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Report on the technical review of the seventh national communication of Germany

Parties included in Annex I to the Convention were requested by decision 9/CP.16 to submit their seventh national communication to the secretariat by 1 January 2018. According to decision 15/CMP.1, Parties included in Annex I to the Convention that are also Parties to the Kyoto Protocol are required to include in their national communications supplementary information under Article 7, paragraph 2, of the Kyoto Protocol. This report presents the results of the technical review of the seventh national communication and relevant supplementary information under the Kyoto Protocol of Germany, conducted by an expert review team in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention" and the "Guidelines for review under Article 8 of the Kyoto Protocol".

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Abbreviations and acronyms

AEA	annual emission allocation
APA	Germany's Adaptation Action Plan
AR4	Fourth Assessment Report of the Intergovernmental Panel on Climate Change
BMBF	Federal Ministry of Education and Research
BMUB	Federal Ministry of the Environment, Nature Conservation, Building and Nuclear Safety
BMZ	Federal Ministry for Economic Cooperation and Development
BR	biennial report
CAP 2020	Climate Action Programme 2020
CAP 2050	Climate Action Plan 2050
CH_4	methane
CHP	combined heat and power
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CTF	common tabular format
ERT	expert review team
ESD	effort-sharing decision
EU	European Union
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
FONA3	third Framework Programme "Research for Sustainable Development"
GCOS	Global Climate Observation System
GDP	gross domestic product
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
LULUCF	land use, land-use change and forestry
NA	not applicable
NC	national communication
NE	not estimated
NF_3	nitrogen trifluoride
NIR	national inventory report
NO	not occurring
non-Annex I Party	Party not included in Annex I to the Convention
non-ETS sectors	sectors not covered by the European Union Emissions Trading System
N_2O	nitrous oxide
PaMs	policies and measures
PFC	perfluorocarbon
reporting guidelines for supplementary information	"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol. Part II: Reporting of supplementary information under Article 7, paragraph 2"
SF_6	sulfur hexafluoride
UNEP	United Nations Environment Programme

UNFCCC reporting guidelines on NCs	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications"
WAM	'with additional measures'
WEM	'with measures'
WOM	'without measures'

I. Introduction and summary

A. Introduction

1. This is a report on the in-country technical review of the NC7 of Germany. The review was coordinated by the secretariat in accordance with the "Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention", particularly "Part V: UNFCCC guidelines for the technical review of national communications from Parties included in Annex I to the Convention" (annex to decision 13/CP.20), and the "Guidelines for review under Article 8 of the Kyoto Protocol" (annex to decision 22/CMP.1 and annex I to decision 4/CMP.11).[1]

2. In accordance with the same decisions, a draft version of this report was transmitted to the Government of Germany, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. The review was conducted from 12 to 17 March 2018 in Berlin by the following team of nominated experts from the UNFCCC roster of experts: Ms. Rehab Ahmed Hassan (Sudan), Mr. Vincent Camobreco (United States of America), Ms. Maya Fukuda (Japan), Ms. Karin Simonson (Canada) and Mr. Hongwei Yang (China). Ms. Simonson and Mr. Yang were the lead reviewers. The review was coordinated by Mr. Javier Hanna and Ms. Karen Ortega (UNFCCC secretariat).

B. Summary

4. The ERT conducted a technical review of the information reported in the NC7 of Germany in accordance with the UNFCCC reporting guidelines on NCs (decision 4/CP.5) and the reporting guidelines for supplementary information, in particular the supplementary information required under Article 7, paragraph 2, and on the minimization of adverse impacts under Article 3, paragraph 14, of the Kyoto Protocol (annex to decision 15/CMP.1 and annex III to decision 3/CMP.11).

1. Timeliness

5. The NC7 was submitted on 20 December 2017, before the deadline of 1 January 2018 mandated by decision 9/CP.16.

2. Completeness, transparency of reporting and adherence to the reporting guidelines

6. Issues and gaps identified by the ERT related to the reported information are presented in table 1. The information reported by Germany in its NC7, including the supplementary information under the Kyoto Protocol, mostly adheres to the UNFCCC reporting guidelines on NCs.

[1] At the time of the publication of this report, Germany had submitted its instrument of acceptance of the Doha Amendment; however, the amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, paragraph 6, pending the entry into force of the amendment.

Table 1
Assessment of completeness and transparency of mandatory information reported by Germany in its seventh national communication, including supplementary information under the Kyoto Protocol

Section of NC	*Completeness*	*Transparency*	*Reference to description of recommendations*	*Supplementary information under the Kyoto Protocol*	*Completeness*	*Transparency*	*Reference to description of recommendations*
Executive summary	Complete	Transparent	NA	National system	Mostly complete	Transparent	Issue 1 in table 5
National circumstances	Complete	Transparent	NA	National registry	Complete	Mostly transparent	Issue 1 in table 6
GHG inventory	Complete	Transparent	NA	Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	Not complete	Transparent	Issue 1 in table 16
PaMs	Complete	Mostly transparent	Issues 1, 2 and 3 in table 9	PaMs in accordance with Article 2	Complete	Mostly transparent	Issue 1 in table 9
Projections and the total effect of PaMs	Complete	Mostly transparent	Issue 1 in table 15	Domestic and regional programmes and/or arrangements and procedures	Mostly complete	Transparent	Issue 1 in table 7
Vulnerability assessment, climate change impacts and adaptation measures	Complete	Transparent	NA	Information under Article 10[a]	Complete	Transparent	NA
Financial resources and transfer of technology	Mostly complete	Mostly transparent	Issue 1 in table 18 and issue 1 in table 19	Financial resources	Complete	Mostly transparent	Issue 1 in table 18
Research and systematic observation	Complete	Transparent	NA	Minimization of adverse impacts in accordance with Article 3, paragraph 14	Complete	Transparent	NA
Education, training and public awareness	Complete	Transparent	NA				

Note: A list of recommendations pertaining to the completeness and transparency issues identified in this table is included in chapter III below.

[a] The assessment refers to information provided by the Party on the provisions contained in Article 4, paragraphs 3, 5 and 7, of the Convention reported under Article 10 of the Kyoto Protocol, which is relevant to Parties included in Annex II to the Convention only. Assessment of the information provided by the Party on the other provisions of Article 10 of the Kyoto Protocol is provided under the relevant substantive headings under the Convention, for example research and systematic observation.

3. Summary of reviewed supplementary information under the Kyoto Protocol

7. The supplementary information under Article 7, paragraph 2, of the Kyoto Protocol is incorporated in different sections of the NC7, and the supplementary information under Article 7, paragraph 1, of the Kyoto Protocol is reported in the NIR of the 2017 annual submission. Table 2 provides references to where the information is reported. The technical assessment of the information reported under Article 7, paragraphs 1 and 2, of the Kyoto Protocol is contained in the relevant chapters of this report.

Table 2
Overview of supplementary information under the Kyoto Protocol reported by Germany

Supplementary information	*Reference to the section of NC7*
National registry	Chapter 3.5
National system	Chapter 3.4
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	Not reported
PaMs in accordance with Article 2	Chapter 4.5
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	Chapters 2 and 4
Information under Article 10	Chapters 3, 4, 6, 8 and 9
Financial resources	Chapter 6
Minimization of adverse impacts in accordance with Article 3, paragraph 14	Reported in the NIR of the Party's 2017 annual submission

II. Technical review of the information reported in the seventh national communication, including the supplementary information under the Kyoto Protocol

A. Information on national circumstances and greenhouse gas emissions and removals

1. National circumstances relevant to greenhouse gas emissions and removals

(a) Technical assessment of the reported information

8. The NC7 describes national circumstances that define climate policy development and implementation of the Convention in Germany and that are relevant to climate actions and their effects on GHGs. The NC7 contains key information for the following areas: legislation, population trends, economic development, geography, climate and climate change, energy, transport, industry, waste and wastewater, buildings, agriculture and forestry.

9. Germany is a federation of 16 federal states (Länder). The Constitution of Germany governs the division of responsibilities between the federal government and the federal states. The individual areas of environmental law (e.g. air quality control and climate protection, and waste management) are subject to concurrent legislation, which means that the federal states have the power to legislate as long as the federal government does not exercise its legislative authority. However, the federal government has overall decision-making authority over environmental legislation and the ability to transpose EU directives on environment-related matters. The federal government and the federal states cooperate on environmental policy in the form of specific working groups.

10. The population of Germany in 2015 was 82 million people, having increased between 2011 and 2015 owing to particularly high net immigration. However, long-term causes of decline in population persist and the population is projected to fall to 76.5 million by 2060. GDP (in real terms) increased by 1.9 per cent in 2016 for the seventh year in a row,

representing strong economic growth. Primary energy consumption increased slightly (~1 per cent) in 2016 compared with both 2014 and 2015 due in part to economic growth, population growth and cooler weather than in those previous years. The share of nuclear power in primary energy consumption fell to 7.0 per cent of total primary energy consumption in 2016. Germany's electricity export balance was 52 TWh in 2015. Overall, Germany's total GHG emissions have been decreasing since 1990; however, GHG emissions from road transport have remained relatively stable and close to 1990 levels. This is due to a combination of increased passenger and freight kilometres over recent decades, as well as an increase in vehicle ownership, especially of heavy duty vehicles.

11. The ERT noted that, during the period 1990–2015, Germany's population and GDP increased by 2.8 and 43.9 per cent, respectively, while GHG emissions per GDP unit and GHG emissions per capita decreased by 49.9 and 29.9 per cent, respectively. GHG emissions in 2015 decreased by 27.9 per cent below the 1990 level. The biggest reduction was in the electricity generation sector owing partly to an increase in use of renewable sources. Table 3 illustrates the national circumstances of Germany by providing some indicators relevant to emissions and removals.

Table 3
Indicators relevant to greenhouse gas emissions and removals for Germany for the period 1990–2015

						Change (%)	
Indicator	*1990*	*2000*	*2010*	*2014*	*2015*	*1990–2015*	*2014–2015*
GDP per capita (thousands 2011 USD using purchasing power parity)	31.39	36.76	40.43	43.42	43.78	39.9	0.8
GHG emissions without LULUCF per capita (t CO_2 eq)	15.75	12.69	11.52	11.17	11.04	–29.9	–1.1
GHG emissions without LULUCF per GDP unit (kg CO_2 eq per 2011 USD using purchasing power parity)	0.50	0.35	0.28	0.26	0.25	–49.9	–1.9

Sources: (1) GHG emission data: Germany's 2017 GHG inventory submission, version 7; (2) population and GDP: World Bank.

Note: The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table.

(b) Assessment of adherence to the reporting guidelines

12. The ERT assessed the information reported in the NC7 of Germany and recognized that the reporting is complete, transparent and adhering to the UNFCCC reporting guidelines on NCs. There were no issues raised during the review relating to the topics discussed in this chapter of the review report.

2. Information on greenhouse gas emissions and removals

(a) Technical assessment of the reported information

13. Total GHG emissions[2] excluding emissions and removals from LULUCF decreased by 27.9 per cent between 1990 and 2015, whereas total GHG emissions including net emissions or removals from LULUCF decreased by 27.2 per cent over the same period. Table 4 illustrates the emission trends by sector and by gas for Germany.

[2] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified. Values in this paragraph are calculated based on the 2017 annual submission, version 7.

Table 4
Greenhouse gas emissions by sector and by gas for Germany for the period 1990–2015

	GHG emissions (kt CO_2 eq)					*Change (%)*		*Share (%)*	
	1990	*2000*	*2010*	*2014*	*2015*	*1990–2015*	*2014–2015*	*1990*	*2015*
Sector									
1. Energy	1 036 736.02	869 936.54	801 652.68	764 409.27	762 231.35	–26.5	–0.3	82.9	84.5
A1. Energy industries	427 353.07	357 414.65	356 325.99	347 269.77	335 396.50	–21.5	–3.4	34.2	37.2
A2. Manufacturing industries and construction	186 700.09	130 060.64	125 254.85	121 394.55	127 060.77	–31.9	4.7	14.9	14.1
A3. Transport	164 403.87	182 766.95	154 209.81	160 124.98	160 806.92	–2.2	0.4	13.1	17.8
A4. and A5. Other	220 311.86	173 397.53	154 580.88	125 076.32	128 263.78	–41.8	2.5	17.6	14.2
B. Fugitive emissions from fuels	37 967.13	26 296.77	11 281.15	10 543.64	10 703.39	–71.8	1.5	3.0	1.2
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NA	NA	NA	NA
2. IPPU	96 642.84	76 894.77	62 534.27	61 445.93	61 534.49	–36.3	0.1	7.7	6.8
3. Agriculture	79 581.56	67 562.78	62 853.35	66 590.89	66 955.17	–15.9	0.5	6.4	7.4
4. LULUCF	–31 311.74	–37 960.40	–16 368.63	–14 877.28	–14 579.84	–53.4	–2.0	NA	NA
5. Waste	37 955.05	28 563.55	14 709.97	11 816.13	11 210.50	–70.5	–5.1	3.0	1.2
6. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indirect CO_2	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA	NA	NA	NA
Gas									
CO_2	1 052 246.81	899 286.37	832 436.65	794 828.97	792 054.50	–24.7	–0.3	84.1	87.8
CH_4	120 293.33	87 736.38	58 259.55	56 008.97	55 616.08	–53.8	–0.7	9.6	6.2
N_2O	64 989.04	43 088.37	36 793.78	38 590.32	39 078.19	–39.9	1.3	5.2	4.3
HFCs	50.32	6 010.19	10 263.64	10 962.51	11 113.43	21 985.5	1.4	0.0	1.2
PFCs	3 060.42	958.68	345.89	234.60	253.67	–91.7	8.1	0.2	0.0
SF_6	4 428.00	4 072.50	3 100.04	3 396.17	3 561.67	–19.6	4.9	0.4	0.4
NF_3	6.88	8.92	61.43	20.28	11.89	72.8	–41.4	0.0	0.0
Total GHG emissions without LULUCF	**1 250 915.47**	**1 042 957.64**	**941 750.27**	**904 262.22**	**901 931.51**	**–27.9**	**–0.3**	**100.0**	**100.0**
Total GHG emissions with LULUCF	**1 219 603.72**	**1 004 997.24**	**925 381.64**	**889 384.93**	**887 351.67**	**–27.2**	**–0.2**	**NA**	**NA**

Source: GHG emission data: Germany's 2017 annual submission, version 7.

