" in these guidelines for national systems.
[11] Montreal, 1-8 May 2000.

and reporting. Higher tier QC activities also include technical reviews of source categories, activity and emission factor data and methods;

(c) Quality assurance (QA) activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation development process, to verify that data quality objectives were met, ensure that the inventory represents the best possible estimate of emissions and sinks given the current state of scientific knowledge and data available, and support the effectiveness of the QC programme;

(d) Key source category is one that is prioritized within the national inventory because its estimate has a significant influence on a country's total inventory of direct greenhouse gases in terms of the absolute level of emissions, the trend in emissions, or both;

(e) Decision tree is a flow-chart describing the specific ordered steps which need to be followed to develop an inventory or an inventory component in accordance with the principles of good practice.

4. Recalculation, consistent with the UNFCCC reporting guidelines on annual inventories[12], is a procedure for re-estimating anthropogenic greenhouse gas (GHG)[13] emissions by sources and removals by sinks of previously submitted inventories[14] as a consequence of changes in methodologies, changes in the manner in which emission factors and activity data are obtained and used, or the inclusion of new source and sink categories.

III. OBJECTIVES

5. The objectives of national systems under Article 5, paragraph 1, for the estimation of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, referred to below as national systems, are:

(a) To enable Parties included in Annex I to estimate anthropogenic GHG emissions by sources and removals by sinks, as required by Article 5, and to report these emissions by sources and removals by sinks in accordance with Article 7, paragraph 1, and relevant decisions of the Conference of the Parties (COP) and/or the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP);

(b) To assist Parties included in Annex I in meeting their commitments under Articles 3 and 7;

(c) To facilitate the review of the information submitted under Article 7 by Parties included in Annex I, as required by Article 8;

(d) To assist Parties included in Annex I to ensure and improve the quality of their inventories.

IV. CHARACTERISTICS

6. National systems should be designed and operated to ensure the transparency, consistency, comparability, completeness and accuracy of inventories as defined in the guidelines for the preparation of inventories by Parties included in Annex I, in accordance with relevant decisions of the COP and/or COP/MOP.

[12] FCCC/CP/1999/7.
[13] References to greenhouse gases (GHG) in these guidelines for national systems refer to GHGs not controlled by the Montreal Protocol.
[14] "National GHG inventories" are referred to simply as "inventories" in these guidelines for the sake of brevity.

7. National systems should be designed and operated to ensure the quality of the inventory through planning, preparation and management of inventory activities. Inventory activities include collecting activity data, selecting methods and emission factors appropriately, estimating anthropogenic GHG emissions by sources and removals by sinks, implementing uncertainty assessment and quality assurance/quality control (QA/QC) activities, and carrying out procedures for the verification of the inventory data at the national level, as described in these guidelines for national systems.
8. National systems should be designed and operated to support compliance with Kyoto Protocol commitments related to the estimation of anthropogenic GHG emissions by sources and removals by sinks.
9. National systems should be designed and operated to enable Parties included in Annex I to consistently estimate anthropogenic emissions by all sources and removals by all sinks of all GHGs, as covered by the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* and IPCC good practice guidance, in accordance with relevant decisions of the COP and/or COP/MOP.

V. GENERAL FUNCTIONS

10. In the implementation of its national system, each Party included in Annex I shall:
    (a) Establish and maintain the institutional, legal and procedural arrangements necessary to perform the functions defined in these guidelines for national systems, as appropriate, between the government agencies and other entities responsible for the performance of all functions defined in these guidelines;
    (b) Ensure sufficient capacity for timely performance of the functions defined in these guidelines for national systems, including data collection for estimating anthropogenic GHG emissions by sources and removals by sinks and arrangements for technical competence of the staff involved in the inventory development process;
    (c) Designate a single national entity with overall responsibility for the national inventory;
    (d) Prepare national annual inventories and supplementary information in a timely manner in accordance with Article 5 and Article 7, paragraphs 1 and 2, and relevant decisions of the COP and/or COP/MOP;
    (e) Provide information necessary to meet the reporting requirements defined in the guidelines under Article 7 in accordance with the relevant decisions of the COP and/or COP/MOP.

VI. SPECIFIC FUNCTIONS

11. In order to meet the objectives and perform the general functions described above, each Party included in Annex I shall undertake specific functions related to inventory planning, preparation and management.[15]

A. Inventory planning

12. As part of its inventory planning, each Party included in Annex I shall:

[15] For the purpose of these guidelines for national systems, the inventory development process encompasses inventory planning, preparation and management. These steps of the inventory development process are considered in these guidelines only in order to clearly identify the functions to be performed by the national systems, as described in paragraphs 12 to 17 of the present guidelines.

(a) Designate a single national entity with overall responsibility for the national inventory;
(b) Make available the postal and electronic addresses of the national entity responsible for the inventory;
(c) Define and allocate specific responsibilities in the inventory development process, including those related to choice of methods, data collection, particularly activity data and emission factors from statistical services and other entities, processing and archiving, and QC and QA. This definition shall specify the roles of, and cooperation between, government agencies and other entities involved in the preparation of the inventory, as well as the institutional, legal and procedural arrangements made to prepare the inventory;
(d) Elaborate an inventory QA/QC plan which describes specific QC procedures to be implemented during the inventory development process, facilitate the overall QA procedures to be conducted, to the extent possible, on the entire inventory and establish quality objectives;
(e) Establish processes for the official consideration and approval of the inventory, including any recalculations, prior to its submission and to respond to any issues raised by the inventory review process under Article 8.

13. As part of its inventory planning, each Party included in Annex I should consider ways to improve the quality of activity data, emission factors, methods and other relevant technical elements of inventories. Information obtained from the implementation of the QA/QC programme, the review process under Article 8 and other reviews should be considered in the development and/or revision of the QA/QC plan and the quality objectives.

B. Inventory preparation

14. As part of its inventory preparation, each Party included in Annex I shall:
(a) Identify key source categories following the methods described in the IPCC good practice guidance (chapter 7, section 7.2);
(b) Prepare estimates in accordance with the methods described in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, as elaborated by the IPCC good practice guidance, and ensure that appropriate methods are used to estimate emissions from key source categories;
(c) Collect sufficient activity data, process information, and emission factors as are necessary to support the methods selected for estimating anthropogenic GHG emissions by sources and removals by sinks;
(d) Make a quantitative estimate of inventory uncertainty for each source category and for the inventory in total, following the IPCC good practice guidance;
(e) Ensure that any recalculations of previously submitted estimates of anthropogenic GHG emissions by sources and removals by sinks are prepared in accordance with the IPCC good practice guidance and relevant decisions of the COP and/or COP/MOP;
(f) Compile the national inventory in accordance with Article 7, paragraph 1, and relevant decisions of the COP and/or COP/MOP;
(g) Implement general inventory QC procedures (tier 1) in accordance with ist QA/QC plan following the IPCC good practice guidance.

15. As part of its inventory preparation, each Party included in Annex I should:

(a) Apply source category specific QC procedures (tier 2) for key source categories and for those individual source categories in which significant methodological and/or data revisions have occurred, in accordance with the IPCC good practice guidance;

(b) Provide for a basic review of the inventory by personnel that have not been involved in the inventory development, preferably an independent third party, before the submission of the inventory, in accordance with the planned QA procedures referred to in paragraph 12 (d) above;

(c) Provide for a more extensive review of the inventory for key source categories, as well as source categories where significant changes in methods or data have been made;

(d) Based on the reviews described in paragraphs 15 (b) and 15 (c) above and periodic internal evaluations of the inventory preparation process, re-evaluate the inventory planning process in order to meet the established quality objectives referred to in paragraph 12 (d).

