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Report on the technical review of the eighth national communication and the technical review of the fifth biennial report of Bulgaria

Parties included in Annex I to the Convention were requested by decision 6/CP.25 to submit their eighth national communication to the secretariat by no later than 31 December 2022. 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 eighth national communication and relevant supplementary information under the Kyoto Protocol of Bulgaria, 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".

Developed country Parties were requested by decision 6/CP.25 to submit their fifth biennial report to the secretariat by no later than 31 December 2022. This report presents the results of the technical review of the fifth biennial report of Bulgaria, 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".

The review of these submissions took place in Bonn from 27 to 31 March 2023.

Contents

Abbreviations and acronyms

AEA	annual emission allocation
Annex II Party	Party included in Annex II to the Convention
AR	Assessment Report of the Intergovernmental Panel on Climate Change
BR	biennial report
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COVID-19	coronavirus disease 2019
CTF	common tabular format
ERT	expert review team
ESD	European Union effort-sharing decision
ESR	European Union effort-sharing regulation
EU	European Union
EU ETS	European Union Emissions Trading System
ExEA	Executive Environment Agency of Bulgaria
GCOS	Global Climate Observing 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
MoEW	Ministry of Environment and Water of Bulgaria
N_2O	nitrous oxide
NA	not applicable
NAPCC	National Action Plan on Climate Change
NC	national communication
NECP	National Energy and Climate Plan
NF_3	nitrogen trifluoride
NMVOC	non-methane volatile organic compound
NO	not occurring
NO_X	nitrogen oxides
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”
RES	renewable energy source(s)
SF_6	sulfur hexafluoride
SO_X	sulfur oxides

UNFCCC reporting guidelines on BRs	"UNFCCC biennial reporting guidelines for developed country Parties"
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 centralized technical review of the NC8 and BR5 of Bulgaria. The review was organized 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 IV: UNFCCC guidelines for the technical review of biennial reports from Parties included in Annex I to the Convention" and "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.1).

2. In accordance with decision 13/CP.20, a draft version of this report was transmitted to the Government of Bulgaria, which did not provide any comments.

3. The review was conducted together with the review of three other Parties included in Annex I to the Convention from 27 to 31 March 2023 in Bonn by the following team of nominated experts from the UNFCCC roster of experts: Souhila Bouilouta (Algeria), Yeshiwork Assefa Ejigu (Ethiopia), Dirk Guenther (Germany), Kirsten May (United Kingdom of Great Britain and Northern Ireland), Dzmitry Melekh (Belarus), Irene Papst (Germany), Adam Pogorzelski (Poland), Sirintornthep Towprayoon (Thailand) and Teame Tsegai (Eritrea). Adam Pogorzelski and Sirintornthep Towprayoon were the lead reviewers. The review was coordinated by Agnieszka Patoka-Janowska and Marion Vieweg-Mersmann (secretariat).

B. Summary

4. The ERT conducted a technical review of the information reported in the NC8 of Bulgaria in accordance with the UNFCCC reporting guidelines on NCs,[1] 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[2] and of the information reported in the BR5 of Bulgaria in accordance with the UNFCCC reporting guidelines on BRs.[3]

1. Timeliness

5. The NC8 was submitted on 23 December 2022, before the deadline of 31 December 2022 mandated by decision 6/CP.25. The NC8 was resubmitted on 31 March 2023 to address issues raised during the review. The resubmission included changes and additions to information related to the GHG inventory, PaMs, projections, vulnerability assessment, climate change impacts and adaptation, research and systematic observation, and education, training and public awareness. Unless otherwise specified, the information and values from the latest submission are used in this report.

6. The BR5 was submitted on 23 December 2022, before the deadline of 31 December 2022 mandated by decision 6/CP.25. The CTF tables were also submitted on 23 December 2022. The CTF tables and BR5 were resubmitted on 31 March 2023 to address issues raised during the review. The resubmission included changes and additions to CTF tables 1, 3, 4 and 6 as well as information related to the GHG inventory, PaMs and projections. Unless otherwise specified, the information and values from the latest submission are used in this report.

[1] Decision 6/CP.25, annex.
[2] Decision 15/CMP.1, annex, and decision 3/CMP.11, annex III.
[3] Decision 2/CP.17, annex.

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

7. Issues and gaps identified by the ERT related to the information reported by Bulgaria in its NC8 are presented in tables 1–2. The information reported, including the supplementary information under the Kyoto Protocol, mostly adheres to the UNFCCC reporting guidelines on NCs.

8. Bulgaria made improvements to the reporting in its NC8 compared with that in its NC7, including by addressing many recommendations and encouragements from the previous review report. The ERT noted that the Party has improved:

(a) The transparency of the GHG inventory information reported by providing a description of the factors underlying emission trends;

(b) The transparency of the information reported on PaMs by providing a more thorough description of the PaMs adopted in the energy, transport and industry sectors;

(c) The completeness of the information reported on PaMs by indicating which PaMs are innovative and/or replicable by other Parties and providing a description of the way in which the progress in implementation of PaMs to mitigate GHG emissions is monitored and evaluated over time;

(d) The transparency of the information reported on projections and the total effects of PaMs by providing clear information that facilitates a basic understanding of the models and/or approaches used;

(e) The completeness of the information reported on projections and the total effects of PaMs by providing WAM projections on a gas-by-gas basis; emission projections related to fuel sold to ships and aircraft engaged in international transport; the estimated and expected total effect of implemented and adopted PaMs; projections of the indirect GHGs CO, NO_X, NMVOCs and SO_X; information on models, such as their strengths and weaknesses; information on how the model or approach used accounts for any overlaps or synergies between different PaMs; and the main differences between the assumptions and methods used for the NC8 and those used for previous NCs;

(f) The transparency of the information reported on vulnerability assessment, climate change impacts and adaptation measures by providing information on the guidelines used for reporting on climate change impacts and adaptation;

(g) The completeness of the information reported on research and systematic observation by providing information on actions taken to support capacity-building related to research and systematic observation in developing countries, on the highlights and innovations in this area, and on the significant efforts made with regard to the socioeconomic analysis of both the impacts of climate change and response options;

(h) The transparency of the information reported on education, training and public awareness by providing updated information on its actions relating to education, training and public awareness;

(i) The completeness of the information reported on education, training and public awareness by providing information on the extent of public participation in the preparation or domestic review of its NC8 and on the involvement of public organizations and non-governmental organizations in training and public awareness actions and plans;

(j) The completeness of the supplementary information related to the Kyoto Protocol by providing information on the national registry; on enforcement and administrative procedures in place to meet the commitments under the Kyoto Protocol; on national legislative arrangements and administrative procedures that ensure the sustainable use of natural resources and the conservation of biodiversity when implementing activities under Article 3, paragraphs 3–4, of the Kyoto Protocol; and on how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol to implement its commitments under Article 3, paragraph 1, of the Kyoto Protocol in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties.