14. The decrease in total emissions was driven mainly by factors such as a change from the use of solid fuels to lower-emission liquid and gaseous fuels since 1990; an increase in use of renewable energy sources and the resulting substitution of fossil fuels; commissioning of more efficient industrial plants and facilities; changes in livestock raising conditions and reduction in livestock population; and compliance with statutory provisions on waste management, which have reduced waste-related CH_4 emissions by over 70 per cent since 1990.

15. Between 1990 and 2015, GHG emissions from the energy sector decreased by 26.5 per cent (274,504.67 kt CO_2 eq). This reduction results from a combination of factors, including replacing the use of solid fuels with the use of lower-emission liquid and gaseous

fuels since 1990, an increased use of renewable energy sources and the resulting substitution of fossil fuels, as well as the decline of industry in former East Germany leading to more efficient industrial plants and facilities and less industrial energy use overall. The trend in GHG emissions from fuel combustion from 1990 to 2015 showed notable decreases in energy industries (21.5 per cent or 91,956.57 kt CO_2 eq), manufacturing industries and construction (31.9 per cent or –59,639.32 kt CO_2 eq) and other sectors (41.8 per cent or 92,048.08 kt CO_2 eq). Transport emissions decreased by 2.2 per cent from 1990 to 2015, and represented 17.8 per cent of total national emissions in 2015. Transport emissions are relatively stable because of gains in per-vehicle efficiency offset by an increase in passenger transport (in terms of billions of passenger kilometres) and growth in goods transport (in terms of tonne kilometres). Total energy use decreased by 12.4 per cent between 1990 and 2015. Coal use decreased by 38.2 per cent and gas use increased by 18.5 per cent. Nuclear energy use decreased by 40.0 per cent, currently representing 7.8 per cent of total energy use in 2015, which is lower than the level in 1990 (11.3 per cent). The use of renewable energy sources increased from only 1.8 per cent of total energy in 1990 to 13.8 per cent of total energy supply in 2015.

16. Between 1990 and 2015, GHG emissions from IPPU decreased by 36.3 per cent (35,108.35 kt CO_2 eq). This decrease is primarily attributable to a decrease in emissions in the chemical sector, owing mainly to a significant reduction in N_2O emissions from the production of adipic acid as a consequence of the adoption of abatement systems, which resulted in a reduction of 17,825.78 kt CO_2 eq between 1990 and 2015. Between 1990 and 2015, GHG emissions from the agriculture sector decreased by 15.9 per cent (12,626.38 kt CO_2 eq), owing mainly to a decrease in enteric fermentation emissions (9,882.65 kt CO_2 eq) because of changes in livestock raising conditions and reduction in livestock populations. The LULUCF sector was a net sink of 14,579.84 kt CO_2 eq in 2015; net GHG removals have decreased by 16,731.90 kt CO_2 eq (53.4 per cent) since 1990. The decreasing LULUCF net sink was mainly driven by a shift in the age-class distribution of trees. Between 1990 and 2015, GHG emissions from the waste sector decreased by 70.5 per cent (26,744.55 kt CO_2 eq) owing mainly to changes in waste management regulations resulting in less biogenic waste landfilled, less landfill gas production and increased landfill gas collection.

17. In terms of trends by specific GHGs, the overall reduction in CO_2 emissions (24.7 per cent) between 1990 and 2015 is closely linked to trends in the energy sector. The sharp reduction (14.2 per cent) in emissions in this area seen from 1990 to 1995 was primarily the result of economy restructuring and fuel switching in the "new" German Länder (of former East Germany). The changes in the fuel mix continued, to a somewhat lesser degree, until 2015. Use of natural gas as a substitute for solid and liquid fuels is one of the main reasons for the decreasing trend in CO_2 emissions, which is also reflected in the emission trends for stationary combustion activities. While CO_2 emissions from liquid fuels decreased by about 23 per cent compared to 1990 and CO_2 emissions from solid fuels decreased by as much as about 40 per cent, CO_2 emissions from gaseous fuels increased by roughly 25 per cent over the same period.

18. CH_4 emissions have reduced by 53.8 per cent since 1990. The key driver of this downward trend is in the waste sector, and refers to the decline in the amount of biodegradable organic waste that is landfilled. A second factor in overall CH_4 emission trends is that energy recovery from coal mine CH_4 has increased, while the overall emissions of this gas have decreased (owing to the closure of coal mines). Yet another reason for the CH_4 emission reduction is that livestock populations have been reduced, particularly in the former East Germany, with reductions occurring especially in the first half of the 1990s.

19. Since 1990, N_2O emissions have decreased by 39.9 per cent. The chemical industry has had the greatest influence on N_2O emission reduction, especially in the area of adipic acid production, as a consequence of abatement systems being fitted in 1997 and 2009. N_2O emissions from the chemical industry have reduced by 96.5 per cent with respect to 1990.

20. HFC emissions increased primarily as a result of intensified use of HFCs as refrigerants in refrigeration systems and of the increasing disposal of those systems. The reduction in PFC emissions was achieved primarily through efforts of primary aluminium producers and semiconductor manufacturers. The reduction in SF_6 emissions up to 2003 was due primarily to the use of this gas in automobile tyres being phased out since the mid-1990s.

Similar success has been achieved with soundproof windows, for which production use of SF_6 has been reduced to nearly zero.

21. The ERT noted that, during the period 1990–2015, Germany's GDP per capita increased by 39.9 per cent, while GHG emissions per GDP and GHG emissions per capita decreased by 49.9 and 29.9 per cent, respectively. This decoupling of GHG emissions and GDP or population growth has been influenced mainly by the emission trends as described in paragraphs 14–20 above.

22. The summary information provided on GHG emissions was consistent with the information reported in the 2017 annual submission.

23. During the review, Germany provided additional information, including preliminary GHG inventory data for 2016. This preliminary information reflects a 0.3 per cent increase in total national emissions compared with 2015. The preliminary data show that, in 2016, GHG emissions from the transport sector exceeded the level of 1990 by 1.5 per cent and that GHG emissions in the energy sector continue to decrease despite increased electricity exports (a decrease by 25.6 per cent below the 1990 level).

(b) Assessment of adherence to the reporting guidelines

24. The ERT assessed the information reported in the NC7 of Germany and recognized that the reporting is complete, transparent and adhering to the UNFCCC reporting guidelines on NCs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

3. National system for the estimation of anthropogenic emissions by sources and removals by sinks

(a) Technical assessment of the reported information

25. In the NC7 Germany provided a description of how its national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol is performing the general and specific functions defined in the annex to decision 19/CMP.1 in conjunction with decisions 3/CMP.11 and 4/CMP.11. The description includes most of the elements mandated by paragraph 30 of the annex to decision 15/CMP.1 in conjunction with decision 3/CMP.11. The ERT took note of the review of the national system reflected in the report on the individual review of the 2016 annual submission of Germany.

(b) Assessment of adherence to the reporting guidelines

26. The ERT assessed the information reported in the NC7 of Germany and identified an issue relating to completeness. The specified issue is described in table 5.

Table 5
Findings on the national system for the estimation of anthropogenic emissions by sources and removals by sinks from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation*
1	Reporting requirement specified in paragraph 30 Issue type: completeness Assessment: recommendation	The NC7 did not include information regarding the Party's national system on the elements required by paragraph 30(c)–(g) of the annex to decision 15/CMP.1 in conjunction with decision 3/CMP.11, although this information was reported in the NIR of the 2017 annual submission of Germany. During the review, Germany provided further information on the national system for estimating GHG emissions and removals, including on the three levels of the national system network. Level 1 includes the national single entity in the German Environment Agency. Level 2 is the Co-ordination Committee of the Federal Ministries. Level 3 includes cooperation agreements with industry. The ERT recommends that Germany improve the completeness of its reporting of the national system by including in its next NC information on elements required by

No.	Reporting requirement, issue type and assessment	Description of the finding with recommendation
		paragraph 30(c)–(g) of the annex to decision 15/CMP.1 in conjunction with decision 3/CMP.11, or cross-referencing to the relevant sections of the NIR, where the national system is described in detail.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the reporting guidelines for supplementary information. The reporting on the requirements not included in this table is considered to be complete and transparent.

4. National registry

(a) Technical assessment of the reported information

27. In the NC7 Germany provided information on how its national registry performs the functions in accordance with the annex to decision 13/CMP.1 in conjunction with decision 3/CMP.11 and the annex to decision 5/CMP.1 and complies with the requirements of the technical standards for data exchange between registry systems. The ERT took note of the review of the changes to the national registry reflected in the report on the individual review of the 2016 annual submission of Germany.

(b) Assessment of adherence to the reporting guidelines

28. The ERT assessed the information reported in the NC7 of Germany and identified an issue relating to transparency. The finding is described in table 6.

Table 6
Findings on the national registry from the review of the seventh national communication of Germany

No.	Reporting requirement, issue type and assessment	Description of the finding with recommendation
1	Reporting requirement specified in paragraph 32 Issue type: transparency Assessment: recommendation	Germany provided information on its national registry in its NC7 by referring back to the relevant section of the NC6. The NC6 reported that the EU registry has undergone a major redevelopment with a view to complying with the requirements of Commission regulations (EU) 920/2010 and 1193/2011. However, the ERT noted that the NC7 referred to a different regulation (Commission regulation (EU) 389/2013) as the basis for a major redevelopment of the EU registry. In addition, the ERT noted that any changes to the national registry resulting from changes to the overarching EU registry were not reported in the NC7. During the review, Germany indicated that it will provide in its next NC updated information and clear references to the most recent NIR where an up-to-date description of the national registry is provided. The ERT recommends that Germany provide in its next NC an up-to-date description of the national registry or provide clear references to the most recent NIR where the national registry is described.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the reporting guidelines for supplementary information. The reporting on the requirements not included in this table is considered to be complete and transparent.

B. Information on policies and measures and institutional arrangements

1. Domestic and regional programmes and/or legislative arrangements and procedures related to the Kyoto Protocol

(a) Technical assessment of the reported information

29. For the second commitment period of the Kyoto Protocol, from 2013 to 2020, Germany committed to contributing to the joint EU effort to reduce GHG emissions by 20 per cent below the base-year level (1990). Implementation of the Kyoto Protocol by Germany is underpinned by the EU 2020 climate and energy package, which sets emission reduction targets for 2020, including targets for the member States for the non-ETS sectors under the ESD. Under the EU ETS, emissions in selected industries and production processes are capped by quantity limits throughout the EU. The reduction commitments in the other sectors

are distributed among the member States. As part of effort sharing within the EU, Germany has undertaken to reduce emissions in the non-ETS sectors by 14.0 per cent relative to 2005. The EU 2020 climate and energy package is implemented through Germany's major policy instruments: CAP 2020 (German Government action programme to achieve the goal of reducing GHG emissions by 40 per cent by 2020 compared with 1990), CAP 2050 (German Government long-term low GHG emission development strategy that confirms and specifies the climate target to become extensively GHG -neutral by 2050) and Germany's energy transition. More information on Germany's climate policy and the EU 2020 climate and energy package can be found in chapter II.B.2 below.

30. The federal government, through BMUB, has authority over environmental legislation and transposing EU environmental directives into domestic legislation. Moreover, the federal government is in charge of monitoring the implementation of the above-mentioned policy instruments.

31. Germany has legislative arrangements and administrative procedures in place to make information publicly accessible. In the NC7 Germany provided several examples of information campaigns aimed at enhancing public awareness and increasing civil society participation in legal climate action taken by the German Government. The ERT noted that the NC7 addressed the recommendation from the previous review report to provide information on how Germany makes information on legislative arrangements publicly accessible. The updated information elaborates in more detail how CAP 2050 has aimed to develop a culture of engagement with civil society and the general public through various actions, including public awareness activities and public dialogue processes. Before and during the review, Germany also provided information on the bulletin to be published whenever new legislation in Germany is enacted at the federal level, with similar bulletins serving the same purpose at the Länder level. The ERT considers it useful that Germany include this information in its next NC to further enhance the transparency of its reporting.

32. The ERT noted that, following the encouragements of the previous review report, Germany provided additional information on PaM decision-making processes and the respective roles of the three administrative levels in the NC7. During the review, Germany also referred to a detailed summary of the structure and functioning of the environmental administration in the country and the influence of EU decisions on Germany's climate-related PaMs. However, the ERT noted that the source document from which this summary was taken was not publicly available at the time of the review. The ERT considers it useful that Germany ensure, when referencing key sources of information on issues related to reporting requirements, that such sources of information are official and publicly available (i.e. not preliminary). The ERT also noted that Germany has national legislative arrangements and administrative procedures in place that seek to ensure that the implementation of activities under Article 3, paragraph 3, forest management under Article 3, paragraph 4, and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol also contributes to the conservation of biodiversity and the sustainable use of natural resources. In that regard, the emphasis of climate action efforts in agriculture until 2050 is on reducing emissions and increasing resource efficiency to achieve sustainable agriculture production. The focus of climate action in the LULUCF sector to 2050 is on maintaining and improving the ability of forests to act as sinks through various measures, such as maintaining permanent grassland and the conservation and sustainable management of forests.

(b) Assessment of adherence to the reporting guidelines

33. The ERT assessed the information reported in the NC7 of Germany and identified issues relating to completeness and transparency. The findings are described in table 7.