C. Inventory management

16. As part of its inventory management, each Party included in Annex I shall:

(a) Archive inventory information for each year in accordance with relevant decisions of the COP and/or COP/MOP. This information shall include all disaggregated emission factors, activity data, and documentation about how these factors and data have been generated and aggregated for the preparation of the inventory. This information shall also include internal documentation on QA/QC procedures, external and internal reviews, documentation on annual key sources and key source identification and planned inventory improvements;

(b) Provide review teams under Article 8 with access to all archived information used by the Party to prepare the inventory, in accordance with relevant decisions of the COP and/or COP/MOP;

(c) Respond to requests for clarifying inventory information resulting from the different stages of the review process of the inventory information, and information on the national system, in a timely manner in accordance with Article 8.

17. As part of its inventory management, each Party included in Annex I should make the archived information accessible by collecting and gathering it at a single location.

VII. UPDATING OF THE GUIDELINES

18. These guidelines shall be reviewed and revised, as appropriate, by consensus, in accordance with decisions of the COP/MOP, taking into account any relevant decisions of the COP.

6 ANNEX: FURTHER INFORMATION ON THE PREPARATION OF INVENTORIES

The individual process stages in the preparation of inventories shown in Figure 2 are explained in greater detail below.

6.1 Upstream procedures

The concept of the key source category was introduced by the IPCC to ensure that the various and detailed activities and capacities necessary for the preparation of inventories could be concentrated on the source categories most important for the inventories. Key source categories are defined as categories prioritised within the national inventory because their estimation has a significant influence on the total emissions of direct greenhouse gases in terms of the absolute level of emissions, in contributing to the trend in emissions over time or on account of the uncertainties with which they are associated.

For this purpose, certain upstream procedures are always carried out between two cycles of emissions reporting independently of the emissions reporting subprocesses shown in Figure 2.

The following subprocesses are classified as upstream procedures:

- the determination of key source categories (following the Tier 1 procedure set out in Chapter 7.2 of the *IPCC Good Practice Guidance*);
- the calculation and aggregation of uncertainties relating to emissions by means of Monte Carlo simulation (following the Tier 1 or Tier 2 procedures set out in the *IPCC Good Practice Guidance*);
- the more extensive determination of key source categories by means of Monte Carlo simulation (following the Tier 2 procedure set out in Chapter 6.4 of the *IPCC Good Practice Guidance*).

6.1.1 Determination of key source categories (following the Tier 1 procedure)

Key source categories are determined by the Single National Entity once a year before the emissions reporting process is carried out. Identification as a key source category serves as a criterion for the calculation method (Tier approach) and, in consequence, the level of detail that have to be applied in the emissions modelling work on a particular source category. In addition to this, the results of the determination of the key source categories are used to identify source categories that require priority action when measures are taken to improve the preparation of inventories.

The methods to be applied for the determination of key source categories are laid down in the *IPCC Good Practice Guidance*. These methods make it possible to identify the key source categories either by means of an analysis of the inventory for a year that examines the level of emissions from the individual source categories (Tier 1 level assessment), an analysis of a time series based on the information in the inventory (Tier 1 trend assessment) or a detailed analysis of inventory information with quantified magnitudes of error (Tier 2 level and trend assessment allowing for uncertainties).

In order to determine the key source categories, the two Tier 1 procedures level (looking at the years 1990 and 2004) and trend (looking at 2004 compared to 1990) were applied to

Germany's greenhouse gas emissions. This was the first time that analyses of this kind took account not just of the emissions from sources, but also the capture of greenhouse gases by sinks.

6.1.2 Calculation and aggregation of uncertainties relating to emissions

Uncertainties are an elementary component of emissions inventories, and their determination should produce a quantitative expression of the accuracy of the emissions inventories. Uncertainties are determined as part of the data collection process. However, they can only be aggregated following the preparation of the inventory or the conclusion of the emissions reporting cycle.

When uncertainties are calculated and aggregated, the uncertainties relating to activity rates and emission factors, which are usually estimated by experts at the level of the structural elements in the CSE, are converted and aggregated into uncertainties relating to emissions. Uncertainties are aggregated once a year at the end of the reporting cycle for the current reporting year.

In the current NIR, Germany reports uncertainties that have been found using the Tier 1 method. For the calculation of Tier 1 uncertainties, uncertainties were estimated as far as possible at present by the experts of the specialised units in the Federal Environment Agency and the external institutions that supply data.

The aggregated uncertainties serve as a basis for the more extensive determination of key source categories.

6.1.3 More extensive determination of key source categories

A more extensive determination of key source categories by means of Monte Carlo simulation (Tier 2) can only be carried out if the uncertainties of the input data are available for each source category (usually EF and AR), in which case the Tier 2 procedure must also be applied.

Hitherto, uncertainties have not been calculated for the German greenhouse gas inventory by means of Monte Carlo simulation following the Tier 2 approach. Experts have estimated the uncertainties for activity rates and emission factors to a varying extent in the individual source categories while, in order to ensure the comprehensiveness of the figures, values from the literature have also been drawn on so that a complete data set can be supplied for the IT-based performance of the calculations required in the Tier 2 method. As a result of the planned determination of Tier 2 uncertainties, it is envisaged that uncertainties will be taken into account as well when key source categories are determined in future.

6.2 Determination of the basis for calculations

The **selection of calculation methods** for the determination of emissions has an impact on the whole emissions reporting process. For this reason, the appropriateness of the methods used is checked at the beginning of the whole process. The *IPCC Good Practice Guidance* contains decision trees that can be used to identify which methods are to be applied for each of the source categories. This depends on whether they are key source categories or not. If another – country-specific – method is applied instead of the method specified, the grounds

for this are to be set out in the NIR. It is necessary to explain and document in a verifiable fashion why the method chosen is just as good as, or superior to, the method specified.

Furthermore, the **selection and reviewing of data sources** also represent critical factors in the performance of the system because it is impossible for the results of all the subsequent processes (data preparation, calculation, reporting) to be better than the quality of the primary data. Data sources may relate to activity rates, emission factors or emissions from a particular source category. In many cases, data sources will already have been in use for several years. It may be necessary for new data sources to be selected, e.g. on account of the need for a change of methodology, the discontinuation of a previous data source, a need for additional data or the results of quality control work done on the data sources used hitherto.

The suitability of a data source is influenced by various criteria. These include:

- long-term availability;
- the institutionalisation of data provision;
- good documentation;
- the performance of quality control and assurance measures by data providers;
- the identification of uncertainties;
- the representativeness of the data; and
- the completeness of the data to be expected.

It is vital that the decision to select a particular data source be documented and that, where the data sources have significant deficits, plans be made for suitable measures to improve the data.

Standards with respect to quality control, quality assurance and documentation must be forwarded to the data providers; in particular, this requirement is especially relevant where research projects are commissioned because, as the party that has placed the contract for such services, the Federal Environment Agency must be able to exercise a considerable influence on the contractor in these cases.

6.3 Data collection

Data are collected and documented by the relevant specialised representatives. This can be done by the evaluation of official or association statistics, studies, periodicals or external research projects, the execution of in-house research projects, the use of personal information or exchanges of data between the Federal Government and the Länder. Furthermore, working results obtained by other means are often reused for the purposes of emissions reporting.

Data collection comprises the following steps:

- the definition of requirements;
- the specification of source category-specific quality and review criteria for the data;
- the submission of requests for data to data providers by the specialised unit responsible; and
- the receipt of data.