Table 1
Assessment of completeness and transparency of mandatory information reported by Bulgaria in its eighth national communication

Section of NC	*Completeness*	*Transparency*	*Reference to description of recommendations*
Executive summary	Complete	Transparent	
National circumstances relevant to GHG emissions and removals	Complete	Transparent	
GHG inventory	Complete	Transparent	
PaMs	Mostly complete	Mostly transparent	Issues 3–5 in table I.2
Projections and the total effect of PaMs	Mostly complete	Mostly transparent	Issues 2–3 in table I.3
Vulnerability assessment, climate change impacts and adaptation measures	Complete	Transparent	
Financial resources and transfer of technology[a]	NA	NA	NA
Research and systematic observation	Complete	Transparent	
Education, training and public awareness	Complete	Transparent	

Note: A list of recommendations pertaining to the completeness and transparency issues identified in this table is included in annex I. The assessment of completeness and transparency by the ERT in this table is based only on the "shall" reporting requirements.

[a] Bulgaria is not an Annex II Party and is therefore not obliged to adopt measures and fulfil obligations defined in Article 4, paras. 3–5, of the Convention.

Table 2
Assessment of completeness and transparency of mandatory supplementary information under the Kyoto Protocol reported by Bulgaria in its eighth national communication

Supplementary information under the Kyoto Protocol	*Completeness*	*Transparency*	*Reference to description of finding(s)*
National system	Complete	Transparent	
National registry	Complete	Transparent	
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	Complete	Transparent	
PaMs in accordance with Article 2	Complete	Transparent	
Domestic and regional programmes and/or arrangements and procedures	Complete	Transparent	
Information under Article 10[a]	NA	NA	NA
Financial resources[b]	NA	NA	NA
Minimization of adverse impacts in accordance with Article 3, paragraph 14	Complete	Transparent	

Note: A list of findings pertaining to the completeness and transparency issues identified in this table is included in annex I. The assessment of completeness and transparency by the ERT in this table is based only on the "shall" reporting requirements.

[a] The assessment refers to information provided by the Party on the provisions contained in Article 4, paras. 3, 5 and 7, of the Convention, as reported under Article 10 of the Kyoto Protocol, which is relevant to Annex II Parties only. An assessment of the information 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.

[b] Bulgaria is not an Annex II Party and is therefore not obliged to provide information on financial resources under Article 11 of the Kyoto Protocol, including on "new and additional" resources.

9. Issues and gaps identified by the ERT related to the reported information by Bulgaria in its BR5 are presented in table 3. The information reported mostly adheres to the UNFCCC reporting guidelines on BRs.

10. Bulgaria made improvements to the reporting in its BR5 compared with that in its BR4, including by addressing some recommendations and encouragements from the previous review report. The ERT noted that the Party has improved:

(a) The transparency of the information reported on its quantified economy-wide emission reduction target and related assumptions, conditions and methodologies by explaining the use of notation keys in relation to the quantified economy-wide emission reduction target in CTF table 2(e)I;

(b) The completeness of the information reported on progress in achievement of quantified economy-wide emission reduction targets and relevant information by providing the required information on all the mitigation actions reported in CTF table 3; summary information on changes to its domestic institutional arrangements since its last NC or BR; and information on the use of units from market-based mechanisms in the BR5 and CTF table 4(b) in relation to tracking progress towards its target by means of using the appropriate notation keys;

(c) The completeness of the information reported on projections by providing information that facilitates a basic understanding of the models and/or approaches used to project GHG emissions and removals and to estimate the total effects of PaMs on emissions and removals;

(d) The transparency of the information reported on projections by providing a description of the main differences between the assumptions and methods used to estimate projections for the BR5 compared with those used for previous BRs.

Table 3
Summary of completeness and transparency of mandatory information reported by Bulgaria in its fifth biennial report

Section of BR	*Completeness*	*Transparency*	*Reference to description of finding(s)*
GHG emissions and removals	Complete	Transparent	
Quantified economy-wide emission reduction target and related assumptions, conditions and methodologies	Complete	Transparent	
Progress in achievement of targets	Complete	Mostly transparent	Issue 1 in table II.1 Issues 2–3 in table II.2
Provision of support to developing country Parties[a]	NA	NA	NA

Note: A list of findings pertaining to the completeness and transparency issues identified in this table is included in annex II. The assessment of completeness and transparency by the ERT in this table is based only on the "shall" reporting requirements.

[a] Bulgaria is not an Annex II Party and is therefore not obliged to adopt measures and fulfil obligations defined in Article 4, paras. 3–5, of the Convention.