Table 7
Findings on domestic and regional programmes and/or legislative arrangements and procedures related to the Kyoto Protocol from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation*
1	Reporting requirement specified in paragraph 37 Issue type: completeness Assessment: recommendation	In the previous review report, a completeness issue was identified (FCCC/IDR.6/DEU, paras. 24–25), namely that information on the procedures for addressing cases of non-compliance under domestic law was not provided in the NC6. The ERT noted that Germany has not addressed this issue in its NC7. During the review, Germany clarified that, as part of the draft agreement between the governing parties in the new coalition government, a Climate Action Act, complemented by further relevant acts, which could include establishment of rules for taking action against non-compliance, is to be adopted in 2019. To improve completeness of reporting, the ERT recommends that Germany include information on the procedures for addressing cases of non-compliance under domestic law in its next NC, such as the information provided during the review.

Note: Paragraph numbers listed under reporting requirement refer to the relevant paragraph of the reporting guidelines for supplementary information. The reporting on the requirements not included in this table is considered to be complete and transparent.

2. Policies and measures, including those in accordance with Article 2 of the Kyoto Protocol

(a) Technical assessment of the reported information

34. Germany provided information on its package of PaMs implemented, adopted and planned, by sector and by gas, in order to fulfil its commitments under the Convention and its Kyoto Protocol. Germany reported on its policy context and legal and institutional arrangements put in place to implement its commitments and monitor and evaluate the effectiveness of its PaMs.

35. Germany provided information on a set of PaMs similar to those previously reported. Germany also provided information on changes made since the previous submission to its institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of the progress made towards its target. There have been no changes on its institutional and procedural arrangements since the previous NC.

36. Germany gave priority to implementing the PaMs that make the most significant contribution to its emission reduction efforts. Germany provided information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals in accordance with the objective of the Convention. Germany reported on how it periodically updates its PaMs to reduce greater levels of emissions and on the PaMs that have been discontinued since the previous submission.

37. The key overarching cross-sectoral policy in the EU is the 2020 climate and energy package, adopted in 2009, which includes the revised EU ETS and the ESD. The package is supplemented by renewable energy and energy efficiency legislation and legislative proposals on the 2020 targets for CO_2 emissions from cars and vans, the carbon capture and storage directive, and the general programmes for environmental conservation, namely the 7th Environment Action Programme and the clean air policy package.

38. In operation since 2005, the EU ETS is a cap-and-trade system that covers all significant energy-intensive installations (mainly large point emissions sources such as power plants and industrial facilities) that produce 40–45 per cent of the GHG emissions of the EU. It is expected that the EU ETS will guarantee that the 2020 target (a 21 per cent emission reduction below the 2005 level) will be achieved for sectors under the system. The third phase of the EU ETS started in 2013 and the system now includes aircraft operations (since 2012) as well as N_2O emissions from chemical industries, PFC emissions from aluminium production and CO_2 emissions from industrial processes (since 2013).

39. The ESD became operational in 2013 and covers sectors outside the EU ETS, including transport (excluding domestic and international aviation, and international maritime transport), residential and commercial buildings, agriculture and waste, together accounting for 55–60 per cent of the GHG emissions of the EU. The aim of the ESD is to decrease GHG emissions in the EU by 10 per cent below the 2005 level by 2020 and includes binding annual targets for each member State for 2013–2020.

40. Germany also highlighted EU-wide mitigation actions that are under development, such as the pending comprehensive package of EU legislation involving changes to the fourth trading period of the ETS (2021–2030), further revisions to the Effort Sharing Regulation, and enhanced use of renewable energy sources and energy efficiency targets for 2030. The mitigation action most critical for Germany's contribution to attaining the EU-wide 2020 emission reduction target is the EU ETS, with a projected mitigation impact of 9,000 kt CO_2 eq in 2020.

41. In addition to PaMs such as the EU ETS, which are implemented regionally by EU member States (i.e. EU level), some PaMs are also implemented at the subnational (Länder) and municipal level. All 16 of the German Länder have their own climate action concepts and programmes, as explained in greater detail in the NC6. Since the submission of NC6, 5 of the 16 Länder have adopted their own climate legislation, with draft legislation and/or preparations under way in 2 more. The NC7 also indicates that, in accordance with legislation in some Länder, local authorities are authorized to participate in or implement climate-related PaMs. The German Government supports the engagement of cities and local authorities in climate mitigation and adaptation measures in accordance with the Local Authorities Guideline, which establishes the conditions for funding for local authority-led projects and provides funding through the National Climate Initiative, a programme launched in 2008 to promote and incentivize climate action across all levels of government and sectors of society (e.g. local authorities, educational institutions, companies and consumers). More information on the National Climate Initiative was provided in the NC6.

42. In addition to EU policies (i.e. the ETS and ESD), Germany has introduced a number of national-level policies to achieve its national target (40.0 per cent below the 1990 level by 2020), as elaborated in CAP 2020, *Energiewende* (Germany's "Energy Transition") and CAP 2050. The key policies reported include the Renewable Energy Sources Act, electricity-saving measures and various measures funded by proceeds of ETS trading via the Special Energy and Climate Fund, the Energy Efficiency Fund and the National Climate Initiative. The mitigation effect of the Renewable Energy Sources Act is the most significant, with a projected mitigation impact of 147,000 kt CO_2 eq in 2020. Other policies that are expected to deliver significant emission reductions include putting lignite-fired power plants on standby for reserve capacity (10,000 kt CO_2 eq in 2020), market incentives for renewable energies (3,900 kt CO_2 eq in 2020), energy conservation regulations (3,100 kt CO_2 eq in 2020) and electricity saving measures (3,000 kt CO_2 eq in 2020).

43. Germany highlighted the domestic mitigation actions that are under development in the longer term, such as the programme of measures to be elaborated under CAP 2050 by the end of 2018 and the implementation of sectoral targets to be achieved by 2030, as well as the pending climate legislation that Germany expects to pass in 2019. This legislation is expected to set out legal measures to ensure that Germany meets its 2030 targets.

44. During the review, Germany noted that according to current projections it will have difficulty meeting its target for the non-ETS sectors, as well as its national 2020 target, without the implementation of additional, far-reaching measures. Germany did not provide further information on planned PaMs that could help to close the gap by 2020, but noted the significant challenge of attempting to simultaneously phase out nuclear power and coal-fired power plants in the near term. During the review week, Germany also highlighted the planned procedures to develop further measures to ensure that the 2030 target will be met.

Table 8
Summary of information on policies and measures reported by Germany

Sector	*Key PaMs*	*Estimate of mitigation impact by 2020 (kt CO_2 eq)*	*Estimate of mitigation impact by 2030 (kt CO_2 eq)*
Policy framework and cross-sectoral measures	CAP 2020	67 000–78 000	–
	Energiewende ("Energy Transition")	–	–
	CAP 2050	–	–
	Special Energy and Climate Fund	–	–
	EU ETS	9 003	–
Energy			
Renewable energy	Renewable Energy Sources Act	147 000	–
Energy efficiency	National Action Plan on Energy Efficiency	25 000–30 000	–
Energy supply	Combined Heat and Power Act	2 000	–
	Security reserve (lignite plants)	10 000	–
IPPU	EU regulation 517/2014	NE	–
Agriculture	EU Common Agricultural Policy	NE	–
LULUCF	Maintaining Germany's forest sink	NE	–
Waste	Further improvements to recycling and packaging regulations	NE	–

Note: The estimates of mitigation impact are estimates of emissions of CO_2 or CO_2 eq avoided in a given year as a result of the implementation of mitigation actions.

45. During the review, Germany provided detailed information on how it is assessing the impacts of its mitigation measures and revising its climate policies accordingly. For example, in 2017 a research consortium was commissioned to prepare projection scenarios to predict how emissions in Germany might develop to 2035. The resulting *2017 Projections Report*[3] included an analysis of a WEM scenario reflecting the new climate and energy policy measures introduced to date. This information was then used to further inform the development of CAP 2050, which includes the establishment of guiding principles, key measures and transformative pathways for all sectors by 2050 (including interim sectoral targets for 2030). The pending programme of measures under CAP 2050, which will be developed in further detail at a later date, is intended to ensure that the 2030 target will be achieved and, as part of this effort, environmental, social and economic impacts of each proposed programme will be assessed. Furthermore, the programme of measures under CAP 2050 and the associated assessment of impacts is to be developed in consultation with a wide range of stakeholders, including through the Climate Action Alliance, established in 2015, which will continue to provide stakeholder input to the German Government from representatives of groups of all parts of society, the Länder and local authorities.

46. Another example of Germany's efforts regarding impact assessment is the adoption of a "learning system" approach as part of CAP 2050. This approach involves an iterative policy cycle in which agenda setting, policy formulation, decision-making, policy implementation and policy evaluation are integrated to ensure that Germany's climate policy can effectively adapt to any changing circumstances (i.e. technological advancements, scientific findings or social behaviours).

[3] Available at http://cdr.eionet.europa.eu/de/eu/mmr/art04-13-14_lcds_pams_projections/projections/envwqc4_g/170426_PB_2017_-_final.pdf.

(b) Policies and measures in the energy sector

47. **Energy supply**. *Energiewende* continues to be Germany's primary long-term measure to address the energy sector. The approach under *Energiewende* involves lowering GHG emissions through a combination of increased use of renewable energy sources and increased energy efficiency.

48. The Combined Heat and Power Act (2002), a key measure for promoting CHP plants in Germany, was last amended in 2016. The act establishes a financial bonus for CHP electricity generation above the existing electricity price, particularly where CHP plants are used to replace coal-fired generation. Funding to support CHP measures has recently doubled from EUR 750 million to EUR 1.5 billion per year. The measure is expected to produce a mitigation contribution of 2,000 kt CO_2 eq in 2020, although larger reductions are possible if further efficiencies can be found (e.g. by avoiding emissions occurring outside the electricity sector).

49. In 2015, Germany decided to put a number of lignite-fired power plants on standby for reserve capacity only. Although this measure reduces the overall energy supply and shrinks Germany's energy exports, the associated mitigation impact of this measure is significant, at an estimated net contribution of 10,000 kt CO_2 eq in 2020. During the review, Germany stated that it faces a significant challenge in reducing its GHG emissions as a result of attempting to simultaneously phase out nuclear energy and coal-fired electricity over the coming years.

50. **Renewable energy sources**. Under the Renewable Energy Sources Act (2000), Germany provides incentives for increased production of energy from renewable sources (e.g. feed-in tariffs) and encourages annual increases in energy supply through predefined capacity objectives for both onshore and offshore wind generation and solar generation. During the review, Germany stated that as a result of this programme, renewable energy sources are proving to be attractive to private investment. In turn, financing has facilitated further expansion of renewable energy sources while simultaneously providing a range of social benefits such as stable energy prices and domestic employment. Germany expects a mitigation contribution of 147,000 kt CO_2 eq in 2020 from this programme.

51. **Energy efficiency**. As this is one of the two main pillars of *Energiewende*, Germany places a high importance on energy efficiency measures. The National Action Plan on Energy Efficiency was implemented in 2014 in recognition of the need to extend and expand the existing energy efficiency policy in order to address an anticipated gap in meeting the 2020 target. More than 30 different measures are coordinated under the plan, which include establishing energy efficiency practices in buildings, emphasizing energy saving as a business opportunity and a way of generating returns, and increasing individual awareness and responsibility for energy efficiency. The plan is supported by funding amounting to more than EUR 17 billion and is expected to achieve an emission reduction of between 25,000 and 35,000 kt CO_2 eq in 2020. However, during the review, Germany also noted that energy efficiency measures are taking time to show results, in part because of the challenges associated with measurement of impacts, data availability and changing consumer behaviours.

52. **Residential and commercial sectors**. In its NC7, Germany provided information on a number of PaMs targeting emission reduction in the residential and commercial sectors, several of which overlap with the energy efficiency PaMs described above. Specific examples of buildings-related PaMs are the CO_2 Building Rehabilitation Programme which encourages energy-efficient construction and renovation of residential and non-residential buildings, the Energy Efficiency Incentive Programme which targets the replacement of inefficient heating and ventilation systems, the Market Incentive Programme which promotes the use of renewable energies for heating and cooling, and the National Efficiency Label which helps consumers to identify efficient replacement heating systems. During the review, Germany clarified that the responsibility for enforcing regulatory PaMs in this sector falls to the Länder. Germany also noted that the latest measures in this sector tend to focus on an "envelope" approach in which the entire energy demand of the building is considered as a system when assessing efficiencies and impacts.

53. **Transport sector**. In its NC7, Germany provided an overview of key measures in this sector, including the establishment of CO_2 emission standards for light commercial vehicles,

the expansion of a toll on heavy goods vehicles and incentives for the purchase of electric vehicles. Together, these measures are expected to produce a mitigation impact in the order of 600 kt CO_2 eq in 2020. During the review, Germany explained that emissions from the transport sector have remained relatively stable since 1990. This is despite an increase in kilometres travelled by passengers and a growth in goods transport over the past 50 years. Germany also noted an increase in vehicle ownership compared with previous years. As a result, it is proving difficult to achieve a further reduction in emissions from this sector, and future sectoral targets (i.e. in 2030) may be challenging given that both GDP and population are also steadily increasing.

54. The NC7 includes information on how Germany promotes and implements the decisions of ICAO and IMO to limit emissions from aviation and marine bunker fuels. Germany provided an update on its efforts to support the adoption of the Global Market Based Measure adopted by ICAO in October 2016 and the resulting need to establish new arrangements for the inclusion of flights to and from the European Economic Area from 2017 onward. Germany also provided information on how it is working with other countries on drafting an IMO road map towards an emission reduction strategy that is expected to include a medium-term reduction target (to be adopted in 2018) and a long-term target (to be adopted in 2023) for the shipping sector.