Requests to support the work on the inventories are sent by the Single National Entity to the source category-specific specialised representatives via the heads of section. A master file

specifying the structure for the supporting work in question is provided to help in the preparation of the NIR data. The specifications given in the CSE constitute requirements for the subsequent inputting of the data. Reporting requirements, including the QC/QA measures to be carried out, along with the results of all inventory reviews, the data stocks for each of the source categories and the current results of the determination of key source categories are communicated to the specialised representatives by means of information events held by the Federal Environment Agency's Working Group on Emissions Inventories and the Agency's Intranet page on emissions reporting. On this basis, the specialised representatives **define requirements** for third parties with regard to both data sources and calculation methods.

These requirements influence the upstream process of determining the basis for the calculations (review and selection of methods and data sources), a process that always takes place when requirements have not yet been fulfilled or have changed.

Once the requirements with regard to data sources and methods have been defined – but before any third parties begin collecting data –, the **source category-specific quality and review criteria** for such third-party data have to be **defined** in order to support the QC process at the data level.

The amount of data expected from the data provider and the requirements with regard to data quality and the documentation of the data should be set out when a specialised representative **requests data** from a third party. Once the **data have been received**, checks are made on their completeness, compliance with quality criteria and up-to-dateness. The data are validated by the specialised representative.

6.4 Data preparation and emissions calculation

The process of data preparation and emissions calculation comprises the following steps:

- data entry;
- data preparation (modelling, disaggregation, aggregation);
- the calculation of emissions;
- the preparation of the report sections (texts); and
- expert-level approval.

Report texts are prepared in parallel to the time series on activity rates, emission factors, uncertainties and emissions that are incorporated into the tabular sections. In this respect, the term "data" is understood in a broad sense. In addition to numerical values, time series, etc., it also denotes contextual information such as the sources of time series and calculation methods, as well as information on the **preparation of report sections** for the NIR and the documentation of recalculations.

A considerable amount of the **data entry and processing** work (processing of data and emissions calculations in the narrower sense of the term "data") is done in the CSE. This considerably increases transparency and consistency, as well as opening up the possibility of the automation of the execution of data-level quality-control measures in the CSE (formulation of check conditions in CalQlator). In cases of this kind, certain QC measures do

not have to be carried out manually. Cross-checks with simplified assumptions should be applied to check the plausibility of the results of calculations based on complex models.

After all checks have been carried out and any consultations conducted, the **emissions are calculated** in the CSE by means of an automated procedure based on the following principle:

activity rate * emission factor = emissions.

If upstream calculation methods are stored in the CSE, these calculations are initiated first before the actual calculation of emissions is undertaken.

The relevant QC representative is responsible **for issuing expert-level approvals** for both the texts and the results of the calculations prior to their further use by the Single National Entity.

6.5 Preparation of reports

The preparation of reports involves the following activities:

- the aggregation of emissions data into the relevant report formats and preparation of data tables (CRF, NFR);
- the calculation of CO_2 equivalents for the greenhouse gas emissions;
- the collation of the report texts that have been submitted to finalise the draft report (NIR) and the editing of the complete NIR;
- the internal Federal Environment Agency review of the draft and its subsequent approval;
- the forwarding of the report to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety;
- the interministerial coordination process; followed by
- the submission of the report to the UNFCCC Secretariat; and
- archiving.

Before emissions data can be transferred into the report tables for the Framework Convention on Climate Change (CRF = Common Reporting Format) and the UNECE Geneva Convention on Long-range Transboundary Air Pollution (NFR = Nomenclature for Reporting), **emissions data** from the CSE time series (in the data-collection format) must be **aggregated** into the CRF or NRF source-category **report formats**. This is accomplished by means of hierarchical allocation within the CSE. Aggregation is carried out automatically.

Following their mathematical aggregation, the activity data, emission factors and emissions are automatically transcribed into the IPCC's CRF report tables. In future, CRF Reporter will be completed from the CSE via an interface.

At present, the few emissions data not yet recorded in the CSE are still entered manually into the CRF tables. This process involves an increased likelihood of error, so the report tables need to be cross-checked by an independent reviewer.

In accordance with Paragraph 20 of the *IPCC Guidelines on Reporting and Review* (*FCCC/CP/2002/8*), greenhouse gases are calculated in CO_2 equivalents on the basis of the relevant GWP values published in the *Second Assessment Report*.

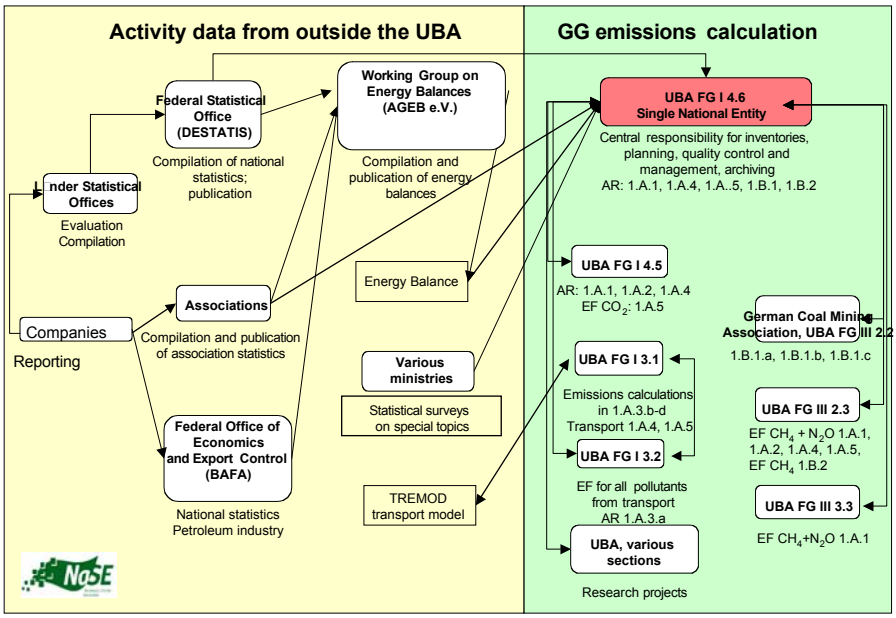
The report coordinator **collates the report texts that have been submitted to finalise the NIR draft report**. Source category-specific specialised contacts at the Single National Entity then carry out an **internal review of the data and report sections** using a QC checklist. The results of this review are made available to the specialised representatives, which may then revise their contributions if necessary, and following consultation. Once the report has been revised in this way, the report coordinator edits the whole NIR.

The report tables, the NIR and the inventory plan that will be included in it in future **are approved** in the course of the Federal Environment Agency's internal coordination process by cosigning. The documents are then **forwarded to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety** for **interministerial coordination**. The Ministry arranges for the translation of the NIR and its **submission to the UNFCCC Secretariat**.

The data tables and the accompanying NIR in the version provided for ministerial coordination are then burnt onto a CD and archived with unambiguous identifiers. The content of the CSE database used for the calculations is likewise copied and archived. The final version submitted to the Secretariat of the Framework Convention on Climate Change is also **archived**.

7 ANNEX: RESPONSIBILITIES AND DATA FLOWS FOR THE CALCULATION OF GREENHOUSE GAS EMISSIONS

7.1 Energy



Source: German NIR, 2005

Figure 6: Responsibilities and data flows for the calculation of greenhouse gas emissions in the energy sector

Probably the most important data sources for the determination of activity rates in the CSE are the *Energiebilanzen der Bundesrepublik Deutschland* (*Energy Balances of the Federal Republic of Germany*; below: *Energy Balance*), which are published by the Working Group on Energy Balances (AGEB e.V.). The *Energy Balance* provides an overview of the interrelations within Germany's energy sector and presents data in such a way that they can be broken down by fuels and source categories. The *Energy Balance* draws its data from a wide range of other sources. As a result, the publication of the *Energy Balance* is subject to some delay. The most recent available *Energy Balance* describes the situation in 2000.