11. The NC8, BR5 and CTF table resubmissions made during the review improved:

(a) The GHG inventory information reported by describing the factors underlying emission trends, noting that no changes to the national inventory arrangements took place since the last submission and explaining the base year reported in CTF table 1;

(b) The information reported on its quantified economy-wide emission reduction target and related assumptions, conditions and methodologies by explaining the use of notation keys in relation to the quantified economy-wide emission reduction target in CTF table 2(e);

(c) The information reported on PaMs by indicating which PaMs are innovative and/or replicable by other Parties and clearly differentiating between PaMs that have expired and those that have been implemented;

(d) The information reported on progress in achievement of quantified economy-wide emission reduction targets and relevant information by noting that no changes to the domestic institutional arrangements took place since the last submission; providing information on the use of units from market-based mechanisms in the BR5 and CTF table 4(b) in relation to tracking progress towards its target by means of using the appropriate notation keys; reporting on emissions and/or removals from the LULUCF sector in CTF

tables 4 and 4(a)I using the appropriate notation keys; and explaining the notation keys used in CTF tables 4 and 4b;

(e) The information reported on projections and the total effects of PaMs by providing WAM projections on a gas-by-gas basis; the correct values for total GHG emission projections in CTF tables 6(a) and (c) and for energy emission projections by subtracting transport emissions from those for the energy sector as a whole to remove double counting; emission projections related to fuel sold to ships and aircraft engaged in international transport; GHG emission projections for 2035; diagrams illustrating GHG emission projections in an aggregated format for all sectors and by gas; the estimated and expected total effect of implemented and adopted PaMs; projections of the indirect GHGs CO, NO_X and NMVOCs, as well as of SO_X; information on models, such as their strengths and weaknesses; information on how the model or approach used accounts for any overlaps or synergies between different PaMs; and the main differences between the assumptions and methods used for the NC8 and those used for previous NCs;

(f) The information reported on vulnerability assessment, climate change impacts and adaptation measures by providing an outline of the action taken to implement Article 4, paragraph 1(e), of the Convention with regard to adaptation, particularly with respect to the protection and rehabilitation of areas affected by drought and desertification in Africa; information on the monitoring and evaluation framework for adaptation strategies and plans; and information on the progress, outcome and status of implementation of adaptation actions;

(g) The information reported on research and systematic observation by providing information on the highlights and innovations in this area and on the significant efforts made with regard to the socioeconomic analysis of both the impacts of climate change and response options;

(h) The information reported on education, training and public awareness by providing information on the extent of public participation in the preparation or domestic review of its NC8 and on the involvement of public organizations and non-governmental organizations in training and public awareness actions and plans.

II. Technical review of the information reported in the eighth national communication and fifth biennial report

A. National circumstances relevant to greenhouse gas emissions and removals

1. Technical assessment of the reported information

12. The NC8 contains key data on legislation, population trends, geography and land use, climate and climate change, economic developments, energy, transport, the buildings sector, industry, trade, the services sector, agriculture, forestry, resource efficiency and wastewater. According to data reported in the NC8, the population decreased by 11.5 per cent between 2011 and 2020 owing to negative natural population growth and to Bulgarians migrating to other countries. The population decrease has hindered the country's economic growth.

13. The climate profile of Bulgaria has been evolving over time. The country observed an increase of 0.9 °C in the average annual air temperature between 1988 and 2020 in areas of up to 800 m altitude. The warmest year within this period was 2020, which had an average annual temperature of 13.0 °C. The average amount of precipitation in Bulgaria has been decreasing; in 2020, it was about 10 per cent below the average for 1991–2020.

14. More than 70 per cent of Bulgaria's gross energy needs are met by imports. The Party is highly dependent on imported natural gas and crude oil. However, overall energy dependency decreased by about 10 per cent between 2005 and 2020. Industry is the largest consumer of energy in Bulgaria, but its share of the total of energy consumed in 2020 was 55 per cent lower than its share in 1990. The energy mix for electricity generation includes nuclear energy (41 per cent), renewable energy (33 per cent), local coal (17 per cent) and

gaseous fuels (6 per cent). The share of RES in gross domestic energy consumption has been growing; it increased from 9.4 per cent in 2005 to 23.3 per cent in 2020.

15. In Bulgaria, the transport sector has been developing significantly in terms of infrastructure. In 2020, there were 19,900 km of roads, 5,464 km of railway lines and 10 civil airports. The number of vehicles has also been growing – from about 2.1 million in 1990 to about 3.5 million in 2020. However, the fleet is ageing: 87 per cent of the vehicles are more than 10 years old. The expansion of the transport sector has led to an increase in its share of total energy consumption – from 5 per cent in 1990 to 34 per cent in 2020.

16. Agriculture is a major part of the Bulgarian economy. In 2020, agricultural land comprised 46 per cent of the country's total land area, an increase of 0.2 per cent since 2019. National parks and protected areas in Bulgaria have a high potential for sequestering carbon from the atmosphere. Bulgaria has three national parks with a total area of 193,049 ha (5.3 per cent of the country's territory); these are managed by directorates under MoEW. The national parks offer opportunities for tourism, scientific research and education. Forest cover increased by 1 per cent from the cover reported in the NC7.

17. The level and structure of GDP, total population and final energy consumption are the three key factors for forecasting energy demand in Bulgaria. These factors allow scrutinization of the interrelationships between macroeconomic development, sectoral development and GHG emissions. GHG emission projections depend on a number of economic and energy assumptions and are subject to significant uncertainty, especially in the longer term.

18. Bulgaria's GDP growth has changed over the past years. The NC7 indicated that a slow economic recovery had started, with real GDP growth increasing from 1.6 per cent in 2011 to 3.6 per cent in 2015.The NC8 indicates that GDP rose by 4 per cent in 2019 but decreased by 4 per cent in 2020 owing to the COVID-19 pandemic. Bulgaria's GDP growth is a direct and significant factor impacting GHG emissions.

19. Bulgaria requested flexibility in accordance with Article 4, paragraphs 6 and 10, of the Convention in relation to the base-year definition. In accordance with Article 4, paragraph 6, of the Convention and decision 9/CP.2, Bulgaria, as a Party with an economy in transition, may use 1988 as its base year.

2. Assessment of adherence to the reporting guidelines

20. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres 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.

B. Greenhouse gas inventory information[4]

1. Technical assessment of the reported information

21. Bulgaria reported information in its BR5 and NC8 on its historical GHG emissions and inventory arrangements. Total GHG emissions[5] excluding emissions and removals from LULUCF decreased by 50.0 per cent between 1990 and 2020, while total GHG emissions including net emissions or removals from LULUCF decreased by 50.8 per cent over the same period. Emissions peaked in 2017 and decreased thereafter. The changes in total emissions were driven mainly by factors such as the Party's transition from a centrally planned economy to a market-based economy, which led to a decrease in power production from thermal power stations; structural changes in industry; a decline in the cattle and sheep populations; and a decline in the use of fertilizers in agriculture. The observed reduction in emissions in 2020,

[4] GHG emission data in this section are based on Bulgaria's 2022 annual submission, version 1.0, which has not yet been subject to review. All emission data in subsequent chapters are based on Bulgaria's BR5 CTF tables unless otherwise noted.