55. **Industrial sector**. Germany also provided information on specific PaMs being implemented in the industrial sector. One of the measures highlighted involves the provision of grant funding to eligible companies to cover the costs of improvements related to energy efficiency (up to EUR 1.5 million to cover up to 20 per cent of the capital cost) for commercial and industrial production processes. These investments have targeted three areas: conversion of production processes, waste heat utilization and further improvements to the production process. This PaM was launched in 2014 and receives support via the Special Energy and Climate Fund.

(c) Policies and measures in other sectors

56. **Industrial processes**. The main measure to address emissions from industrial processes is the implementation of EU regulation 517/2014, which involves a reduction of emissions of F-gases to 70 per cent below the 1990 level by 2030. The regulation also bans the production of certain products containing F-gases and the use of SF_6, while establishing requirements for the maintenance and inspection of equipment containing certain levels of these gases. In the NC7 Germany stated that, by 2015, emissions from the industrial processes sector had been reduced by 36.3 per cent since 1990 and have reached stable levels in recent years.

57. **Agriculture**. PaMs in this sector are mainly determined as a result of market trends, EU policy and national regulatory law. The key PaM for agriculture in Germany continues to be the EU Common Agricultural Policy. In implementing the Common Agricultural Policy, Germany has employed a system of direct payments to farmers that is fully decoupled from production quotas. As a result, there are no longer incentives for overproduction. Rather, payments under this policy are now increasingly tied to "greening" and other environmental requirements. Under this approach, 30 per cent of payments are now dependent on maintaining permanent grassland, crop diversification, and allocating a minimum area (5 per cent) of arable land to "ecological focus areas". Other PaMs focus on the promotion of organic agriculture, including reaching a target share of 20 per cent of all agricultural land by 2030 and increasing the use of manure-based biogas to 30 per cent of farm manure produced by 2025. During the review, Germany explained that, in addition to producing mitigation benefits by 2020 and beyond, PaMs in this sector are providing a range of social and environmental co-benefits and are producing synergies with PaMs in other sectors (e.g. increased manure usage in biogas plants, increase in organic farming and reduced land use for urban development and transport).

58. **LULUCF**. Germany's efforts to maintain grasslands are discussed in paragraph 57 above because they are also directly linked to agricultural PaMs. Additionally, Germany has implemented a number of measures aimed at maintaining its forest sink, including funding for climate-smart forestry, funding for expanding the forested area and support for efforts to conserve, restore and sustainably manage forests internationally. Although Germany does

not intend to directly account for the reduction of emissions resulting from its forest activities, it did note during the review that indirect mitigation benefits are captured in other sectors (e.g. the reduced use of other construction materials owing to the increased use of harvested wood products).

59. **Waste management**. The NC7 noted that Germany intends to adopt a regulation on the anaerobic digestion of waste to further reduce the amount of CH_4 generated in waste digestion plants. This measure will also encourage the use of any biogas generated as a result of digestion as an additional energy source (noting that a share of the emission reduction resulting from this will be reflected in other sectors). Other key measures in this sector include increasing the rate of recovery of secondary raw materials through improved recycling and further revisions to the Packaging Act (2017) that will come into effect in 2019. The revisions aim to reduce emissions by reducing the use of primary raw materials. Although significant mitigation reductions have already been achieved in this sector, during the review Germany stated that the added impact of these new measures is not yet known. Moreover, as Germany shifts away from an approach focused on reducing waste to an approach more focused on generating improved inputs for a circular economy, some of these mitigation impacts will be captured in other sectors. In addition to describing actions taken domestically, Germany also provided information during the review on its international outreach efforts in this sector, explaining how some of its innovative waste policies can be replicated in other countries, in particular developing countries.

(d) Minimization of adverse impacts in accordance with Article 2 and Article 3, paragraph 14, of the Kyoto Protocol

60. As part of the supplementary information under the Kyoto Protocol, in its NC7, Germany reported information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, including the adverse effects of climate change and effects on international trade and social, environmental and economic impacts on other Parties, especially developing country Parties. Germany also provided updated information on measures aimed at minimizing adverse impacts related to bioenergy production, as well as adaptation support provided to other countries.

61. Further information on how Germany strives to implement its commitments under Article 3, paragraph 14, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties was reported in the 2017 annual submission. The reporting included information on the assessment of the economic and social consequences of response measures, adverse effects of climate change, minimization of effects on international trade and social, environmental and economic impacts on other Parties. In its NC7, Germany explained that most measures in Germany are not expected to have direct adverse effects and others are expected to have positive impacts on developing countries, according to qualitative analysis. Almost all of the possible indirect effects are also considered to be positive. During the review, Germany presented several measures aimed at minimizing adverse impacts which are related to, among other issues, the promotion of sustainability criteria for biofuels, the elimination of coal subsidies and the provision of support to developing countries to diversify their energy supplies.

(e) Assessment of adherence to the reporting guidelines

62. The ERT assessed the information reported in the NC7 of Germany and identified four issues relating to transparency. The findings are described in table 9.

Table 9
Findings on policies and measures, including those in accordance with Article 2 of the Kyoto Protocol from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement[a] specified in paragraph 17 Issue type: transparency Assessment: recommendation	Information in the NC7 was provided on PaMs by sector. However, information was not subdivided by GHG or supplemented with a summary table. To improve the transparency of reporting on PaMs in future NCs, the ERT recommends that Germany provide information on PaMs according to the UNFCCC reporting guidelines on NCs, including by presenting the information by gas and summarizing the information in a table.
2	Reporting requirement[a] specified in paragraph 22 Issue type: transparency Assessment: recommendation	Information was not provided in the NC7 using the subject headings required by paragraph 22 of the UNFCCC reporting guidelines on NCs (i.e. name and short description of PaM, objectives of the PaM, GHGs affected, type of PaM, status of implementation and implementation entity). To improve the transparency of reporting on PaMs in future NCs, the ERT recommends that Germany adhere to the reporting guidance and present information using the subject headings required in paragraph 22 of the UNFCCC reporting guidelines on NCs. When this information appears in previous NCs, or in the BR, the ERT encourages Germany to clearly cross-reference the relevant information.
3	Reporting requirement[a] specified in paragraph 25 Issue type: transparency Assessment: recommendation	Information on how PaMs are modifying longer-term GHG trends was provided in the NC7, but was included in the projections chapter, rather than in the PaMs chapter. This information was also presented at the sectoral level, instead of by individual PaMs. To improve the transparency of reporting on PaMs in future NCs, the ERT recommends that Germany include information on how its PaMs are modifying longer-term GHG emission trends in the PaMs chapter or clearly cross-reference relevant information provided in other chapters. Where possible, the ERT also suggests providing this information by specific PaM or programme of PaMs to increase transparency on the effectiveness of the individual measures or packages of measures.
4	Reporting requirement[b] specified in paragraph 36 Issue type: transparency Assessment: recommendation	The information provided in the NC7 did not clearly identify how Germany strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, despite the fact that Germany's NC6 clearly included this required information. The ERT noted that the BR3 reported more detailed information on this issue; however, the NC7 did not include a clear reference to where this information was contained in the BR3. During the review, Germany clarified that sections 4.5.3 and 4.5.4 of the NC7 provide relevant information on this matter. Additionally, Germany provided further information on the analysis of adverse effects of PaMs on developing countries, including a summary of relevant results. The ERT noted the additional information provided during the review would enhance transparency if included in future NCs. Therefore, to enhance the transparency of future reports, the ERT recommends that Germany clearly identify in the next NC information on how it strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects (e.g. by using separate headings) and provide any additional, relevant information.

Note: The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

[a] Paragraph numbers listed under reporting requirement refer to the relevant paragraph of the UNFCCC reporting guidelines on NCs.

[b] Paragraph number listed under reporting requirement refers to the relevant paragraph of the reporting guidelines for supplementary information.

C. Projections and the total effect of policies and measures, including information on supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol

1. Projections overview, methodology and results

(a) Technical assessment of the reported information

63. Germany reported updated projections for 2020, 2025, 2030 and 2035 relative to actual inventory data for 2014 under the WEM scenario. The WEM scenario reported by Germany includes implemented and adopted PaMs launched by 31 July 2016.

64. In addition to the WEM scenario, Germany reported a WAM scenario. The WAM scenario includes planned PaMs. Germany provided a definition of its scenarios, explaining that its WEM scenario includes all new climate and energy measures launched by 31 July 2016 and existing ones that had been substantially modified by the same date, while its WAM scenario primarily includes the PaMs that are set out in CAP 2020 and the National Action Plan on Energy Efficiency, but which have not yet been implemented. The definitions indicate that the scenarios were prepared according to the UNFCCC reporting guidelines on NCs.

65. Germany did not report a WOM scenario. During the review, Germany provided information describing the difficulty of producing a WOM scenario including that for each PaM there are different assumptions for assessing the impact of the measure. For example, different policies have different start years, so depending on when the start year of an overall WOM scenario was chosen, it would lead to different results as compared to an individual PaM analysis.

66. The projections are presented on a sectoral basis, using the same sectoral categories as those used in the reporting on mitigation actions, and on a gas-by-gas basis for CO_2, CH_4, N_2O, PFCs, HFCs and SF_6 (treating PFCs and HFCs collectively in each case), as well as NF_3 for 1990–2014, 2020, 2025, 2030 and 2035. The projections are also provided in an aggregated format for each sector and for total emissions using GWP values from the AR4.

67. Germany did not report emission projections for indirect GHGs such as carbon monoxide, nitrogen oxides, non-methane volatile organic compounds or sulfur oxides.

68. Emission projections related to fuel sold to ships and aircraft engaged in international transport were reported separately, as were emissions and removals for the LULUCF sector. Neither was included in the national totals. Germany reported on factors and activities affecting emissions and removals for each sector.

69. Germany implemented a recommendation made in the previous review report, namely to include more information on the results of sensitivity analyses in the projections section of the report, and the ERT commends Germany for its improved reporting.

(b) Methodology, assumptions and changes since the previous submission

70. The methodology used for the preparation of the projections is identical to that used for the preparation of the emission projections for the NC6 and BR2. Germany reported supporting information further explaining the methodologies. One difference is that previous GHG emission projections used the GWPs from the IPCC Second Assessment Report and the current GHG emissions projections are based on GWPs from AR4.

71. During the review, Germany presented additional information on the modelling approach, including the approach used in the *2017 Projections Report* (see para. 45 above). The analysis was conducted by linking detailed sectoral analyses through an energy system model which then feeds into an emissions calculation model to generate GHG emission estimates consistent with Germany's GHG inventory. Germany also described the challenges related to the timing and processes involved with developing projection reports every other year (i.e. on alternate years), noting in particular the fact that projections are developed prior to the availability of the final inventory data in a given year. Therefore, in the NC7 Germany

presented projections relative to actual inventory data for 2014 and not relative to inventory data for 2015, which were available later, before the time of the submission of the NC7.

72. To prepare its projections, Germany relied on the following key underlying assumptions: the German resident population rises minimally between 2012 and 2014, then decreases slightly but steadily in the years to follow, with just under 79 million inhabitants expected for 2035; relatively steady growth for economic development to 2035; gross value added in the manufacturing sector experiences strong growth in the same period, rising from EUR 473 billion (2010) in 2015 to EUR 542 billion (2035); and the price for crude oil in 2035 is significantly higher than in 2015. These variables and assumptions were reported in CTF table 5 and table 15 of the NC7. The assumptions used to produce the projections were based on the recommendations under the EU Monitoring Mechanism Regulation for the trends in resident population, GDP, crude oil prices and the price of EU emission allowances.

73. Germany provided information in its NC7 and in CTF table 5 on the key variables and assumptions used in the preparation of the projection scenarios. Germany did not provide information on changes to the assumptions in the NC7. During the review, Germany provided additional information on the selection of key variables and included information on how the variables changed from the previous projections report. Germany also provided information in its NC7 on sensitivity analyses, including an overview of parameters modified and the impact on results.

74. Sensitivity analyses were conducted for a number of important assumptions, such as demographic and economic trends. The assumed economic growth was increased and the decline in the population was reduced in both the WEM and the WAM scenarios. For both scenarios, the calculation showed that the sensitivity around demographic and economic trends had minimal impacts on the 2020 results (less than 1 per cent change). A sensitivity analysis around the effect of lower electricity exports was also examined, which resulted in a considerable reduction of emissions of around 36 Mt CO_2 eq in 2020 or around 3 per cent in 2020 compared with 1990 in both the WEM and the WAM scenarios, reflecting the relative importance of the assumption around electricity exports.

75. As a result of the sensitivity analyses performed by Germany and presented in the NC7 around some of the key parameters in the projections analysis (see para. 72), under the WEM scenario, the range in GHG emission reductions in 2020 compared with 1990 is projected to be from 33.7 to 37.5 per cent. Under the WAM scenario, the range in GHG emission reductions in 2020 compared to 1990 is projected to be from 34.5 to 38.4 per cent. The lower range of reduction results is associated with stronger economic growth, while the higher range of reduction results is associated with a lower electricity export balance.

(c) Results of projections

76. The projected emission levels under different scenarios and information on the Kyoto Protocol targets and the quantified economy-wide emission reduction target are presented in table 10 and the figure below. Germany's national emission reduction target, as well as projected ESD emissions and AEAs under the ESD, are also presented in the figure below.