The main *Energy Balance* is accompanied by the *Satellitenbilanz Erneuerbare Energieträger* (*Satellite Balance of Renewable Energies*; below: *Satellite Balance*). This document gives a detailed account of the output and consumption of renewable energies. The *Satellite Balance* appears at the same time as the *Energy Balance*.

In addition to the *Energy Balance*, the Working Group on Energy Balances also publishes what are known as the *Auswertetabellen zur Energiebilanz* (*Energy Balance Evaluation Tables*; below: *Evaluation Tables*). As far as fuels are concerned, these tables only list the fuels with the highest activity levels individually and aggregate fuels with lower activity levels to find cumulative values (for example, "other solid fuels"). Breakdowns into specific source categories are limited largely to source categories associated with the end use of energy (such as the "manufacturing sector" or "transport"). Some source categories are not listed

(such as the generation of district heat). The *Evaluation Tables* are published relatively promptly (in the summer of the following year) and can be used to determine aggregated activity rates for the most commonly used fuels at the source category level. Further disaggregation can be achieved by factoring in other statistics.

The Association of Industrial Energy and Power Producers (*VIK*) publishes the *Statistik der Energiewirtschaft* (*Energy-Sector Statistics*; below: *VIK Statistics*) at short intervals (one to two years). Among other things, the *VIK Statistics* include data on power generation, different types of plant and fuel consumption. The data are broken down to a large extent, both by source categories and on the basis of a complex classification of the various types of plant. The *VIK Statistics* are normally published a little over a year after the relevant data have been collected.

The relevant *Fachserien* (*Technical Series*) and *Reihen* (*Series*) published by the Federal Statistical Office (*Technical Series 4*, *Series 4.1.1, Series 6.4* and *Series 8.1*; below: *Technical Series 4*) represent another important source of data for the determination of activity rates. These publications contain data on production, fuel consumption and plants in the manufacturing and mining sectors. The data are published relatively promptly after collection (about one year) and offer, in particular, detailed breakdowns organised by the various areas of the manufacturing sector. Some of these data are also included in the *VIK Statistics*.

Another source of data is the *Statistik der Kohlenwirtschaft* (*Coal Industry Statistics*). These statistics provide the basis for the data given on activities in which coal is consumed and can be used to verify findings that relate to these areas.

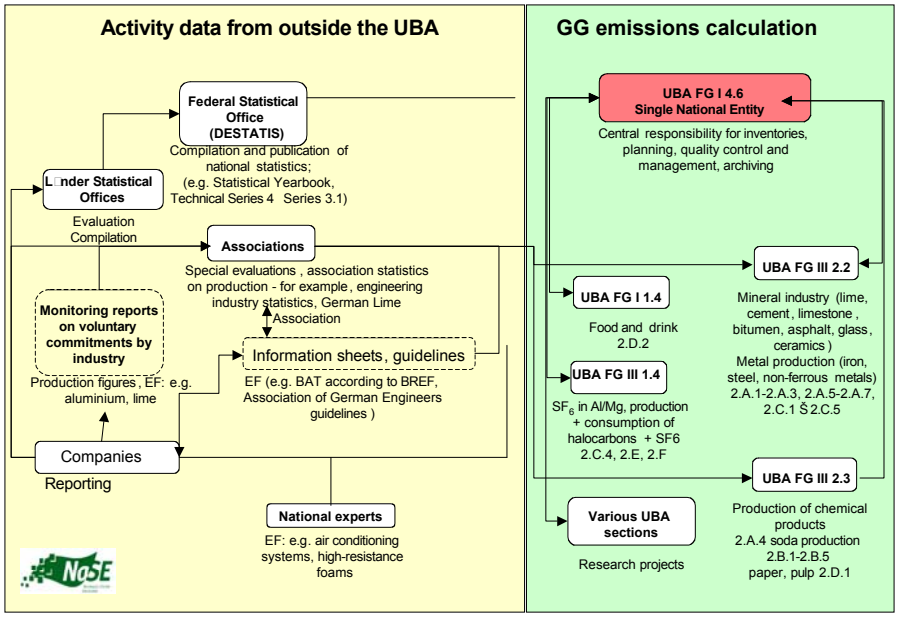
The calculations in the Federal Environment Agency module are also based on the German Electricity Association (VDEW) statistics *Leistung und Arbeit (Output and Work)* and *Betriebsmittel* (*Operating Equipment*; below: *VDEW Statistics*). Among other things, these statistics include information on the output of power stations, steam generators and electricity generation. The *VDEW Statistics* have been discontinued, which means it will not be possible to update data from these sources in the near term.

Yet another data source is the Association of the German Petroleum Industry (MWV) publication *Mineralöl-Zahlen* (*Petroleum Data*; below: *MWV Statistics*). This publication contains data on the stocks and consumption of petroleum in Germany differentiated by source categories. The statistical data are very up-to-date when they are published (a few months after the data have been collected).

Transport emissions are mainly determined using TREMOD (Transport Emission Estimation Model; IFEU, 2005).[16] A great deal of basic data from generally accessible statistics and special surveys have been used, harmonised and supplemented for the calculations undertaken with TREMOD.

16 To permit the derivation and evaluation of reduction measures, TREMOD is also used to calculate the energy consumption and CO_2 emissions of the individual categories of road vehicle. The values found are subsequently compared with total consumption and emissions of CO_2.

7.2 Industrial processes



Source: German NIR 2005

Figure 7: Responsibilities and data flows for the calculation of greenhouse gas emissions from industrial processes

Various different sections within the Federal Environment Agency are responsible for providing the data used to calculate emissions from industrial processes.

Activity data are calculated on the basis of *Technical Series 4*, *Series 3.1* (production in the manufacturing sector) and *Series 8.1* (technical statistics on iron and steel) published by the Federal Statistical Agency *(DESTATIS Technical Series 4, Series 3.1, 1991-2004; DESTATIS Technical Series 4, Series 8.1, 1991-2004)*. These publications contain production data for goods produced by the manufacturing sector. *Series 3.1* appears on a quarterly and yearly basis, while *Series 8.1* appears monthly and quarterly, i.e. both provide very recent statistics.

In addition to this, the calculation of emissions from some industrial processes draws on production data in association statistics and data from the *Monitoringberichten (Monitoring Reports*) on cement clinkers, lime and primary aluminium production that have been compiled and published by the Rhine-Westphalian Institute for Economic Research (RWI) for several years on behalf of various industries as a contribution to the monitoring of their compliance with voluntary commitments on climate protection. The *Monitoring Reports* are also based in part on data from industry associations. Prior to the use of these data sources, the Federal Environment Agency checks the extent to which the data cover all of the production for the source category in question.