[5] 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.

particularly in the energy and IPPU sectors (12.8 and 48.6 per cent respectively), was primarily driven by the impacts of the COVID-19 pandemic. The pandemic caused a significant decrease in the use of solid fuels for electricity generation owing to decreased demand and reduced industrial production.

22. Table 4 illustrates the emission trends by sector and by gas for Bulgaria. The emissions reported in the 2022 annual submission are the same as those reported in CTF table 1.

Table 4
Greenhouse gas emissions by sector and by gas for Bulgaria for 1990–2020

	GHG emissions (kt CO_2 eq)					*Change (%)*		*Share (%)*	
	1990	*2000*	*2010*	*2019*	*2020*	*1990–2020*	*2019–2020*	*1990*	*2020*
Sector									
1. Energy	–71 271.25	40 933.40	46 226.88	40 215.32	35 063.74	–50.8	–12.8	72.5	71.3
A1. Energy industries	36 538.03	24 190.20	31 332.55	22 518.21	18 249.60	–50.1	–19.0	37.1	37.1
A2. Manufacturing industries and construction	17 762.87	7 223.91	3 158.11	4 120.19	4 009.90	–77.4	–2.7	18.1	8.2
A3. Transport	6 521.69	5 474.14	7 998.02	9 918.66	9 350.97	43.4	–5.7	6.6	19.0
A4. and A5. Other	8 219.18	2 625.79	2 136.91	1 777.75	1 829.46	–77.7	2.9	8.4	3.7
B. Fugitive emissions from fuels	2 229.47	1 419.36	1 601.29	1 880.50	1 623.81	–27.2	–13.7	2.3	3.3
C. CO_2 transport and storage	NO	NO	NO	NO	NO	–	–	–	–
2. IPPU	10 084.04	7 230.49	4 441.53	10 316.36	5 300.15	–47.4	–48.6	10.3	10.8
3. Agriculture	12 263.32	5 014.82	5 288.98	6 233.77	6 188.05	–49.5	–0.7	12.5	12.6
4. LULUCF	–17 888.73	–17 757.11	–12 298.68	–9 988.32	–9 605.23	–46.3	–3.8	NA	NA
5. Waste	4 738.20	3 787.05	3 363.82	2 707.17	2 633.68	–44.4	–2.7	4.8	5.4
6. Other[a]	NO	NO	NO	0.00	0.00	–	–	–	0.0
Gas[b]									
CO_2	76 699.20	45 464.33	47 858.93	42 255.77	36 967.11	–51.8	–12.5	78.0	75.2
CH_4	13 063.80	7 585.49	6 772.68	5 825.25	5 733.60	–56.1	–1.6	13.3	11.7
N_2O	8 590.12	3 876.41	4 007.66	4 904.61	4 760.57	–44.6	–2.9	8.7	9.7
HFCs	NO, NA	33.04	663.13	6 468.72	1 704.49	–	–73.7	–	3.5
PFCs	NO, NA	NO, NA	0.06	0.01	0.01	–	–15.0	–	0.0
SF_6	3.69	6.49	18.76	18.26	19.84	437.1	8.6	0.0	0.0
NF_3	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	–	–	–	–
Total GHG emissions excluding LULUCF	**98 356.81**	**56 965.77**	**59 321.21**	**59 472.62**	**49 185.62**	**–50.0**	**–17.3**	**100.0**	**100.0**
Total GHG emissions including LULUCF	**80 468.09**	**39 208.65**	**47 022.53**	**49 484.30**	**39 580.40**	**–50.8**	**–20.0**	**NA**	**NA**

Source: GHG emission data: Bulgaria's 2022 annual submission, version 1.0.
[a] Emissions and removals reported under the sector other (sector 6) are not included in total GHG emissions.
[b] Emissions by gas without LULUCF. The Party did not report indirect CO_2 emissions.

23. In brief, Bulgaria's national inventory arrangements were established in accordance with the provisions of decision 19/CMP.1. Along with relevant regulations, Bulgaria's Environmental Protection Act provides the basis for the Party's national inventory system. All activities related to the preparation of the Party's GHG inventory are coordinated and managed at the national level by MoEW. ExEA is the single national entity responsible for the overall process of national GHG inventory planning, preparation and management. The change in these arrangements since the BR4 is the revision of order 296/04.12.2015, which is related to the structure of the inventory team and aims to increase the capacity of ExEA for adequate planning, preparation and management of the emissions inventory.

2. Assessment of adherence to the reporting guidelines

24. The ERT assessed the information reported in the NC8 and BR5 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres to the UNFCCC reporting guidelines on NCs and the UNFCCC reporting guidelines on BRs. 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. Bulgaria provided in the NC8 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 all the elements mandated by paragraph 30 of the annex to decision 15/CMP.1. The ERT took note of the review of the changes to the national system reflected in the report on the individual review of the 2020 annual submission of Bulgaria.

(b) Assessment of adherence to the reporting guidelines

26. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

4. National registry

(a) Technical assessment of the reported information

27. In its NC8 Bulgaria 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 2020 annual submission of Bulgaria.

(b) Assessment of adherence to the reporting guidelines

28. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

C. Quantified economy-wide emission reduction target and related assumptions, conditions and methodologies

1. Technical assessment of the reported information

29. Bulgaria reported information on its economy-wide emission reduction target in its BR5. For Bulgaria the Convention entered into force on 10 August 1995. Under the Convention Bulgaria committed to contributing to the achievement of the joint EU economy-wide emission reduction target of 20 per cent below the 1990 level by 2020.

30. The target for the EU and its member States is formalized in the EU 2020 climate and energy package. The legislative package regulates emissions of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 using GWP values from the AR4 to aggregate the GHG emissions of the EU until 2020. Emissions and removals from the LULUCF sector are not included in the quantified economy-wide emission reduction target under the Convention.