Table 10
Summary of greenhouse gas emission projections for Germany

	GHG emissions (kt CO_2 eq per year)	*Changes in relation to base-year[a] level (%)*	*Changes in relation to 1990 level (%)*
Kyoto Protocol base year[b]	1 253 599.34	NA	0.2
Quantified emission limitation or reduction commitment under the Kyoto Protocol (2013–2020)[c]	NA	NA	NA
Quantified economy-wide emission reduction target under the Convention[d]	NA	NA	NA
Domestic target	750 549.28	–40.1	–40.0
Inventory data 1990[e]	1 250 915.47	–0.2	NA
Inventory data 2015[e]	901 931.51	–28.1	–27.9

	GHG emissions (kt CO_2 eq per year)	*Changes in relation to base-year[a] level (%)*	*Changes in relation to 1990 level (%)*
WOM projections for 2020[f]	NE	NE	NE
WEM projections for 2020[f]	816 368.00	–34.9	–34.7
WAM projections for 2020[f]	805 623.00	–35.7	–35.6
WOM projections for 2030[f]	NE	NE	NE
WEM projections for 2030[f]	734 524.00	–41.4	–41.3
WAM projections for 2030[f]	682 048.00	–45.6	–45.5

[a] "Base year" in this column refers to the base year used for the target under the Kyoto Protocol, while for the target under the Convention the base year for Germany is 1990 and the changes in relation to this year are showed in the last column.

[b] The Kyoto Protocol base-year level of emissions is provided in the initial review report, contained in document FCCC/IRR/2016/DEU.

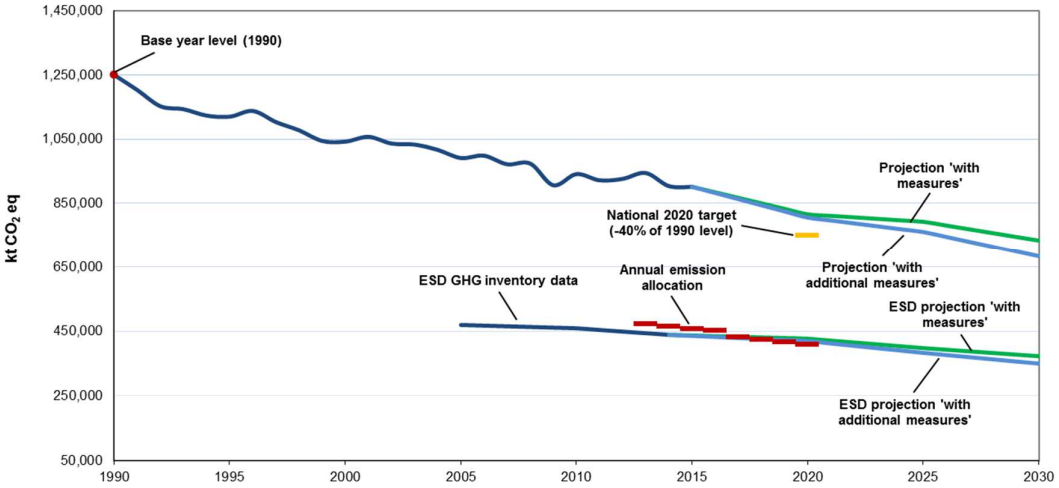
[c] The Kyoto Protocol target for the second commitment period (2013–2020) is a joint target of the EU and its 28 member States and Iceland. The target is to reduce emissions by 20 per cent compared with the base-year (1990) level by 2020. The target for non-ETS sectors is 14.00 per cent for Germany under the ESD.

[d] The quantified economy-wide emission reduction target under the Convention is a joint target of the EU and its 28 member States. The target is to reduce emissions by 20 per cent compared with the base-year (1990) level by 2020.

[e] From Germany's 2017 annual inventory submission, version 7.

[f] From Germany's NC7 and/or BR3.

Greenhouse gas emission projections reported by Germany



Sources: (1) data for the years 1990–2015: Germany's 2017 annual inventory submission; total GHG emissions excluding LULUCF; (2) data for the years 2015–2030: Germany's NC7 and BR3; total GHG emissions excluding LULUCF.

77. During the review, Germany provided additional information on the most recent emission trends and projections. Germany's GHG emissions in 2016 were 2,548.99 kt CO_2 eq more than in 2015 (0.3 per cent), which represents the second emissions increase in successive years. Furthermore, the projections in the BR3 and NC7 were based on GDP growth assumptions of 1.3 per cent between 2015 and 2020. Actual annual GDP growth was 2.2 per cent in 2017 and is projected to be 2.4 per cent in 2018, indicating that it will be increasingly difficult to reach the national target in 2020.

78. Germany's Kyoto Protocol target for the second commitment period (2013–2020) is a joint target for the EU and its 28 member States and Iceland. The target is to reduce emissions by 20.0 per cent in the period 2013–2020 compared with the Kyoto Protocol base-year level. Under the Convention, Germany's target is also a joint target for the EU and its 28 member States: a 20.0 per cent reduction by 2020 compared with 1990. The EU targets are split into the EU ETS (which is an EU-wide target, and it is expected that the market mechanism of the EU ETS will guarantee that emissions from sectors under this scheme will

achieve the 2020 target) and the ESD for sectors not covered by the EU ETS (see paras. 39 and 40 above). The target for Germany is a reduction of 14.0 per cent between 2005 and 2020 under the ESD. In addition, Germany has set itself an ambitious national target of a 40.0 per cent reduction by 2020 compared with the 1990 level.

79. During the review, Germany further highlighted measures under way to ensure that the 2030 national target will be met, such as the programme of measures to be elaborated under CAP 2050 by the end of 2018 and the implementation of sectoral targets to be achieved by 2030, as well as the pending climate legislation that Germany expects to pass in 2019, as described in paragraph 43 above.

80. Germany's total GHG emissions excluding LULUCF in 2020 and 2030 are projected to be 816,368.00 and 734,524.00 kt CO_2 eq, respectively, under the WEM scenario, which represents a decrease of 34.7 and 41.2 per cent below the 1990 level, respectively. Under the WAM scenario, emissions in 2020 and 2030 are projected to be lower than those in 1990 by 35.5 and 45.4 per cent, amounting to around 805,623 and 682,048 kt CO_2 eq, respectively. The 2020 projections suggest that Germany will continue contributing to the achievement of the EU target under the Convention (see para. 78 above).

81. Germany's target for non-ETS sectors is to reduce its total emissions by 14.0 per cent below the 2005 level by 2020 (see para. 29 above). Germany's AEAs, which correspond to its national emission target for non-ETS sectors, change linearly from 472,527.65 kt CO_2 eq in 2013 to 410,908.76 kt CO_2 eq for 2020. According to the projections under the WEM scenario, emissions from non-ETS sectors are estimated to reach 426,298.00 kt CO_2 eq by 2020. Under the WAM scenario, Germany's emissions from non-ETS sectors in 2020 are projected to be 418,785.00 kt CO_2 eq. The projected level of emissions under the WEM and WAM scenarios are 3.7 and 1.9 per cent, respectively, above the AEA for 2020. The ERT noted that this suggests that Germany may face challenges in meeting its target for non-ETS sectors under both the WEM and the WAM scenarios.

82. In addition to its target for non-ETS sectors, Germany committed itself to achieving a domestic target of a 40.0 per cent reduction in emissions below the 1990 level by 2020. The projections indicate that Germany may face challenges in achieving its domestic target, without the implementation of new, far-reaching measures. Germany's total GHG emissions in 2020 are projected to be only 34.7 per cent and 35.5 per cent below the 1990 level under the WEM and WAM scenarios, respectively.

83. Germany presented the WEM and WAM scenarios by sector for 2020 and 2030, as summarized in table 11.

Table 11
Summary of greenhouse gas emission projections for Germany presented by sector

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
	1990	*2020*		*2030*		*1990–2020*		*1990–2030*	
Sector		*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
Energy (not including transport)	684 598	408 946	403 590	365 193	327 367	–40.3	–41.0	–46.7	–52.2
Transport	164 404	159 100	158 430	150 033	139 009	–3.2	–3.6	–8.7	–15.4
Industry/industrial processes	283 089	173 414	170 927	148 318	147 038	–38.7	–39.6	–47.6	–48.1
Agriculture	79 770	66 276	64 202	65 115	63 142	–16.9	–19.5	–18.4	–20.8
LULUCF	–31 279	29 081	29 081	19 174	19 174	–193.0	–193.0	–161.3	–161.3
Waste	37 966	8 633	8 473	5 866	5 494	–77.3	–77.7	–84.5	–85.5
Other (specify)									
Total GHG emissions without LULUCF	**1 249 829**	**816 368**	**805 623**	**734 524**	**682 048**	**–34.7**	**–35.5**	**–41.2**	**–45.4**

Source: Germany's BR3 CTF table 6.

84. According to the projections reported for 2020 under the WEM scenario, the most significant emission reductions are expected to occur in the energy sector (excluding transport), amounting to projected reductions of 275,652.00 kt CO_2 eq (40.3 per cent) between 1990 and 2020. The second largest amount of reductions is projected to occur in the industry/industrial processes sector with reductions of 109,675.00 kt CO_2 eq (38.7 per cent) between 1990 and 2020. The agriculture and waste management/waste sectors are projected to reduce emissions by 13,494.00 kt CO_2 eq (16.9 per cent) and 29,333.00 kt CO_2 eq (77.3 per cent) between 1990 and 2020, respectively. Finally, the transportation sector has the lowest projected reduction with 5,304.00 kt CO_2 eq (3.2 per cent) between 1990 and 2020.

85. The pattern of projected emissions reported for 2030 under the WEM scenario remains the same: the most significant emission reductions are expected to occur in the energy sector (excluding transport), amounting to projected reductions of 319,405.00 kt CO_2 eq (46.7 per cent) between 1990 and 2030. The second largest reductions are projected to occur in the industry/industrial processes sector with reductions of 134,771.00 kt CO_2 eq (47.6 per cent) between 1990 and 2030. The agriculture and waste management/waste sectors are projected to reduce emissions by 14,655.00 kt CO_2 eq (18.4 per cent) and 32,100.00 kt CO_2 eq (84.5 per cent) between 1990 and 2030, respectively. The transportation sector still has the lowest projected reductions in 2030, but represents a significant improvement over the 2020 reduction projections due to increasing implementation of measures over time (e.g. increased electrification). The transportation sector projected emission reductions are 14,371.00 kt CO_2 eq (8.7 per cent) between 1990 and 2030.

86. If additional measures are considered (i.e. under the WAM scenario), the patterns of emission reductions by 2020 and 2030 presented by sector and by gas generally remain the same. The most significant emission reductions are still expected to occur in the energy sector (excluding transport), amounting to projected reductions of 281,008.00 kt CO_2 eq (41.0 per cent) and 357,231.00 kt CO_2 eq (52.2 per cent) between 1990 and 2020 and between 1990 and 2030, respectively. The biggest difference between the WEM and the WAM scenarios occurs in the transportation sector in 2030 where, under the WAM scenario, transportation is no longer projected to be the sector contributing the lowest amount of emission reductions. The transportation sector projected emission reductions are 25,395.00 kt CO_2 eq (15.4 per cent) between 1990 and 2030 under the WAM scenario.

87. Germany presented the WEM and WAM scenarios by gas for 2020 and 2030, as summarized in table 12.

Table 12
Summary of greenhouse gas emission projections for Germany presented by gas

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
	1990	*2020*		*2030*		*1990–2020*		*1990–2030*	
Gas		*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
CO_2	1 052 238	713 243	704 796	646 059	595 871	–32.2	–33.0	–38.6	–43.4
CH_4	119 235	51 223	51 109	46 707	46 528	–57.0	–57.1	–60.8	–61.0
N_2O	65 189	37 811	35 837	36 638	34 529	–42.0	–45.0	–43.8	–47.0
HFCs	50	9 358	9 148	3 553	3 553	18 616.0	18 196.0	7 006.0	7 006.0
PFCs	3 060	242	242	230	230	–92.1	–92.1	–92.5	–92.5
SF_6	4 344	4 319	4 319	1 165	1 165	–0.6	–0.6	–73.2	–73.2
NF_3	7	20	20	20	20	185.7	185.7	185.7	185.7
Total GHG emissions without LULUCF	**1 249 829**	**816 368**	**805 623**	**734 524**	**682 048**	**–34.7**	**–35.5**	**–41.2**	**–45.4**

Source: Germany's BR3 CTF table 6.

88. For 2020 the most significant reductions are projected for CO_2 emissions: 338,995.00 kt (32.2 per cent) between 1990 and 2020. Reductions are also projected for CH_4 with 68,012.00 kt CO_2 eq (57.0 per cent) between 1990 and 2020 and for N_2O with 27,378.00 kt CO_2 eq (42.0 per cent) between 1990 and 2020. HFCs are expected to increase by 9,308.00 kt CO_2 eq (18,616.0 per cent) between 1990 and 2020.

89. The pattern of projected emissions reported for 2030 under the WEM scenario remains the same, with the most significant reductions projected for CO_2 emissions: 406,179.00 kt (38.6 per cent) between 1990 and 2030. Reductions for CH_4 are projected to be 72,528.00 kt CO_2 eq (60.8 per cent) between 1990 and 2030 and reductions in N_2O are projected to be 28,551.00 kt CO_2 eq (43.8 per cent) between 1990 and 2030. HFCs are only expected to increase by 3,503.00 kt CO_2 eq (7,006.0 per cent) between 1990 and 2030.

90. If additional measures are considered (i.e. in the WAM scenario), the patterns of emission reductions by 2020 and 2030 presented by gas remain the same.

91. The ERT noted that in the BR2, under the WEM scenario, Germany projected total GHG emission reductions excluding LULUCF of 33.4 and 43.5 per cent below the 1990 level in 2020 and 2030, respectively. As shown in table 12 above, in this NC7 under the WEM scenario, Germany projected reductions in total GHG emissions excluding LULUCF of 34.7 and 41.2 per cent below the 1990 level in 2020 and 2030, respectively. This represents a slight increase in projected GHG emission reductions for 2020, but less of a reduction in 2030 under the WEM scenario. Under the WAM scenario in the NC7, emissions in 2020 and 2030 are projected to be lower than those in 1990 by 35.5 and 45.4 per cent, respectively. The BR2 did not present a WAM scenario for comparison.

(d) Assessment of adherence to the reporting guidelines

92. The ERT assessed the information reported in the NC7 of Germany and identified four issues relating to transparency. The findings are described in table 13.