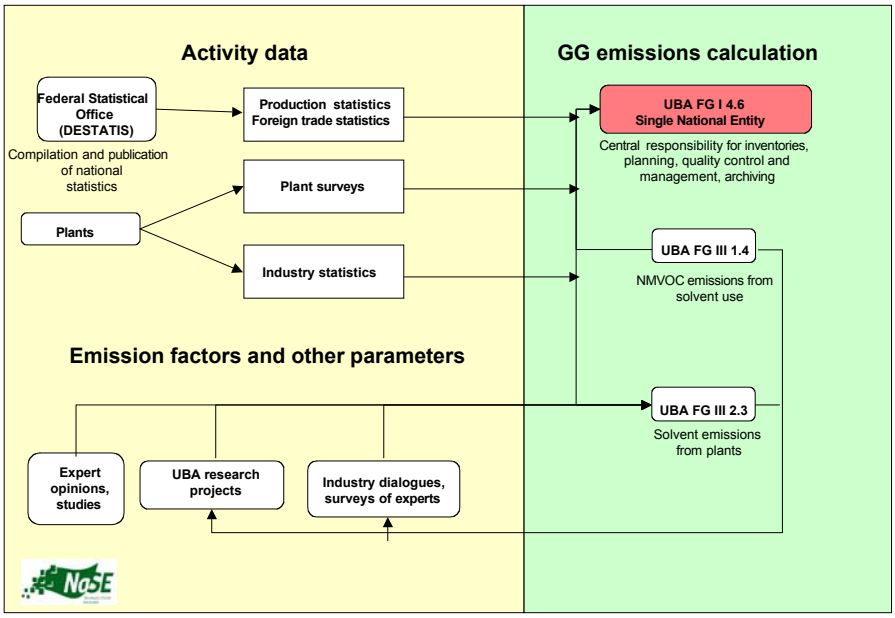
Data from the *Leistungsbericht* (*Annual Report*) of the German Pulp and Paper Association (VDP) are used in the chapter on “Other production: pulp and paper”. The chapter on “Other production: Food and drink” draws on data from the Federation of German Food and Drink

Industries (BVE), the Federal Statistical Office and the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV).

Due to a lack of reliable statistical data on the consumption and production of halogenated hydrocarbons and SF_6, direct use is made of information provided by manufacturers and surveys of manufacturers in this field. The great majority of the activity rates were researched on a targeted basis in accordance with the inventory requirements as part of a research project. Each of the various sub-source categories relates to just a few companies.

Some emission factors are obtained from national and international fact sheets, guidelines and surveys of experts. Alternatively, default values are used. More detailed information on these factors is presented in the descriptions of the methodologies for the various source categories.

7.3 Use of solvents and other products



Source: German NIR 2005

Figure 8: Responsibilities and data flows for the calculation of greenhouse gas emissions due to the use of solvents and other products

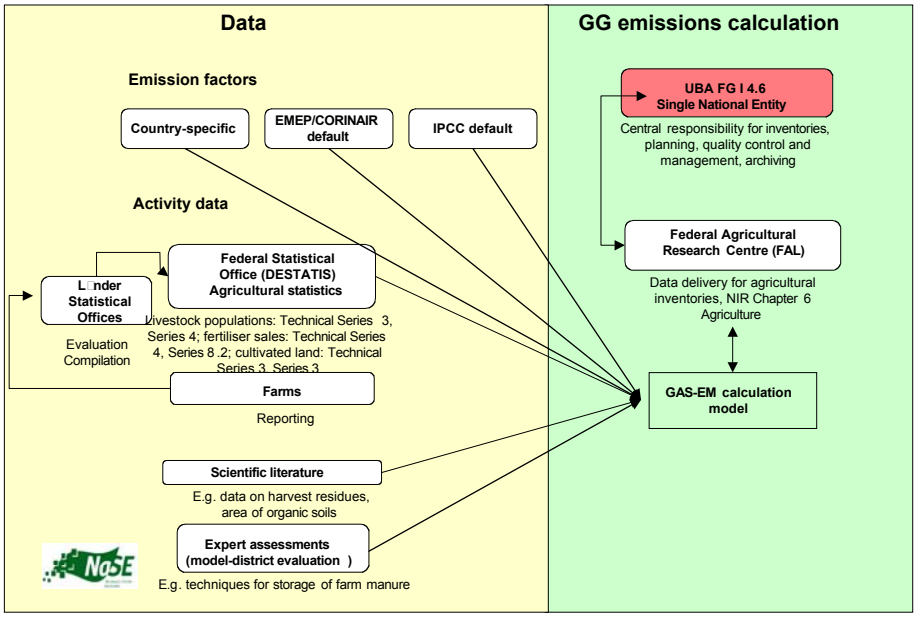
With regard to the calculation of emissions due to the use of solvents and other products, Section FG III 1.4 of the Federal Environment Agency is responsible for the methodology and the selection of parameters and data used for calculations of NMVOC emissions. Section III 1.4 of the Federal Environment Agency, which has “global responsibility” for this field, is supported by Section III 2.3/2.4 in its work on the sub-group of solvent emissions from industrial plants (e.g. painting, printing, etc.). The internal responsibilities for the determination of N_2O emissions from products have not yet been defined to a sufficient extent by the Federal Environment Agency.

The activity data are drawn mainly from statistics published by the Federal Statistical Office (DESTATIS), especially its statistics on production and foreign trade. Industry statistics are

also used for certain source categories and sectors. Older surveys of industrial plants are used to account for N_2O emissions associated with the use of narcotics.

Emission factors and other parameters that enter into the calculation of emissions from the use of solvents and other products are taken from national studies and expert reports, as well as research projects directly commissioned by the Federal Environment Agency. In some cases, they are also based on information provided by experts in the course of dialogues with industry.

7.4 Agriculture



Source: German NIR 2005

Figure 9: Responsibilities and data flows for the calculation of greenhouse gas emissions from the agricultural sector

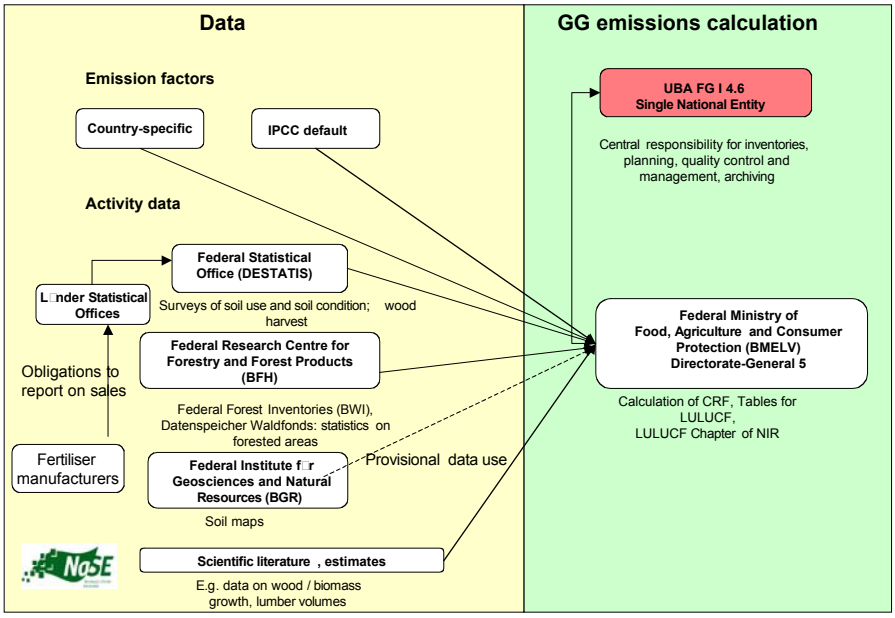
The calculations of emissions for Chapter 6 (“Agriculture”) are carried out by the Federal Agricultural Research Centre (FAL). In order to calculate agricultural emissions in Germany, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) initiated a project under which the Federal Agricultural Research Centre developed a modular model for tabular calculations (GASeous Emissions, GAS-EM; Dämmgen et al, 2002). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the Federal Ministry of Food, Agriculture and Consumer Protection now have a framework ministerial agreement in place that regulates the exchange of data and information as well as the operation of a joint database by the Federal Environment Agency and Federal Agricultural Research Centre.