31. The EU-wide targets are primarily implemented through the EU ETS and ESD. The EU ETS covers mainly point emissions sources in the energy, industry and aviation sectors. An EU-wide emission cap was put in place for 2013–2020 for the EU ETS with the goal of reducing emissions by 21 per cent below the 2005 level by 2020. For 2030, a reduction target of 62 per cent below the 2005 level has been set for emissions covered by the EU ETS. The ESD became operational in 2013 and covers sectors outside the EU ETS, including transport (excluding aviation and international maritime transport), residential and commercial buildings, agriculture, small industry and waste. The ESD is regulated through targets for each member State that add up to a reduction at the EU level of 10 per cent below the 2005 level by 2020. The ESR, the successor to the ESD, was adopted in 2018 and amended in 2023 with the target of reducing emissions covered under the ESR by 40 per cent below the 2005 level by 2030.

32. The EU generally allows its member States to use units from the Kyoto Protocol mechanisms for compliance purposes, subject to a number of restrictions in terms of origin and type of project and up to an established limit. Operators and airline operators can use such units to fulfil their requirements under the EU ETS, and member States can use such units for their national ESD targets, within specific limitations.

33. The European Commission set out its vision for a climate-neutral EU in November 2018, and in December 2019 presented the European Green Deal as a road map with actions for making the EU economy sustainable. The European Council endorsed in December 2019 the objective of making the EU climate-neutral by 2050. As part of the European Green Deal, the 2050 climate-neutrality target was made binding in the first European Climate Law, adopted in 2021. It also increased the ambition of the 2030 emission reduction target to 55 per cent below the 1990 level. In 2023, the European Parliament adopted a series of legislative proposals, collectively referred to as Fit for 55, intended to help achieve the new 2030 target. These new regulations strengthened both the ESR and EU ETS 2030 targets, extended the EU ETS to include maritime shipping in 2024 and established the Social Climate Fund to address equitability of mitigation impacts. The regulations also created the EU ETS 2 to cover at the point of distribution most fuel used in non-ETS sectors, beginning in 2027. Member States will set out any increased ambition in the update of their national energy and climate plans.

34. Bulgaria has a national target of limiting its emission growth to 20 per cent above the 2005 level by 2020 for ESD sectors. This target has been translated into binding quantified AEAs for 2013–2020. Bulgaria's AEAs change following a linear path from 26,933.22 kt CO_2 eq in 2013 to 26,543.23 kt CO_2 eq in 2020.[6] Under the ESR, Bulgaria has a national target of reducing emissions from covered sectors to 10 per cent below the 2005 level by 2030.

35. Bulgaria also reported on its longer-term target, covering a pathway to climate neutrality by 2050. This pathway is included in Bulgaria's Long-term Climate Change Mitigation Strategy until 2050, adopted in October 2022. The document was developed in compliance with the provisions of article 15 of the EU regulation on the governance of the Energy Union and climate action (2018/1999).

2. Assessment of adherence to the reporting guidelines

36. The ERT assessed the information reported in the BR5 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres to the UNFCCC reporting guidelines on BRs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

[6] According to the EU transaction log.

D. Information on policies and measures

1. Technical assessment of the reported information

37. Bulgaria provided in its NC8 and BR5 information on its PaMs[7] implemented, adopted and planned to fulfil its commitments under the Convention. Bulgaria's set of PaMs is similar to that previously reported. Most of the information in the NC8 reiterates information on PaMs included in the NC7 and BR4. In its NC8, Bulgaria included a list of 15 PaMs no longer in place and noted that these PaMs were not used in calculating the GHG projections reported in the NC8 and BR5.

38. Bulgaria reported on its policy context and legal and institutional arrangements in place for implementing its commitments and monitoring and evaluating the effectiveness of its PaMs. Bulgaria also indicated that there have been no changes to its institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of progress towards its target. The Climate Change Mitigation Act adopted in 2014 is the key legislation in this area. The third NAPCC sets out further requirements for the monitoring and evaluation of Bulgaria's climate PaMs.

39. The overall responsibility for climate change policymaking in Bulgaria lies with MoEW, and several national institutions and bodies, such as ExEA and the Inter-Ministerial Working Group established in 2015 by MoEW order RD-491, are involved in policy implementation. ExEA is responsible for monitoring, coordinating and implementing climate actions. The Inter-Ministerial Working Group convenes the institutions responsible for planning and implementing sectoral PaMs and has the task of assessing the efficiency of those measures. The third NAPCC obliges the implementing institutions identified in the Plan to report biennially on the implementation of mitigation actions; their feedback is then included in summary reports on the overall implementation of the NAPCC.

40. Bulgaria's assessment of the economic and social consequences of its response measures is covered by the EU impact assessment system under which all new policy initiatives of the EU are assessed. This assessment ensures that potential adverse social, environmental and economic impacts on various stakeholders and third parties are identified and minimized within the legislative process. Bulgaria did not report information on its actions to identify and review its own policies and practices that encourage activities that lead to greater levels of emissions.

41. In its reporting on PaMs, Bulgaria provided the estimated emission reduction impacts for all of its PaMs. The Party reported the effects of 33 individual measures, of which 4 relate to the energy sector, 5 to the households and services sector, 7 to the transport sector, 1 to the IPPU, 6 to the agriculture sector, 6 to the LULUCF sector, 4 to the waste sector, and 1 to both the industry and the waste sector (cross-sectoral measure).

42. The Party did not describe its general methodology for estimating the impacts of its PaMs. Bulgaria reported that the data on the annual GHG effects of individual PaMs are based on information provided by relevant institutions and other bodies responsible for implementing these PaMs. During the review, the Party explained that the methodology used to estimate the annual effects of individual PaMs reported in table 5.17 of the NC8 and CTF table 3 is different from the methodology used to assess the cumulative effects of PaMs presented in the textual part of the NC8. Therefore, these figures cannot be compared and any apparent discrepancies are due to the different approaches applied to the calculations.