Table 13
Findings on greenhouse gas emission projections reported in the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement[a] specified in paragraph 28 Issue type: transparency Assessment: encouragement	The ERT noted that Germany did not report a WOM scenario. The ERT also noted that, according to the UNFCCC reporting guidelines on NCs, Parties are required to report a WEM projection and may report WOM and WAM projections. During the review, Germany provided information describing the difficulty of producing a WOM scenario, including the fact that for each PaM there are different assumptions for assessing the impact of the measure. To enhance the transparency of the reporting, the ERT encourages Germany to provide information in its next NC describing the difficulties involved in developing a WOM scenario that would be consistent across all the PaMs considered.
2	Reporting requirement[a] specified in paragraph 32 Issue type: transparency Assessment: encouragement	The ERT noted that Germany reported 2015 inventory data in the NC7, but projections were based on 2014 data as the starting point. The ERT also noted that, according to the UNFCCC reporting guidelines on NCs, the starting point for the WEM and WAM projections should generally be the latest year for which inventory data are available in the NC. During the review, Germany described the challenges related to the timing and processes involved with developing projection reports every other year (i.e. on alternate years), noting in particular the fact that projections are developed prior to the availability of the final inventory data in a given year. To improve the transparency of the reporting, the ERT encourages Germany to provide, in its next NC, information describing the timing and processes involved with the preparation of the projection reports and to provide an explanation for why the latest year for which inventory data are available in the NC is not used as a starting point for projections.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
3	Reporting requirement[a] specified in paragraph 43 Issue type: transparency Assessment: encouragement	The ERT noted that Germany did not explain in its NC7 how the modelling approach used for the projections accounts for any overlap or synergies that may exist between different PaMs as indicated by the UNFCCC reporting guidelines on NCs. During the review, Germany provided explanations on how the modelling approach accounts for overlaps or synergies between different PaMs and between different sectors. To enhance the transparency of its reporting, the ERT encourages Germany to provide information in its next NC describing how the projections modelling approach accounts or does not account for any overlap or synergies that may exist between different PaMs and specifically between different sectors.
4	Reporting requirement[a] specified in paragraph 45 Issue type: transparency Assessment: encouragement	The ERT noted that Germany reported on the assumptions used in the NC7 projections, but not how they differed from those reported in the NC6. The ERT also noted that, according to the UNFCCC reporting guidelines on NCs, Parties should report the main differences in the assumptions, methods employed and results between projections in the current NC and those in earlier NCs. During the review, Germany indicated that it will provide more complete information in its next NC describing how the main assumptions used in the projections differ from those used in previous reported projections. To enhance the transparency of the reporting, the ERT encourages Germany to provide information in its next NC describing how the main assumptions used in the NC projections differ from those used in previous NC projections, for example on GDP growth rate.

Note: The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

[a] Paragraph numbers listed under reporting requirement refer to the relevant paragraph of the UNFCCC reporting guidelines on NCs.

2. Assessment of the total effect of policies and measures

(a) Technical assessment of the reported information

93. In the NC7 Germany presented an estimate of the total effect of its implemented and adopted PaMs, in accordance with the WEM scenario. Germany also presented the total effect of its additional quantified PaMs under the WAM scenario compared with the WEM scenario. Finally, Germany provided the aggregate reduction effects under the WAM scenario resulting from all PaMs under the WEM and WAM scenarios taken together. Information is presented in terms of GHG emissions avoided or sequestered on a CO_2 eq basis, in 2020, 2025, 2030 and 2035, by sector where the activities are occurring. It also presented relevant information on factors and activities for each sector for 1990–2035.

94. Germany has implemented the recommendation made in the previous review report that it report on historical emissions by gas. The NC7 shows a summary of trends and projections in overall emissions of CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3 for the period 1990–2035 in five-year increments. However, the ERT noted that it is not clear whether the overall emission trends reported for 2020, 2025, 2030 and 2035 include the total effect of the implemented PaMs, as requested by the UNFCCC reporting guidelines on NCs in terms of GHG emissions avoided or sequestered, by gas, in historical and projected years.

95. Germany reported that the total estimated effect of its adopted and implemented PaMs is 33,500.00 kt CO_2 eq in 2020 and 53,600.00 kt CO_2 eq in 2030. According to the information reported in the NC7, PaMs implemented in the energy sector (excluding transport) will deliver the largest emission reductions in 2020 (17,000.00 kt CO_2 eq), followed by PaMs implemented in the industry/industrial processes (10,800.00 kt CO_2 eq) and households (4,700.00 kt CO_2 eq) sectors. According to the information reported in the NC7, PaMs implemented in the industry/industrial processes sector will deliver the largest emission reductions in 2030 (27,900.00 kt CO_2 eq), followed by PaMs implemented in the residential (15,700.00 kt CO_2 eq) and energy (excluding transport) (9,000.00 kt CO_2 eq) sectors.

96. Germany reported that the total estimated effect of its adopted, implemented and planned PaMs is 48,800.00 kt CO_2 eq in 2020 and 105,800.00 kt CO_2 eq in 2030. According to the information reported in the NC7, PaMs implemented and planned in the energy sector (excluding transport) will deliver the largest emission reductions in 2020 (26,000.00 kt CO_2 eq), followed by PaMs implemented and planned in the industry/industrial processes (13,500.00 kt CO_2 eq) and residential (4,900.00 kt CO_2 eq) sectors. According to the information reported in the NC7, PaMs implemented and planned in the energy sector (excluding transport) will deliver the largest emission reductions in 2030 (41,000.00 kt CO_2 eq), followed by PaMs implemented and planned in the industry/industrial processes (33,300.00 kt CO_2 eq) and residential (15,700.00 kt CO_2 eq) sectors.

97. Table 14 provides an overview of the total effect of PaMs as reported by Germany.

Table 14
Projected effects of Germany's planned, implemented and adopted policies and measures by 2020 and 2030

	2020		*2030*	
Sector	*Effect of implemented and adopted measures (kt CO_2 eq)*	*Effect of planned measures (kt CO_2 eq)*	*Effect of implemented and adopted measures (kt CO_2 eq)*	*Effect of planned measures (kt CO_2 eq)*
Energy (without transport)	17 000.00	9 000.00	9 000.00	32 000.00
Transport	800.00	600.00	600.00	11 000.00
Industrial processes	10 800.00	2 700.00	27 900.00	5 400.00
Residential	4 700.00	200.00	15 700.00	0.00
Agriculture	0.00	2 600.00	600.00	3 000.00
Waste management	200.00	200.00	200.00	800.00
Total	**33 500.00**	**15 300.00**	**53 600.00**	**52 200.00**

Source: Germany's NC7 and BR3.
Note: The total effect of implemented and adopted PaMs is defined as the difference between the WOM and the WEM scenarios; the total effect of planned PaMs is defined as the difference between the WEM and the WAM scenarios. Germany did not report a WOM scenario.

(b) Assessment of adherence to the reporting guidelines

98. The ERT assessed the information reported in the NC7 of Germany and identified an issue relating to transparency. The finding is described in table 15.

Table 15
Findings on the assessment of the total effect of policies and measures from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 40 Issue type: transparency Assessment: recommendation	The NC7 presented the total effects of PaMs on a CO_2 eq basis for years 2020, 2025, 2030 and 2035 and presented historical and projected data on total emissions by gas for the period 1990–2035; however, it is not clear if the historical data and trends reported by gas include the total effects of implemented PaMs for 2020 to 2035. During the review, Germany confirmed that the reported estimates in terms of GHG emissions avoided or sequestered by gas include the total effect of its PaMs with the exception of waste management in 2025 under the WEM secenraio. To improve the transparency of the reporting, the ERT recommends that Germany provide in its next NC information to confirm that the reported estimates in terms of GHG emissions avoided or sequestered, by gas (on a CO_2 eq basis), include the total effect of its PaMs in 2020–2035.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

3. Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol

(a) Technical assessment of the reported information

99. In the NC7 Germany did not provide explicit information on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action, nor did it elaborate on supplementarity, as such. The ERT noted that, as reported in CTF table 2(e)I of the BR3, Germany does not plan to use market-based mechanisms to meet its Kyoto Protocol target. However, the NC7 did not contain an explicit reference to the section in the BR3 where this was discussed. The ERT also noted that Germany indicated in its BR3 that credits from Kyoto Protocol mechanisms will be used, if necessary, within the ESD. During the review, Germany confirmed through a formal statement that the majority of emission reductions used to achieve its Kyoto Protocol target for the second commitment period are intended to be a result of domestic PaMs.

(b) Assessment of adherence to the reporting guidelines

100. The ERT assessed the information reported in the NC7 of Germany and identified an issue relating to completeness. The finding is described in table 16.

Table 16
Findings on supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation*
1	Reporting requirement specified in paragraph 33 Issue type: completeness	Germany did not provide an explicit statement in its NC7 regarding how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action and how its domestic action thus constitutes a significant element of the effort made to meet its commitments for the second commitment period of the Kyoto Protocol. The ERT noted that this issue was also identified in the previous review report.
	Assessment: recommendation	During the review, Germany formally confirmed that the majority of emission reductions used to achieve its Kyoto Protocol target for the second commitment period are intended to be a result of domestic PaMs. Germany also informed the ERT that currently it does not intend to use international market-based mechanisms towards the fulfilment of its Kyoto Protocol target in 2020 and has therefore not provided any information on supplementarity of action in the NC7. This is also confirmed in CTF table 2(e)I of the BR3. To increase the completeness of the reporting, the ERT recommends that Germany include explicit information in its next NC on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action and how its domestic action thus constitutes a significant element of the effort made to meet its commitments under Article 3, paragraph 1 bis, of the Kyoto Protocol.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the reporting guidelines for supplementary information. The reporting on the requirements not included in this table is considered to be complete and transparent.

D. Provision of financial and technological support to developing country Parties, including information under Articles 10 and 11 of the Kyoto Protocol

1. Financial resources, including under Article 11 of the Kyoto Protocol

(a) Technical assessment of the reported information

101. Germany reported information on the provision of financial support required under the Convention and its Kyoto Protocol, including on financial support provided, committed and pledged, allocation channels and annual contributions. The ERT commends Germany

for adopting a more systematic and streamlined framework for reporting on its financial support, as a follow-up to recommendations made in the previous review report.

102. Germany indicated the financial resources it has provided and clarified how it has determined such resources as being "new and additional" by including the definition of "new and additional climate finance" in the documentation box of CTF tables 7. The ERT noted that the NC7 neither included a definition of "new and additional" financial resources nor provided a clear reference to the relevant definition in CTF tables 7. During the review, Germany clarified how it has determined resources as being "new and additional" and explained that its definition of "new and additional" is "newly committed or disbursed climate finance during the corresponding reporting years" (see table 18 below).

103. Germany described how its resources address the adaptation and mitigation needs of non-Annex I Parties. It also described how those resources assist non-Annex I Parties to mitigate and adapt to the adverse effects of climate change, facilitate economic and social response measures, and contribute to technology development and transfer and capacity-building related to mitigation and adaptation. Germany reported information on the assistance it has provided to developing country Parties that are particularly vulnerable to the adverse effects of climate change to help them meet the costs of adaptation to those adverse effects. Germany confirmed during the review that this assistance included a financial contribution to the Adaptation Fund (see table 17 below).

104. With regard to the most recent financial contributions aimed at enhancing the implementation of the Convention by developing countries, Germany reported that its climate finance has been allocated on the basis of priority areas, such as efforts to reduce GHG emissions, adapt to the impacts of climate change and protect forests and biodiversity, including REDD-plus activities.[4] As stated in a BMUB official document "Climate Action in Figure – Facts, Trends and Incentives for German Climate Policy"(2017 edition), Germany provided developing and emerging countries with financial support from its budget and grant elements in development loans of the German development bank (KfW).[5] Financed measures for development and implementation of ambitious climate action and adjustment measures range from funding for the largest and the most modern solar complex in Ouarzazate, Morocco, through forest and species conservation in Colombia, to coastal protection measures in Viet Nam. Table 17 includes some of the information reported by Germany on its provision of financial support.

Table 17
Summary of information on provision of financial support by Germany in 2013–2016
(Millions of United States dollars)

Allocation channel of public financial support	*Year of disbursement*			
	2013	*2014*	*2015*	*2016*
Official development assistance[a]	20 049.7	24 873.2	21 264.3	28 655.8
Climate-specific contributions through multilateral channels, including:			418.0	602.7
Global Environment Facility	60.3	59.8	49.2	65.0
Least Developed Countries Fund	40.8	39.8	33.3	27.7
Special Climate Change Fund	26.7	23.9	3.3	
Adaptation Fund	40.8	66.3	55.5	55.3
Green Climate Fund	1.0	1.3	20.1	78.3
Financial institutions, including regional development banks			207.4	245.5
United Nations bodies			9.5	61.5

[4] In decision 1/CP.16, paragraph 70, the Conference of the Parties encouraged developing country Parties to contribute to mitigation actions in the forest sector by undertaking the following activities: reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks.

[5] https://www.kfw.de/kfw.de-2.html.

Allocation channel of public financial support	*Year of disbursement*			
	2013	*2014*	*2015*	*2016*
Other			39.7	69.4
Climate-specific contributions through bilateral, regional and other channels			7 792.9	8 837.7

[a] *Sources*: (1) Query Wizard for International Development Statistics, available at http://stats.oecd.org/qwids/; (2) BR3 CTF tables; (3) Table 17 of the NC7; (4) Revised data provided by Germany during the review.

(b) Assessment of adherence to the reporting guidelines

105. The ERT assessed the information reported in the NC7 of Germany and identified an issue relating to transparency. The finding is described in table 18.