The agricultural statistics compiled by the Federal Statistical Office are a major source of data for the calculation of agricultural emissions. Animal numbers have been taken from the

Federal Statistical Office's relevant technical series (DESTATIS, *Technical Series 3, Series 4*, no year). Other technical series record fertiliser sales and give figures on the area of land under cultivation. In some fields, these data are supplemented by figures from the literature (e.g., harvest residues or area of organic soils). Apart from this, data are available from assessments by experts (for example, an evaluation of model districts with regard to techniques for the storage of farm manure).

The calculations for many parts of the agricultural sector are currently based on simpler methods (EMEP/CORINAIR) or Tier 1 methods (IPCC) that use standard emission factors from the Revised 1996 *IPCC Guidelines* or the *EMEP/CORINAIR Guidebook* issued by the United Nations Economic Commission for Europe (UNECE). Furthermore, in a number of areas, use is made of country-specific factors and parameters taken from research projects and data in the literature that the Federal Agricultural Research Centre has collated and integrated into its mathematical model.

7.5 Land-use change and forestry



Source: German NIR 2005

Figure 10: Data flows for the calculation of greenhouse gas emissions from land-use change and forestry

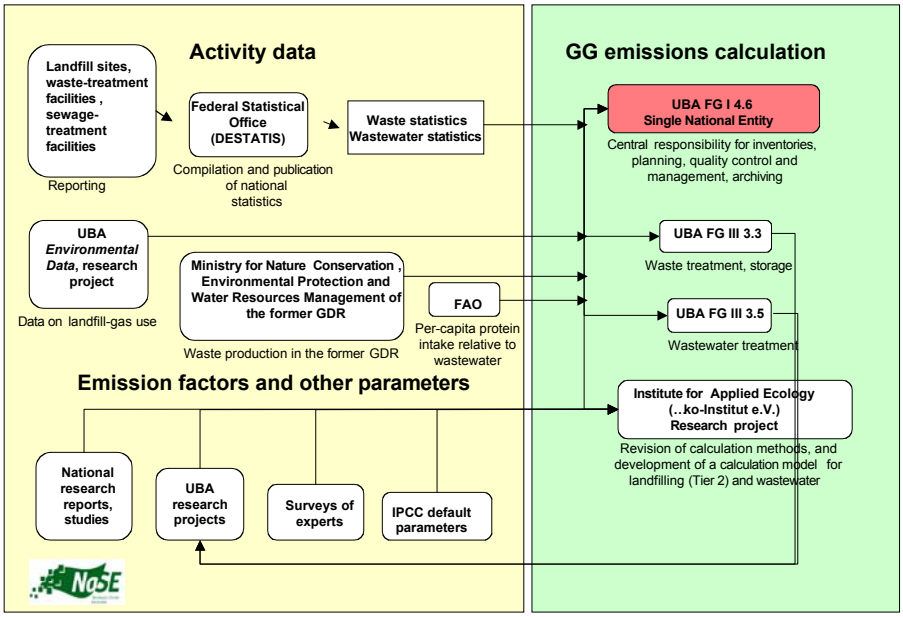
Changes in the carbon stocks in forest biomass were calculated for the first time for the 1990-2003 greenhouse gas inventory. In this work, carried out on behalf of the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) by the Baden-Württemberg Forest Research Institute (FVA), the changes were derived primarily from the data of the *Federal Forest Inventories* (*Bundeswaldinventuren*, *BWI*) in keeping with the provisions of the *Good Practice Guidance for Land-Use, Land-Use Change and Forestry* (*GPG-LULUCF*, IPCC, 2003). For the 2005 Inventory, the Institute for Forest Ecology and Forest Surveys (Institut für Forstökologie und Walderfassung) of the Federal Research Centre for Forestry

and Forest Products (Bundesforschungsanstalt für Forst- und Holzwirtschaft, BFH) updated the changes by means of extrapolation. Apart from the information given in the Federal Forest Inventories, the activity data are also based on information from the Datenspeicher Waldfond (Forest Fund Data Warehouse) forest database.

As to the determination of changes in the use of agricultural land, no activity data that fully meet the quality requirements in this field are yet available. The activity data on CO_2 emissions and the calculation of CO_2 storage in soil require data on agricultural land, quantitative and qualitative information (differentiated by types of usage and crop) for the identification of land-use changes and data for the determination of carbon stocks in soils and biomass. The data used in these areas, which have been taken from the *Flächenerhebung* (*Land Survey*) and *Bodennutzungshaupterhebung* (*Main Survey of Soil Use*) undertaken by the Federal Statistical Office, are only available aggregated by area; which means the data can only be used in conjunction with supplementary data sources (e.g. remote sensing, CORINE Landcover) and mathematical models developed specially for this purpose (on the basis of statutory requirements and empirical methods). Soil carbon stocks are currently estimated with the help of soil maps provided by the Federal Institute for Geosciences and Natural Resources (BGR), while changes in these stocks as a consequence of changes in use are estimated by means of multiple regressions applying emission factors derived from the scientific literature.

Changes in biomass carbon stocks are estimated on the basis of information from harvest statistics, the *Main Survey of Soil Use* and specific factors taken from the scientific literature. Emissions from the liming of soils are determined with the help of data taken from the federal statistics on domestic sales of mineral fertilisers that contain lime and other nutrients. The fertiliser industry is legally required to disclose its sales. Although the first *Survey of the Condition of Forest Soils* (1987-1993) measured soil-carbon stocks in forests in the early 1990s, it did not determine changes in stocks over time.

7.6 Waste and wastewater



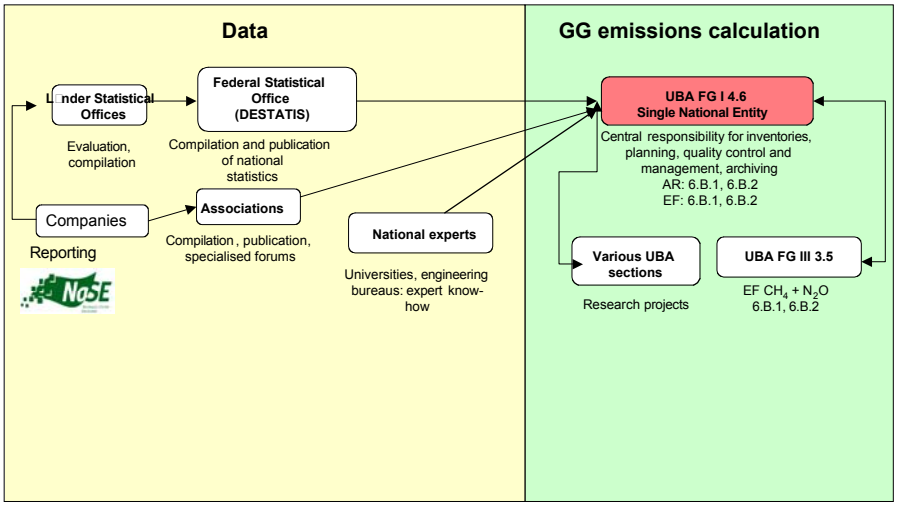
Source: German NIR 2005

Figure 11: Data flows for the calculation of greenhouse gas emissions from the waste sector

Section FG III 3.3 is responsible for the methodology and the selection of parameters and data for the calculation of emissions from the waste sector. The Federal Environment Agency was supported by a research project (Institute for Applied Ecology, 2004b) when landfill emissions were recalculated in 2003 (as part of the development of a Tier 2 method for the Federal Republic of Germany).

The activity data for the waste sector are drawn mainly from data published by the Federal Statistical Office (DESTATIS), which issues detailed, disaggregated time series. The section of the report on waste provides precise information as to which specialised statistical series and sources have been used. The Federal Statistical Office has not published any data on the amounts of waste produced in the former GDR. In this respect, an official source from the former GDR Ministry for Nature Conservation, Environmental Protection and Water Resources Management has been used. The calculations on the use of landfill gas are based on data from the publication *Daten zur Umwelt* (*Environmental Data*), which is issued regularly by the Federal Environment Agency. Data for 2001 have also been taken from an up-to-date research project.