43. The key overarching related 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. The 2021 European Climate Law, which forms part of the European Green Deal, made climate

[7] The UNFCCC reporting guidelines on BRs use the term "mitigation actions", whereas the UNFCCC reporting guidelines on NCs use the term "policies and measures". The terms are used interchangeably in this report to refer to the relevant information in either the NC or BR.

neutrality by 2050 legally binding and raised the EU-wide 2030 emission reduction target to at least 55 per cent compared with the 1990 level. The Fit for 55 package of legislative proposals aims to introduce a series of policies intended to help to achieve the new 2030 target.

44. The 2021–2030 EU-wide policies are operationalized through the national energy and climate plans of EU member States, which should set out national objectives for each of the five dimensions of the Energy Union, namely energy security; the internal energy market; energy efficiency; decarbonization; and research, innovation and competitiveness. The national energy and climate plans are periodically updated to reflect changes to EU policy, such as the implementation of the European Green Deal. Bulgaria's NECP specifies that by 2030 the Party is to hold its GHG emissions under the ESR at the 2005 level. The NECP also includes a 2030 RES target of a 27.09 per cent share of RES in final gross energy consumption and an energy efficiency target of 27.89 per cent of primary energy savings by 2030 compared with the 2007 baseline. The key action in the NECP for decarbonization is the continued implementation of existing and planned measures outlined in the third NAPCC, especially in the energy sector, which is responsible for the majority of Bulgaria's GHG emissions. The objectives set out in the NECP are to promote low-carbon economic development, ensure competitive and secure energy, reduce the dependence on energy imports and ensure that consumers can purchase energy at affordable prices. The NECP foresees that coal-fired power plants will remain as the fundamental capacity providers for Bulgarian electricity production up until 2030. It also assumes that the development of RES will continue owing to investments in wind and solar energy. Energy efficiency efforts are envisaged to focus on improvements in the energy performance of buildings and on energy generation, transmission and distribution.

45. In October 2022 Bulgaria adopted its Long-term Climate Change Mitigation Strategy until 2050, and assume the development of energy from renewable sources (share in gross final energy consumption of 61–70 per cent by 2050), improvement of energy efficiency in all sectors (energy savings of 79–87 TWh by 2050), electrification of transport and heating, development of biomass fuels for households through advanced technologies, and deployment of carbon capture and storage. Oil and coal are expected to be fully phased out by 2050, while nuclear energy continues to support the export of electricity under one scenario.

46. Bulgaria introduced national-level policies to achieve its targets under the ESD, the ESR and domestic emission reduction targets. The key policies reported relate to substituting coal with natural gas for electricity and heat production, increasing the share of biofuels, using biomass in the combustion units of industrial installations, conducting audits for energy efficiency and the implementation of prescribed measures, constructing installations for the mechanical and biological treatment of waste and installations for the treatment and recovery of compost and biogas, and implementing a programme for accelerated gasification. The mitigation effect of fuel substitution from coal to natural gas is the most significant. Other policies that have delivered significant emission reductions are the construction of installations for the mechanical and biological treatment of waste and installations for the treatment and recovery of compost and biogas, and the capture and burning of biogas in all regional landfills. The ERT identified several PaMs as mitigation actions of particular interest. They are presented per sector in paragraphs 47–53 below.

47. **Energy**. Bulgaria's energy sector has not extensively changed since the NC7 submission. Policies in the sector stem from Bulgaria's Energy Strategy until 2020 and revolve around five areas, with the emphasis on lower-emission energy production, the transition towards the use of non-solid fuels in energy generation, and the modernization and decentralization of energy and heat generation. Improvements in the efficiency of power generation plants and solid fuel substitution offer the greatest mitigation potential, according to the Energy Strategy. The Strategy, as reflected in the NC8, is based on the assumption that the main driver of the decrease in coal-based energy generation is substitution with natural gas. The Strategy aimed to systematically reduce coal-based energy production by substituting 600 MW coal-based sources with new natural gas capacity by 2020. During the review, the Party informed the ERT that owing to geopolitical changes affecting natural gas

supply and demand, the substitution will focus on other energy sources, including RES and hydrogen.

48. In Bulgaria, RES have been developed in accordance with the National Action Plan for Renewable Energy by 2020 and the Renewable Energy Act. The production of electricity from RES is expected to contribute significantly to reducing the carbon intensity of the Party's electricity generation mix. There have been plans to use RES in the heating and cooling sector and the district heating sector, along with plans to substitute conventional fuel with RES for the production of heat. Since the use of natural gas instead of electricity for domestic heating and other domestic purposes could reduce household energy consumption by 100–1,800 kWh/year, it was envisaged that 430,050 households would be connected to the natural gas network by 2020. The required investments to achieve the desired growth in the use of natural gas were estimated at a minimum of 774 million Bulgarian leva. Fiscal incentives were introduced to increase the number of households using natural gas. The introduction of these fiscal incentives will have a long-term (beyond 2020) effect on the level of GHG emissions.

49. **Transport**. Bulgaria's road transport sector has undergone substantial structural changes and has seen substantial growth. The road transport sector is the only sector in Bulgaria that has experienced an increase in emissions (a 32.1 per cent increase in 2020 compared with the 1988 level). Reducing dependence on oil is one of the Party's biggest challenges in the transport sector. The Party's PaMs focus on three main areas: (1) the modernization of existing transport infrastructure, the introduction of intelligent transport systems and the increased use of biofuels; (2) the reduction of fuel consumption through the diversification of the modes of transport by developing urban public transport and promoting cycling; and (3) the diversification of the modes of transport by increasing the share of electric public transport and developing intermodal terminals. The ERT identified the development of intermodal terminals as a mitigation action of particular interest because it aims to achieve the twofold effect of increasing access to ecologically friendly means of transport and of reducing transport cost per unit GDP. In addition, the introduction of intelligent transport systems was noted by the ERT, as it covered diverse projects and was expected to deliver the largest total cumulative reduction (together with the promotion of cycling) of all measures in the transport sector: 1,017.18 kt CO_2 eq by 2020.