Table 18
Findings on financial resources, including under Article 11 of the Kyoto Protocol, from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement[a] specified in paragraph 51 Issue type: transparency Assessment: recommendation	The ERT noted that the NC7 did not provide information on how Germany has determined that financial resources provided are "new and additional". The ERT also noted that Germany included the definition of "new and additional climate finance" in the documentation box of CTF tables 7. During the review, Germany explained that its definition of "new and additional" is "newly committed or disbursed climate finance during the corresponding reporting years". To enhance the transparency of the reporting, the ERT recommends that Germany include its definition of "new and additional" financial resources in its next NC submission.

Note: The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

[a] Paragraph number listed under reporting requirement refers to the relevant paragraphs of the UNFCCC reporting guidelines on NCs.

2. Technology development and transfer, including information under Article 10 of the Kyoto Protocol

(a) Technical assessment of the reported information

106. Germany provided information on steps, measures and activities related to technology transfer, access and deployment benefiting developing countries, including information on activities undertaken by the public and private sectors. Germany provided examples of support provided for the deployment and enhancement of the endogenous capacities and technologies of non-Annex I Parties.

107. The ERT noted that Germany reported on its PaMs as well as success and failure stories in relation to technology transfer, and in particular on measures taken to promote, facilitate and finance the transfer and deployment of climate-friendly technologies. For example, through the German Climate Technology Initiative, BMZ is financing modern, climate-friendly and climate-adapted infrastructure measures in emerging economies and developing countries. BMZ is also very active in making contributions to renewable energy development in Africa through the Africa-EU Renewable Energy Cooperation Programme and the Africa-EU Energy Partnership. The ERT also noted that the NC7 did not use table 6 of the UNFCCC reporting guidelines on NCs to provide a description of selected projects or programmes that promote practicable steps to facilitate and/or finance the transfer of, or access to, environmentally sound technologies.

108. Germany provided information on steps taken to promote, facilitate and finance the transfer of technology to developing countries and to build their capacity in order to facilitate implementation of Article 10 of the Kyoto Protocol.

(b) Assessment of adherence to the reporting guidelines

109. The ERT assessed the information reported in the NC7 of Germany and identified an issue relating to completeness. The finding is described in table 19.

Table 19
Findings on technology development and transfer, including information under Article 10 of the Kyoto Protocol from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement[a] specified in paragraph 55 Issue type: completeness Assessment: recommendation	The ERT noted that although Germany reported activities related to technology transfer and success and failure stories in relation to technology transfer, table 6 of the UNFCCC reporting guidelines on NCs, with a description of selected projects or programmes that promoted practicable steps to facilitate and/or finance the transfer of, or access to, environmentally sound technologies, was not provided in the NC7. To increase the completeness of the reporting, the ERT recommends that Germany, in its next NC, report, where feasible, information on any projects or programmes aimed at facilitating and/or financing the transfer of, or access to, environmentally sound technologies using table 6 of the UNFCCC reporting guidelines on NCs.

Note: The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

[a] Paragraph number listed under reporting requirement refers to the relevant paragraphs of the UNFCCC reporting guidelines on NCs.

E. Vulnerability assessment, climate change impacts and adaptation measures

1. Technical assessment of the reported information

110. In the NC7 Germany provided the required information on the expected impacts of climate change in the country; adaptation policies covering regional, sectoral and cross-sectoral vulnerabilities and considerations; and an outline of the actions taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation.

111. Germany provided a description of the climate change vulnerability and impacts on buildings, biodiversity, soil, fisheries, forestry, trade and industry, agriculture, human health, tourism, transport and transport infrastructure and the water sector. The areas of Germany that are most vulnerable to climate change are those located in regions of the country with a warm climate and which are most exposed to heat stress and drought, as well as areas susceptible to floods.

112. During the review, Germany provided information regarding the challenges that it faces in the light of climate change, and action required to overcome these challenges. Germany also highlighted the adaptation response actions taken to date at different levels of government and in different vulnerable areas and sectors, as described in the German Adaptation Strategy to Climate Change (2008).

113. As described in the NC7 a number of adaptation measures were set out in Germany's APA II, including (1) spatial planning and civil protection, (2) development of planning instruments to facilitate better integration of climate change adaptation requirements into planning processes, (3) water regime and water management, (4) raising awareness among actors in the finance industry and (5) exchanging experiences on improving available data sources and improving available data resources.

114. During the review, Germany provided more information about its adaptation policy and strategy and elaborated further on the progress report (2015) for the German climate adaptation strategy. Additionally, Germany explained how the vulnerability and adaptation chapter of the NC7 had been structured accordingly. Germany also highlighted that the key message obtained from the progress report is the need to transition from primarily short-term projects to longer-term projects.

115. Germany included in its NC7 clear information on the expected impacts of climate change and an outline of the actions taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to facilitating adequate adaptation, and the use of methodologies and tools developed at the national level to assess climate change impacts. Germany explained that it did not use the IPCC *Technical Guidelines for Assessing Climate Change Impacts and Adaptations* and the UNEP *Handbook on Methods for Climate Change Impacts Assessment and Adaptation Strategies* for its assessment of vulnerability and development of adaptation strategies. During the review, Germany clarified that it also used its own methodologies and handbook for assessing climate change impacts, which are fully consistent with the above-mentioned IPCC and UNEP guidance. A number of tools, guidelines and methodologies have been developed and included in federal research projects on adaptation processes, such as the *Tatenbank* catalogue of projects on the impacts of adaptation to climate change, *Klimalotse* (climate guide), *Stadtklimalotse* (urban climate guide) and *Klimanavigator* (climate navigator).

116. Consideration has been given to addressing adaptation matters with the adoption of APA I in 2011, which provided further direction to government agencies on enhancing preparedness for climate change. The federal government commissioned an impact analysis on climate change, yielding a variety of recommended measures. One such measure referred to climate impact prevention, which is currently carried out in many areas related to flood protection, green development, avoidance of land sealing and heat preparedness. During the review, Germany indicated that lack of resources for the implementation of adaptation activities has been noticed in some small municipalities. Table 20 summarizes the information on vulnerability and adaptation to climate change presented in the NC7 of Germany.

Table 20
Summary of information on vulnerability and adaptation to climate change reported by Germany

Vulnerable area	*Examples/comments/adaptation measures reported*
Agriculture and food security	*Vulnerability*: Growing season has increased from 222 days to 230 days. Changes in seasonal weather patterns have both positive and negative effects. Changes in the composition of the crops and the natural development phases of species owing to a gradual increase in temperature. Change in water supply has adverse impacts on food security. *Adaptation*: Introduction of "market-oriented and site-adapted farming" to reduce the use of resources, and making farming easier to adapt to climate change. The federal government is planning several research activities to address conditions brought by climate change into agriculture.
Biodiversity and natural ecosystems	*Vulnerability*: Spread of invasive species and changes in the composition and the natural development phases of species owing to increases in temperature. *Adaptation*: The Länder have established a system to monitor the direct and indirect impacts of climate change on biodiversity. Planned activities include further research on biodiversity and climate change, and continuing support for measures to increase adaptive capacity to climate change.
Coastal zones	*Vulnerability:* Damage to coasts caused by rising sea levels, increased storm swells and increased storm surges. Risks include heavy rains and flash floods which can cause damage to buildings and infrastructure in urban areas. *Adaptation*: Development of the framework plan entitled "Coastal Protection Measures in Response to Climate Change" for the period 2009–2025. Measures include monitoring and provision of data on water levels, providing information on the physical and chemical status of water bodies and integrating coastal zone management (e.g. coastal engineering).
Fisheries	*Vulnerability*: Changes in species composition and natural development phases owing to gradual increase in water temperature. *Adaptation*: Development of the Adaptation Strategy to Climate Change and the Improvement of Fisheries Management in the North Sea and Baltic Sea, under the EU Common Fisheries Policy, as of 2010. The German Government is also planning to organize a sustainable, ecosystem-friendly fisheries management system.
Forests	*Vulnerability*: Forests suffering from heat and drought stress as a result of summer heat and a long dry season. Extreme weather events can cause early leaf drop and slow growth. The risk of losses caused by pest infestations is likely to increase with climate change. *Adaptation*: The German institution Waldklimafonds is implementing measures to enhance the potential of forests and woodlands to adapt to climate change. Measures include restoration and planting new natural or

Vulnerable area	*Examples/comments/adaptation measures reported*
	environmentally managed riparian and moist forests. The Ministry of Finance is also funding measures to develop a stable mixed forest that is well-adapted to climate change.
Human health	*Vulnerability*: Damage caused by rising heat stress and climate-related spread of infectious diseases. *Adaptation*: Implement measures to monitor the spread of disease vectors in connection with relevant climate signals. Assess activities to expand and reinforce health and environmental monitoring, to develop an integrated health and environmental monitoring system, and to develop heat action plans. The Federal Ministry of Health/Robert Koch Institute, BMUB and German Environment Agency initiated a human health project in climate-related development of morbidity and infectious diseases. The German Environment Agency is planning to provide a health information campaign for the wider public targeting particularly sensitive groups.
Infrastructure and economy	*Vulnerability*: Heavy rains and floods, snow, ice and storms cause damage to roads, buildings and infrastructure for rail, air and marine transport. *Adaptation*: The Adaptation of Road Infrastructure to Climate Change programme has developed adaptation options and technologies for road and transport infrastructure. The federal government is establishing activities in relation to climate change adaptation for the waterways and navigation in Germany. The Federal Ministry of Transport/Federal Railway Authority will implement appropriate adaptation activities for rail infrastructure and rail traffic.
Water resources	*Vulnerability*: Heavy rains and flash floods affect water management and water balance. Growing regional differences in availability of water. Salinization of groundwater through the rise in sea level, extreme weather events and increasing water scarcity. *Adaptation*: Development of the Impacts of Climate Change on Waterways and Navigation research programme (KLIWAS) and the implementation of the Climate Change and Consequences for Water Management cooperation project (KLIWA).

117. Germany provided a detailed description of international adaptation activities. These activities include (1) promoting adaptation in the context of the international climate regime (the Convention and its Kyoto Protocol) and development cooperation, such as providing funding to developing countries to assist them in implementing their nationally determined contributions and REDD-plus activities and providing support to developing countries to assist them in implementing activities related to other international conventions; (2) international cooperation in the field of adaptation research and development; (3) efforts to strengthen the resilience of poor, vulnerable population groups in developing countries; and (4) the launch of the Climate Risk Insurance Initiative, with the aim of creating access to direct or indirect insurance against climate risks for vulnerable people. Germany also provided information on bilateral cooperation with developing countries on adaptation, such as development cooperation in funding measures resulting from the Copenhagen and Cancun Agreements, in addition to the implementation of the International Climate Initiative under the BMUB, which supports developing countries and countries with emerging economies and economies in transition to build their capacities on adaptation, as well as providing other climate services. The German federal government is also aiming to increase its international engagement and support to vulnerable developing countries to support their adaptation efforts.

2. Assessment of adherence to the reporting guidelines

118. The ERT assessed the information reported in the NC7 of Germany and identified an issue relating to transparency. The finding is described in table 21.

Table 21
Findings on the vulnerability assessment, climate change impacts and adaptation measures from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 49	Germany provided information in its NC7 on support provided to Africa for cooperation in research and technological development, protection from drought and flood, and other initiatives related to energy and drought. However, this information

Issue type: transparency	was included as part of chapters 4 and 6 of the NC7 (Policies and measures, and Financial support and technology cooperation, respectively).
Assessment: encouragement	To enhance the transparency of the reporting, the ERT encourages Germany, in its next NC, to cross-reference any relevant information on issues related to vulnerability and adaptation assessments in the appropriate chapters of the NC.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

F. Research and systematic observation

1. Technical assessment of the reported information

119. Germany provided information on its general policy and funding relating to research and systematic observation, and both domestic and international activities, including contributions to the World Climate Programme, the International Geosphere–Biosphere Programme, GCOS and the IPCC. Germany also provided information on the identification of opportunities for and barriers to free and open international exchange of data and information and on action taken to overcome such barriers.

120. Germany has implemented and planned to implement international and domestic policies and programmes on climate change research, systematic observation and climate modelling that aim to advance capabilities to predict and observe the physical, chemical, biological and human components of the Earth's system over space and time. BMBF developed FONA3, which is a key national research programme implementing the German National Sustainability Strategy and the federal government's High-Tech Strategy, supporting sustainability research and aiming to develop innovative solutions for challenges such as climate change, the loss of biodiversity, land degradation and a lack of resources, and to deliver decision-making tools for future oriented action. FONA3 also supports preventative research in three main areas: the global common goods climate, biodiversity and the oceans; intelligent use of resources; and the improvement of living standards and competitiveness in Germany. For example, it promoted the development of innovative marine measurement technology for the long-term observation of changes in the marine environment. BMBF made a significant contribution to climate research through three major collaborative projects: (1) Regional Atlantic Circulation and Global Change, (2) Biological Impacts of Ocean Acidification and (3) Surface Ocean Processes in the Anthropocene. In another important initiative, the Federal Ministry for Economic Affairs and Energy launched, at the end of 2016, a consultation process to prepare for the 7th Energy Research Programme, which is aiming to systematically realign funding policy with the objectives and requirements of *Energiewende* and to build on the progress achieved. During the review, Germany provided more information about its research landscape, which includes energy, earth and environment, health, new technologies for production, raw materials and use of CO_2, aeronautics, space and transport. Germany also elaborated further on its national research strategy.

121. In terms of activities related to systematic observation, Germany reported on national plans, programmes and support for ground- and space-based climate observing systems, including satellite and non-satellite climate observation. Germany also reported on challenges related to the maintenance of a consistent and comprehensive observation system. Germany has a national GCOS coordinator set up at the German Weather Service. The Party also continued to increase its support for GCOS by providing additional voluntary contributions to fund the implementation of activities and running of the GCOS secretariat. Further efforts were undertaken by Germany for the systematic observation activities in atmosphere, oceans, land surfaces, cryospheric climate observations and multi-source remote sensing observation systems. Sharing environmental data in Germany is regulated by the Spatial Data Access Act (*Geodatenzugangsgesetz*) of 2009. Germany has a range of different data available, for example Spatial Data Infrastructure Germany is an initiative to implement an efficient and innovative provision of public spatial data in the framework of a web-based, networked and standard-based spatial data infrastructure. The Alfred Wegener Institute for Polar and Marine Research is responsible for operating the German paleoclimate databases.