The emission factors and other parameters that are incorporated into the calculation of emissions from waste landfilling and composting have been taken from national studies and expert reports, as well as research projects directly commissioned by the Federal Environment Agency. In addition to this, IPCC default parameters have been used for this purpose. Individual experts have also been consulted regarding a few of the parameters (e.g. half-life selection). Detailed parameters sources are specified in the respective chapters.



Source: German NIR 2005

Figure 12: Data flows for the calculation of greenhouse gas emissions from the wastewater sector

Section FG III 3.5 is responsible for the methodology and the selection of parameters and data for the calculation of emissions from the wastewater and sludge-treatment sector.

The activity data on the wastewater sector are drawn mainly from data published by the Federal Statistical Office (DESTATIS), which issues detailed, disaggregated time series. The chapter on wastewater provides precise information as to which specialised statistical series and sources have been used. The data on per-capita protein intake have been taken from FAO data.

The emission factors and other parameters that are incorporated into the calculation of emissions from wastewater treatment have been taken from national studies and expert reports, as well as research projects directly commissioned by the Federal Environment Agency. In addition to this, IPCC default parameters have been used. Various experts have been consulted directly on a small number of parameters and methodological issues (e.g. occurrence of CH_4 emissions in aerobic wastewater treatment processes).

8 ANNEX: *FEDERAL ENVIRONMENT AGENCY IN-HOUSE ORDER 11/2005*

I 4.6 – 50 200-2/28 Berlin, 12 July 2005

In-House Order No. 11/2005

(please incorporate into the Rules of Procedure, Vol. II[XV])

To all
members of staff
of the Federal Environment Agency

Quality Control and Quality Assurance for Emissions Reporting

Annex: Timetable for emissions reporting

I) Preliminary remarks

Under the provisions of Article 5(1) of the *Kyoto Protocol* and EU *Decision 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol*, Germany is required to ensure the transparent, comparable, complete, consistent and accurate reporting of emissions. To this end, a national system under Article 5(2) is to be established, the Single National Entity responsible for which is based in the Federal Environment Agency. The Quality System for Emissions Inventories (QSE) developed by the Single National Entity specifies the international requirements with regard to quality assurance and quality control in emissions reporting for the National System of Emissions Inventories (NaSE) in Germany.

These requirements and the associated responsibilities within the Federal Environment Agency are summarised in the *QSE Manual* and the documents that apply in conjunction with it.

In order to achieve synergy effects, the following arrangements shall also apply with secondary priority for emissions reporting under the Geneva Convention on Long-range Transboundary Air Pollution (UNECE/LRTAP) with its subsequent protocols and compliance with other European provisions on emissions reporting (including those of the NEC Directive) as soon as binding requirements are introduced in this respect.

The sections involved in emissions reporting are set out in the Schedule of Responsibilities (GVPL).

II) Quality control and quality assurance in emissions reporting

1. *The procedure defined in the* QSE Manual *shall be binding on all personnel of the Federal Environment Agency involved in emissions reporting.*

2. *The Emissions Situation Section shall be the Single National Entity responsible for emissions reporting within the Federal Environment Agency. This responsibility shall be indicated in the next organisational chart of the Federal Environment Agency under the heading "National focal points".*

3. *The roles and responsibilities of the Single National Entity and the sections involved in emissions reporting are set out in Chapter 3.2, "Rollen und Verantwortlichkeiten ("Roles and responsibilities"), of the* QSE Manual.

4. *The specialised departments shall inform the Single National Entity of contacts who are to act as multipliers and coordinators between the Single National Entity and the experts in the departments and ensure the flow of information within each department to the experts responsible. The names and sections of the contacts shall be published on the Intranet page of the Single National Entity.*

5. *The lead specialised units shall consult other organisational units that are responsible for subsidiary issues. The Single National Entity shall provide an overview of the specialised source category-specific responsibilities within the Agency on the Intranet.*

6. *The updating and administration of the* QSE Manual *and its appendices and annexes shall be incumbent upon the Single National Entity with the involvement of the contacts designated by the specialised departments. The version of the* QSE Manual *published on the Single National Entity's Intranet site and the documents that apply in conjunction with it shall be binding.*

7. *The annual deadlines for emissions reporting are listed in the attached Annex, which shall be a component part of the* Manual. *Compliance with these deadlines shall be mandatory.*
   Compliance with deadlines must be ensured primarily by the specialised representatives. In addition to this, responsibility for compliance with deadlines shall fall within the competences of the departmental managements.

8. *Review measures undertaken within the framework of emissions reporting (e.g. expert reviews commissioned by the UNFCCC and UNECE secretariats) shall be coordinated by the Single National Entity. The specialised units involved shall ensure the requisite support and communication.*

Thomas Holzmann

Timetable for Emissions Reporting

Date	Function/Activity	Actors
5 May	Requests for the submission of data and report texts sent to the specialised representatives	Single National Entity (Federal Environment Agency)
By 1 September	Submissions to the Single National Entity	From the Federal Environment Agency and external institutions involved in the NaSE
From 2 September	Review of submissions by staff of the Single National Entity and subsequent consultations	Specialised representatives and QC/QA managers, Single National Entity (Federal Environment Agency)
From 1 October	Preparation of CRF time series and final editing of the report	Single National Entity (Federal Environment Agency), specialised representatives (for consultations)
From 1 November	Internal coordination of the draft report	Within the Federal Environment Agency at the section, departmental management and divisional management levels
From 15 November	Final quality assurance	Single National Entity (Federal Environment Agency)
30 November	Report submitted to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety for the initiation of the interministerial coordination process	Single National Entity (Federal Environment Agency)
15 January	Report submitted to the European Commission (within the framework of the CO_2 monitoring mechanism)	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
15 April	Report submitted to the FCCC Secretariat	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
May	Initial check	FCCC Secretariat, Single National Entity (Federal Environment Agency)
June	*Synthesis and Assessment Report I*	FCCC Secretariat, Single National Entity (Federal Environment Agency)

August	*Synthesis and Assessment Report II*	FCCC Secretariat, specialised representatives and QC/QA managers, Single National Entity (Federal Environment Agency)
September/ October	*Individual Review*	FCCC Secretariat, specialised representatives and QC/QA managers, Single National Entity (Federal Environment Agency)

Appendix 3

Decision No 280/2004/EC, Article 3 (g)	No AAUs, RMUs, ERUs and CERs have been used (in the sense of Article 3 (g)) in the German registry for 2005.
Decision No 280/2004/EC, Article 3 (h)	There is no restriction on legal entities for participation in mechanisms under Article 6, 12 and 17 of Kyoto Protocol in Germany.
Decision No 2005/166/EC, Article 23 (i)	Germany is using the registry software Seringas™ of the *Caisse des dépôts et consignations (CDC)* in France. The registry regulation ((EC) No. 2216/2004) lays down general provisions, functional and technical specifications and operational and maintenance requirements concerning the standardised and secured system of registries. The Seringas™ software has implemented all these requests. All processes concerning allowances, verified emissions, accounts and Kyoto units using a communication link with the properties set out in the *functional and technical specifications for data exchange standards for registry systems under the Kyoto Protocol*, elaborated pursuant to Decision 24/CP.8 of the Conference of the Parties to the UNFCCC. The German registry has successfully passed the accreditation procedures of the European Commission and is online since March 18th 2005. The enclosed document *Detailed Functional and Technical Specifications* includes the description how the DES#7 standard has been implemented in Seringas™.