50. **IPPU**. The Party's PaMs related to the IPPU focus mainly on the improvement of energy efficiency through conducting energy audits of companies consuming more than 3,000 MWh/year and the use of alternative fuels through increasing the use of biomass in the combustion units of industrial installations. The ERT identified the Innovations and Competitiveness programme, which was in operation in 2014–2020, as a mitigation action of particular interest. The programme had the aim of providing focused support to large enterprises in Bulgaria for implementing energy efficiency measures in order to achieve sustainable growth and economic competitiveness. As at 2020, 61 enterprises had been supported under this programme and emission savings of 281.12 kt CO_2 eq/year had been achieved. The ERT also highlighted a measure aimed at increasing the use of biomass – such as separately collected household waste, sludge from domestic sewage, agricultural waste, waste from the food industry and industrial waste mixed with biomass – as an alternative fuel as being innovative in addressing both the waste and the IPPU sectors.

51. **Agriculture**. The key PaMs in the agriculture sector focus on reducing GHG emissions from agricultural land by encouraging the suitable rotation of crops, the management of degraded agricultural land through biological reclamation and the implementation of erosion control measures. In addition, Bulgaria has in place measures for improving the management of manure, including the introduction of low-carbon practices. The ERT noted that the measures related to crop rotation prevent soil erosion and allow for carbon sequestration, both of which have the potential for reducing GHG emissions. Of all the measures implemented in Bulgaria in the agriculture sector, the crop rotation measures have the highest mitigation potential in 2020 and 2030.

52. **Waste**. PaMs in the waste sector focus on two main areas. The first area is the reduction and prevention of waste disposal by constructing installations for the mechanical and biological treatment of waste and installations for the treatment and recovery of compost and biomass. This area was covered by the National Strategic Plan for Gradual Reduction of

Biodegradable Waste Intended for Landfilling 2010–2020. As a result of its implementation, 5,289,000 t of biodegradable waste was diverted from landfills in 2013–2020. The ERT noted that this measure had an additional impact as it allowed for the substitution of phosphate fertilizers in agriculture with compost produced at waste treatment installations. The second area is the capture and flaring of biogas from landfills. The Party aims to implement capture and flaring at all new and existing landfills as well as municipal landfills that are scheduled to be closed. Although the waste sector's share of Bulgaria's total GHG emissions is not high, the impact of the implemented measures on GHG emissions in 2020 and in 2030 is significant, especially for the two above-mentioned measures.

53. **LULUCF**. Bulgaria's PaMs in the LULUCF sector focus on increasing the absorption of CO_2, forest carbon stocks, the carbon sequestration potential of forests and long-term carbon sequestration in wood products. The ERT identified as being of interest the measure related to increasing the area of urban and suburban parks and green zones. Since 2015, municipalities have been entitled to financial support from the State budget for developing plans for these green urban areas. The support enables the actions included in these plans to be properly designed and highly ambitious. Another action of interest is the sustainable regional bioenergy policies initiative under BIO4ECO, which is funded by the EU Interreg Europe programme and was launched in 2016. The initiative increases the public's and businesses' awareness of and engagement in using wood and wood products to sequester CO_2. This area of action is in line with Bulgaria's National Climate Change Adaptation Strategy and Action Plan, one goal of which is to improve the potential for the sustainable use of forest resources by stimulating the long-term use of wood products and expanding their use as a building material.

54. Bulgaria highlighted the domestic mitigation actions that are under development, such as the 1,000 Sunny Roofs programme, which will provide solar collectors and heat pumps for 1,000 apartment blocks and will result in energy savings of 164.9 GWh/year. The ERT noted that Bulgaria reported only two planned measures, so it is not clear which other measures are included in the WAM projection scenario. Table 5 provides a summary of the reported information on the PaMs of Bulgaria.

Table 5
Summary of information on policies and measures reported by Bulgaria

Sector	*Key PaMs*	*Estimated mitigation impact in 2020 (kt CO_2 eq)*	*Estimated mitigation impact in 2030 (kt CO_2 eq)*
Policy framework and cross-sectoral measures	–	–	–
Energy			
Energy efficiency	Improvement of the efficiency of existing coal-fired power plants	466.00	702.00
Energy supply and renewable energy	Fuel substitution from coal to natural gas	2 700.00	1 552.50
Transport	Increase in the share of biofuels	214.00	295.32
	Introduction of intelligent transport systems along the national and urban road network	170.00	459.00
IPPU	Audits for energy efficiency and the implementation of prescribed measures	170.00	234.60
	Use of biomass in the combustion units of industrial installations	554.00	797.76
Agriculture	Promotion of suitable crop rotation, especially with crops that fix atmospheric nitrogen	357.53	394.17
LULUCF	–	–	–
Waste	Construction of installations for the mechanical and biological treatment of waste and installations for the treatment and recovery of compost and biogas	728.00	1 004.64
	Capture and burning of biogas in all new and existing regional landfills	634.00	874.92
Other	Introduction of a mandatory energy efficiency scheme	220.00	303.60

Sector	*Key PaMs*	*Estimated mitigation impact in 2020 (kt CO_2 eq)*	*Estimated mitigation impact in 2030 (kt CO_2 eq)*
Households and services			
	Implementation of measures for accelerated gasification	370.00	325.00

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

55. Bulgaria categorized the reported PaMs into two groups: PaMs with a direct mitigation impact and PaMs without a direct mitigation impact. Detailed information under all the required headings of the reporting requirements for NCs and BRs was reported in table 5.17 of the NC8 and CTF table 3 only for PaMs with a direct impact on GHG emissions.

56. Bulgaria highlighted the role of the Inter-Ministerial Working Group established in 2015 by MoEW order RD-491 in assessing and monitoring the progress of implementation of mitigation actions. The Group includes representatives of several institutions responsible for planning and implementing sectoral PaMs. It scrutinizes, among other things, the efficiency of the measures and considers possible revisions to them.

2. Assessment of adherence to the reporting guidelines

57. The ERT assessed the information reported in the NC8 and BR5 of Bulgaria and identified issues relating to completeness and transparency, and thus adherence to the UNFCCC reporting guidelines on NCs and the UNFCCC reporting guidelines on BRs. The findings are described in tables I.2 and II.1.