During the review, Germany provided more details on its contribution to the Atmospheric Essential Climate Variables to GCOS.

122. The NC7 reflects actions taken to support capacity-building and the establishment and maintenance of observation systems and related data and monitoring systems in developing countries. Germany provided funding for scientists from developing countries working on global climate change research. Germany is implementing its international responsibilities through strengthening cooperation with developing countries. This is done through the following programmes: research for sustainable development of cities of tomorrow, regional research and service centres for climate change and adaptive land management, and a funding programme on International Partnerships for Sustainable Technologies and Services for Climate Protection and the Environment management in Africa. Germany also supports emerging economies and developing countries to establish and operate observation systems and systems for data management, as well as climate monitoring systems.

2. Assessment of adherence to the reporting guidelines

123. The ERT assessed the information reported in the NC7 of Germany and identified an issue relating to transparency. The finding is described in table 22.

Table 22
Findings on research and systematic observation from the review of the seventh national communication of Germany

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 63 Issue type: transparency Assessment: encouragement	Germany provided information on highlights, innovations and efforts made with regard to climate modelling and prediction in its NC7, including information on a wide range of models used to predict future climate; however, no reference was made to the use of general circulation models. During the review, Germany indicated that it uses general circulation models as a transitional stage between the initial models and the currently used climate predicting models. To enhance the transparency of the reporting, the ERT encourages Germany to provide information in its next NC on highlights, innovations and efforts made with regard to its use of general circulation models.

Note: Paragraph number listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs. The reporting on the requirements not included in this table is considered to be complete, transparent and adhering to the UNFCCC reporting guidelines on NCs.

G. Education, training and public awareness

1. Technical assessment of the reported information

124. In the NC7 Germany provided information on its actions relating to education, training and public awareness at the domestic level. The Party provided information on the general policy on education, training and public awareness, primary, secondary and higher education, public information campaigns, training programmes, education materials and resource and information centres.

125. Germany did not report on the extent of public participation in the preparation or domestic review of the NC. During the review, Germany clarified that this exercise of public participation was not done during the domestic review of the NC7, because public consultation is mainly done for future policy plans and programmes, such as CAP 2050, in which civil society was highly engaged. This information was confirmed with representatives of civil society and business organizations during the review.

126. Environmental education in the BMUB follows the principles of education for sustainable development in providing action-oriented and participatory civic education; this service is offered by BMUB. BMUB, through the National Climate Initiative, funds

education projects to increase awareness about climate action among teachers and students. BMUB also publishes monthly newsletters to provide information on its projects and activities. During the review, Germany provided details about its planned and ongoing school educational projects.

127. The federal government of Germany supports climate action through public awareness work, including information campaigns on CAP 2020 and energy transition. BMUB offers a variety of free action-oriented educational resources on climate change in primary, secondary and higher education.

128. Regarding training, BMUB supports the Vocational Education for Sustainable Development programme. This funding programme focuses on increasing environmental and climate action in 14 projects. The projects were implemented in 2015 as part of the first round of funding. Four of the projects target people working on building construction. BMUB also coordinates with other initiatives and agencies to enhance access to climate information by providing newsletters, brochures, information and advisory services. During the review, Germany noted that it supports a range of international capacity development activities, which include elements of education or training activities. Additionally, Germany noted that it provides education and training through the International Climate Initiative.

2. Assessment of adherence to the reporting guidelines

129. The ERT assessed the information reported in the NC7 of Germany and recognized that the reporting is complete, transparent and adhering to the UNFCCC reporting guidelines on NCs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

III. Conclusions and recommendations

130. The ERT conducted a technical review of the information reported in the NC7 of Germany in accordance with the UNFCCC reporting guidelines on NCs. The ERT concludes that the reported information mostly adheres to the UNFCCC reporting guidelines on NCs and that the NC7 provides an overview of the national climate policy of Germany.

131. The information provided in the NC7 includes all elements of the supplementary information under Article 7 of the Kyoto Protocol, with the exception of information on supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol. Supplementary information under Article 7, paragraph 1, of the Kyoto Protocol on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol was provided by Germany in its 2018 annual submission.

132. Germany's total GHG emissions excluding LULUCF covered by its quantified economy-wide emission reduction target were estimated to be 27.9 per cent below its 1990 level, whereas total GHG emissions including LULUCF were 27.2 per cent below its 1990 level in 2015. The decrease in emissions was driven mainly by factors such as a change from the use of solid fuels to lower-emission liquid and gaseous fuels since 1990; increase in use of renewable energy sources and the resulting substitution of fossil fuels; commissioning of more efficient industrial plants and facilities; changes in livestock raising conditions and reduction in livestock population; and compliance with statutory provisions on waste management, which significantly reduced CH_4 emissions.

133. Germany's main policy framework relating to energy and climate change is CAP 2050. As part of CAP 2050, interim sectoral targets have been established to 2030, and a specific programme of measures to reduce emissions to 2030 will be further elaborated in 2018. Presently, the mitigation actions with the most significant mitigation impact include CAP 2020, *Energiewende*, the EU ETS and the Renewable Energy Sources Act. Germany also intends to pass additional legislation in 2019 to support its medium- and long-term climate change goals.

134. The GHG emission projections provided by Germany include those under the WEM and WAM scenarios. In the two scenarios, emissions are projected to be 34.7 and 35.5 per cent below the 1990 level in 2020, respectively. On the basis of the reported information, the

ERT concludes that Germany may face challenges in achieving its national 2020 target (40.0 per cent reduction below the 1990 level by 2020) under the WEM and WAM scenarios. According to the projections under the WEM scenario, emissions from non-ETS sectors are estimated to reach 426,298.00 kt CO_2 eq by 2020. Under the WAM scenario, Germany's emissions from non-ETS sectors in 2020 are projected to be 418,785.00 kt CO_2 eq. The projected level of emissions under the WEM and WAM scenarios are 3.7 and 1.9 per cent, respectively, above the AEAs for 2020. On the basis of the reported information, the ERT concludes that Germany may face challenges in achieving its target for non-ETS sectors.

135. The projections indicate that Germany may not be on track to meet its Kyoto Protocol target for the second commitment period (ESD contribution equivalent to 14.0 per cent reduction below the 1990 level by 2020), under the WEM and WAM scenarios. Similarly, without the implementation of additional, far-reaching measures in the near term, Germany is not on track to meet its national target of a 40 per cent reduction below the 1990 level by 2020.

136. The NC7 did not contain information explaining how Germany's use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action or how its domestic action thus constitutes a significant element of its overall efforts. Similarly, Germany did not include a specific description of supplementarity in its NC. During the review, Germany formally confirmed that the majority of emission reductions used to achieve its Kyoto Protocol target are intended to be a result of domestic PaMs. Germany confirmed that it is not planning to make use of the marked-based mechanisms to meet its Kyoto Protocol target.

137. Germany continued to provide climate financing to developing countries in line with its climate finance programmes such as the NDC Partnership, InsuResilience (the G7 climate risk insurance initiative), the Africa Renewable Energy Initiative, the NAMA Facility and the AFR100 initiative. Germany has nearly doubled its contributions since the NC6, and its public financial support in 2015 and 2016 totalled USD 7,969.6 million and USD 9,232.2 million per year, respectively. For those years, Germany's support provided for mitigation action was higher than its support provided for adaptation. The largest share of financial support went to projects in the energy sector, followed by measures that cut across various sectors.

138. Germany developed its Adaptation Strategy for Climate Change (2008) with the aim of identifying vulnerabilities to climate change impacts, while increasing adaptive capacity. The NC7 describes how Germany has approved its APA II, which includes a number of ongoing adaptation activities. In addition, Germany reported that it has in place a wide range of federal climate change and adaptation services, as well as a well-established climate change modelling and scenario system to predict future changes. Considerable progress has been made in relation to reporting on adaptation policy, as well as on monitoring and evaluation of the Adaptation Strategy.

139. Germany provided information on its domestic and international activities relating to research and systematic observation and global climate observation systems, as well as on general policies and funding of research and systematic observation. Germany has implemented domestic and international programmes on climate change research and systematic observation and on climate modelling, and has plans for further implementation of activities in this area. Germany provided information on the support it has provided to developing countries in this area.

140. Germany provided information on activities, policies and actions in relation to education, training and public awareness implemented domestically. Germany also reported on the information campaigns and educational training programmes already implemented as well as those that are planned. Information on advisory services in the areas of energy, renewable energy sources and climate change mitigation was also included in the NC7.

141. In the course of the review, the ERT formulated the following recommendations for Germany to improve its adherence to the UNFCCC reporting guidelines on NCs and its reporting of supplementary information under the Kyoto Protocol:[6]

(a) To improve the completeness of its reporting by:

(i) Providing information regarding its national system on elements required by paragraph 30(c)–(g) of the annex to decision 15/CMP.1 in conjunction with decision 3/CMP.11, or a specific reference to the place in the NIR of its annual submission where the national system is described in detail (see issue 1, table 5);

(ii) Providing information on the procedures for addressing cases of non-compliance under domestic law (see issue 1, table 7);

(iii) Providing explicit information on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action and how its domestic action thus constitutes a significant element of the effort made to meet its commitments under Article 3, paragraph 1 bis, of the Kyoto Protocol (see para. 99 above or table 16);

(iv) Reporting, where feasible, information on any projects or programmes aimed at facilitating and/or financing the transfer of, or access to, environmentally sound technologies using table 6 of the UNFCCC reporting guidelines on NCs (see para. 107 above or table 19);

(b) To improve the transparency of its reporting by:

(i) Providing an up-to-date description of the national registry or providing clear references to the most recent NIR where the national registry is described (see para. 27 and table 6);

(ii) Providing information on PaMs according to the UNFCCC reporting guidelines on NCs, including by presenting the information by gas and summarizing the information in a table (see issue 1, table 9);

(iii) Providing information on PaMs using the subject headings required in paragraph 22 of the UNFCCC reporting guidelines on NCs (see issue 2, table 9);

(iv) Providing information on how PaMs are modifying longer-term GHG emission trends in the PaMs chapter or clearly cross-referencing relevant information provided in other chapters of the NC (see issue 3, table 9);

(v) Providing information on how Germany strives to implement PaMs under Article 2 of the Kyoto Protocol in such a way as to minimize adverse effects, and providing any additional, relevant information on this matter (see issue 4, table 9);

(vi) Providing information to confirm that the reported estimates in terms of GHG emissions avoided or sequestered, by gas (on a CO_2 eq basis), include the total effect of its PaMs in 2020–2035 (see para. 94 above or table 15);

(vii) Providing the definition of "new and additional" financial resources (see para. 102 above or table 18).

IV. Questions of implementation

142. During the review the ERT assessed the NC7, including the supplementary information provided under Article 7, paragraph 2, of the Kyoto Protocol, and reviewed the information on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol with regard to timeliness, completeness, transparency and adherence to the UNFCCC reporting guidelines on NCs. No questions of implementation were raised by the ERT during the review.

[6] The recommendations are given in full in the relevant sections of this report.

Annex

Documents and information used during the review

A. Reference documents

2017 GHG inventory submission of Germany. Available at https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/submissions/national-inventory-submissions-2017.

BR3 of Germany. Available at https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/national-communications-and-biennial-reports-annex-i-parties/submitted-biennial-reports-brs-from-annex-i-parties.

BR3 CTF tables of Germany. Available at https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/national-communications-and-biennial-reports-annex-i-parties/submitted-biennial-reports-brs-from-annex-i-parties.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories". Annex to decision 24/CP.19. Available at http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications". FCCC/CP/1999/7. Available at http://unfccc.int/resource/docs/cop5/07.pdf.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex to decision 15/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex III to decision 3/CMP.11. Available at http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf.

"Guidelines for review under Article 8 of the Kyoto Protocol". Annex to decision 22/CMP.1. Available at http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf.

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Report on the individual review of the annual submission of Germany submitted in 2016. FCCC/ARR/2016/GER. Available at https://unfccc.int/documents/28367#beg.

Report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of Germany FCCC/IRR/2016/DEU. Available at http://unfccc.int/files/national_reports/annex_i_natcom_/application/pdf/26795831_germany-nc7-1-171220_7_natcom_to_unfccc.pdf.

Report of the technical review of the second biennial report of Germany. FCCC/TRR.2/DEU. Available at https://unfccc.int/documents/9269#beg.

Report on the technical review of the sixth national communication of Germany. FCCC/IDR.6/DEU. Available at https://unfccc.int/process/transparency-and-

reporting/reporting-and-review-under-the-convention/national-communications-and-biennial-reports--annex-i-parties/international-assessment-and-review/review-reports.

Revisions to the guidelines for review under Article 8 of the Kyoto Protocol. Annex I to decision 4/CMP.11. Available at http://unfccc.int/resource/docs/2015/cmp11/eng/08a01.pdf.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Ilka Wagner (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety), including additional material. The following documents[1] were provided by Germany:

Germany. 2014. *Climate Action Programme 2020*. Federal Ministry for the Environment, Nature Conservation, Building, and Nuclear Safety. Available at https://www.bmu.de/en/publication/climate-action-programme-2020.

Germany. 2016. *Climate Action Plan 2050 – Principles and goals of the German government's climate policy*. Federal Ministry for the Environment, Nature Conservation, Building, and Nuclear Safety. Available at https://www.bmu.de/en/publication/climate-action-plan-2050-principles-and-goals-of-the-german-governments-climate-policy.

2017 Projections Report for Germany, pursuant to Regulation (EU) No. 525/2013.

[1] Reproduced as received from the Party.