Each Party included in Annex I shall provide a description of how its national registry performs the functions defined in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1,11 and complies with the requirements of the technical standards for data exchange between registry systems as adopted by the COP/MOP. The description shall include the following information:

(a) The name and contact information of the registry administrator designated by the Party to maintain the national registry.

The designated registry administrator is:

Deutsche Emissionshandelsstelle
Umweltbundesamt
Bismarckplatz 1
14193 Berlin
Germany

The **contact person** for all issues concerning the registry is:

Dr. Thomas Schütz
Phone: +49 (30) 8903 5240
Fax: +49 (30) 8903 5249
Email: thomas.schuetz@uba.de

His deputy is:

Oliver Schwalb
Phone +49 (30) 8903 5241
Fax: +49 (30) 8903 5249
Email: oliver.schwalb@uba.de

(b) The names of the other Parties with which the Party cooperates by maintaining their national registries in a consolidated system

Germany is not maintaining the registry system in a consolidated system with other parties. The German registry is using a database instance for its own, without any connection to other systems. The registry software maintenance and development is performed in cooperation with France (holding the intellectual property rights of the software), Spain, Portugal, Belgium, Luxembourg, Czech Republic, and Slovakia.

(c) A description of the database structure and capacity of the national registry

Due to security reasons, the database structure of the registry can not be provided. The database is part of the development of the Caisse des Dépôts et Consignations (CDC) and therefore CDC holds the intellectual property rights. The database design is very straightforward and includes tables for the accounts, the blocks, the users of the system, the

operators, the installations and some additional elements like an encrypted password table. As relational database management system, the software MS-SQL-Server in the recent release is used.

We have carefully examined the registry software, the database system and the interaction of both. Any new release and bug fix of the software is tested before going into production in order to avoid damages of the database contents.

The capacity of the database is depending on the infrastructure in hard- and software. The registry is running on a load balanced system with an availability of 99.8 %. The database itself is configured to handle about 100 times more data than it is handling now.

(d) A description of how the national registry conforms to the technical standards for data exchange between registry systems for the purpose of ensuring the accurate, transparent and efficient exchange of data between national registries, the clean development mechanism registry and the transaction log (decision 19/CP.7, par. 1)

The software used for the German registry is Seringas™ by CDC. It has been developed as a registry for the European Emissions Trading Scheme and for the Kyoto Trading Scheme. The software uses the DES#7 standard for handling the data exchange between the CITL and the registry. The module performing the handling for data exchange is the same module that will be used for the data exchange with ITL.

All parts of the DES#7 standard are realized within Seringas™.

The software has successfully passed the accreditation tests of the European Commission. The German registry has also passed all test procedures of the European Commission. In addition, the German registry has performed more than 2.800 transactions since 18 March 2005 when going online. More than 99 % of the transactions have been performed without any errors and only very few corrections have been necessary. Therefore, we have the experience that the German registry performs in conformity with the standards for data exchange.

(e) A description of the procedures employed in the national registry to minimize discrepancies in the issuance, transfer, acquisition, cancellation and retirement of ERUs, CERs, tCERs, lCERs, AAUs and/or RMUs, and replacement of tCERS and lCERs, and of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transactions

All procedures mentioned are performed only after having passed the corresponding checks. The following list describes the main checks to be performed. For more details see the technical description of the software Seringas™.

Issuance: It is not possible to issue more AAU or EUA than it is defined in the NAP table.

Transfer: It is not possible to transfer more units than are currently available at the account. The user will get an error message explaining that he has to lower the number of units to be transferred. The software shows the same behavior for all kinds of units.

Acquisition: A transfer is completed only after having passed all steps foreseen in the DES#7 standard. The correct behavior of the software Seringas™ has been shown several times when other registries had to correct their data.

Cancellation: It is checked whether the number of units to be cancelled is equal to the number of surrendered or retired units. If there is a discrepancy the cancellation would be interrupted.

Termination of transactions: If a transaction has not been performed by the CITL after 24 hours the transaction is terminated and the corresponding unit blocks don't appear in the registry system.

Correction of discrepancies: The most frequent case of discrepancies is due to a missing last signal for the finalization of the transaction. This kind of problem is solved by carefully checking the real status of the transaction together with the Commission services and, after having identified that the transaction has performed correctly, setting the status of the transaction to "accepted" instead of "pending". In case of a transaction that has been aborted a script in the database is performed to track back to the situation before the transaction has been initiated.

In case of very complex problems, the software Seringas™ allows to manually transfer blocks between accounts.

The functionalities of tCERs and lCERs are not implemented yet. CDC will deliver the next version of Seringas™ in October. This version will include the missing functions.

(f) An overview of security measures employed in the national registry to prevent unauthorized manipulations and to prevent operator error and of how these measures are kept up to date

The user has to authorize by using username and password. The password has to be chosen by the user himself. All users are responsible for the use of their password and they have been informed to keep the password strictly confidential. The password itself must fulfill certain criteria that are common (at least 10 digits, not letters only…). The password is also used to authorize all individual transactions. This ensures that a transaction can be performed by an authorized person only. Further information on the security of clients can be found in the user guide. The connection between the host and the client is under https and therefore encrypted. Everyday the status of the transactions of the last day and night and the status of the reconciliation is evaluated. In case of discrepancies, the problem solving starts immediately as described above.

The registry is hosted by a professional hosting company. We have defined a monitoring of the performance and of security events and measures for problem solving are defined. Even the case of a catastrophic disaster that would destroy the whole computing center has been foreseen. A second/spare equipment is available at a different location and the backups are stored at another location. Therefore, we can restart the registry within 24 hours with a maximum loss of data of one operation day.

Internal security measures are defined and performed as well. All transactions that have been performed by the administrator (issuance, allocations, re-transfers…) are documented and the head of the German Emissions Trading Authority (Deutsche Emissionshandelsstelle) has to sign them.

It is planned to certify the registry unit by ISO 9000 in order to ensure proper quality assurance development.

(g) A list of the information publicly accessible by means of the user interface to the national registry

The registry, its function and the user interface is described at the homepage of the Deutsche Emissionshandelsstelle: http://www.dehst.de/

The terms of usage are published at the official German journal (Bundesanzeiger) and can be downloaded from the homepage of the Deutsche Emissionshandelsstelle. There are forms accompanied to open operator and person holding accounts:

http://www.dehst.de/DE/Register/Zugang Register/Zugang Register node.html nnn=true

The description of the user interface can be downloaded from the website as well:

http://www.dehst.de/SharedDocs/Downloads/DE/Register/Nutzerhandbuch,templateId=raw,property=publicationFile.pdf/Nutzerhandbuch

We have developed a very clear and instructive guidance document with no more than 36 pages. It describes all functions of the registry for the ordinary user (not the administrator) and includes screen shots as examples. Security issues are discussed in detail.

(h) The Internet address of the interface to its national registry

https://www.register.dehst.de/

(i) A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster

To prevent a long term breakdown of the registry, a disaster management plan has been developed. A second/spare equipment is located at an other location as the production system. It is used as test system and therefore it is guaranteed that the software and the equipment are running. Backups are stored at another location. Within 24 hours a new production system can be up and running with backups of the day before. Therefore, the loss of data is restricted to no more than one day.

(j) The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems

Date	Test Content	Involved Registries	Result
2004-11-03	Connectivity and Initialisation test	CITL, German Registry	passed
2005-04-13	Processes, User Interface	CITL, German Registry	passed
2006-01-27	Kyoto units und functionality	CITL, German Registry	passed

The detailed test contents can be provided if needed. All EU member states had to complete successfully these tests before going online with their national registry.