3. Domestic and regional programmes and legislative arrangements and procedures related to the Kyoto Protocol

(a) Technical assessment of the reported information

58. In its NC8, Bulgaria reported that the implementation of the Kyoto Protocol is underpinned by the Climate Change Mitigation Act and the third NAPCC, which outlines the framework for action to combat climate change for 2013–2020 and focuses the Party's action to reduce the negative impacts of climate change and implement its climate change commitments. The overall responsibility for climate change policymaking lies with MoEW, and a number of national institutions are involved in policy implementation. Direct responsibility for monitoring, coordinating and implementing climate change action rests with ExEA.

59. For the second commitment period of the Kyoto Protocol, from 2013 to 2020, Bulgaria committed to contributing to the joint EU effort to reduce GHG emissions by 20 per cent below the base-year level (see para. 29–31 above).

60. The Party has arrangements and enforcement procedures to meet its commitments under the Kyoto Protocol, including procedures for addressing non-compliance. These include the Climate Change Mitigation Act, which has a rule for non-compliance with emission targets, rules for the monitoring and reporting of GHG emissions, and a rule on administrative measures and the provision of penalties for non-compliance. The legal authority for implementing the arrangements and procedures for addressing cases of non-compliance lies with MoEW.

61. Bulgaria has provisions in place to make information on legislative arrangements and administrative procedures related to compliance and enforcement publicly accessible. The Party reported that it ensures access to relevant information in line with the provisions of the Climate Change Mitigation Act and relevant EU legislation such as regulation 2018/1999. The NAPCC (and reports on its implementation), the NECP and the GHG inventories are available on the MoEW and ExEA websites.

62. Bulgaria has national legislative arrangements and administrative procedures in place that seek to ensure that the implementation of activities under Article 3, paragraph 3, 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. The Ministry of

Agriculture and Food has created a system to conserve biodiversity and use natural resources sustainably. In addition, the conservation of biodiversity and sustainable use of natural resources are part of the mitigation measures under the LULUCF sector and are also part of adaptation PaMs.

(b) Assessment of adherence to the reporting guidelines

63. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

4. Policies and measures in accordance with Article 2 and minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

(a) Technical assessment of the reported information

64. In the NC8 Bulgaria 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. Bulgaria reported that its climate policy follows EU policy, which takes into account the minimization of the adverse effects of emission reduction PaMs at their preparation phase through impact assessments that are developed for each EU legislative proposal and other strategic policy documents. Impacts on third countries are mostly indirect and can often be neither directly attributed to a specific EU policy nor directly measured by the EU in developing countries. Bulgaria therefore reported that its PaMs have no adverse impacts on developing countries.

65. The NC8 includes information on how Bulgaria promotes and implements the decisions of ICAO and IMO to limit emissions from aviation and marine bunker fuels. Bulgaria follows and implements EU maritime and aviation policies. The pertinent EU regulation on the monitoring, reporting and verification of CO_2 emissions from maritime transport was adopted in 2015 and took effect in 2018. International aviation has been included in the EU ETS since the beginning of 2012 and Bulgaria is in the process of implementing relevant legislation. As a member of ICAO, Bulgaria is fully committed to and involved in addressing the challenges caused by climate change and promoting resource-efficient, competitive and sustainable aviation.

66. Further information on how Bulgaria 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 2022 annual submission. The Party noted that the wide-ranging impact assessment system of the EU is used for all new policy initiatives as a key tool that ensures that potential adverse social, environmental and economic impacts on stakeholders and third parties are identified and minimized within the legislative process. The Party reported information on what it prioritized in implementing its commitments under Article 3, paragraph 14, which is the progressive reduction or phase-out of market imperfections, fiscal incentives, tax and duty exemptions, and subsidies in all GHG emitting sectors, taking into account the need for energy price reforms to reflect market prices and externalities.

(b) Assessment of adherence to the reporting guidelines

67. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

E. Estimates of emission reductions and removals and the use of units from market-based mechanisms and land use, land-use change and forestry and progress in achieving the quantified economy-wide emission reduction target

1. Technical assessment of the reported information

68. Bulgaria reported in its BR5 that it did not use units from market-based mechanisms under the Kyoto Protocol to meet its commitment under the ESD. It reported in CTF tables 4 and 4(b) that it did not use any units from market-based mechanisms in 2019 or 2020. Given that the contribution of LULUCF activities is not included in the joint EU target under the Convention, reporting thereon is not applicable to Bulgaria. Table 6 illustrates Bulgaria's ESD emissions and use of units from market-based mechanisms for achieving its ESD target.

Table 6
Summary of information on emissions covered by the European Union effort-sharing decision annual emission allocation and use of units from market-based mechanisms by Bulgaria
(kt CO_2 eq)

Year	*ESD emissions*	*AEA*	*Use of units from market-based mechanisms*	*AEAs transferred to (–) or from (+) other Parties*	*Annual AEA surplus/deficit*	*Cumulative AEA surplus/deficit*[a]
2013	22 238.07	26 933.22	NA	Confidential	4 695.14	4 695.14
2014	22 900.87	27 200.37	NA	Confidential	4 299.50	8 994.64
2015	25 354.87	27 467.52	NA	Confidential	2 112.65	11 107.30
2016	25 587.95	27 734.67	NA	Confidential	2 146.73	13 254.02
2017	26 526.79	25 879.45	NA	Confidential	–647.35	12 606.68
2018	26 339.23	26 100.71	NA	Confidential	–238.52	12 368.15
2019	25 814.52	26 321.97	NA	Confidential	507.45	12 875.60
2020	25 735.61	26 543.23	NA	Confidential	807.61	13 683.22

Sources: Bulgaria's BR5 and BR5 CTF table 4(b), information provided by the Party during the review and EU transaction log (AEAs).

Note: For a given year, a positive number (surplus) indicates that annual or cumulative ESD emissions were lower than the corresponding AEA or cumulative AEAs, while a negative number (deficit) indicates that annual or cumulative ESD emissions were higher than the corresponding AEA or cumulative AEAs.

[a] In 2013–2020 Bulgaria transferred AEAs to other EU member States. The cumulative AEA surplus after these transfers amounts to 8,526.94.

2. Assessment of adherence to the reporting guidelines

69. The ERT assessed the information reported in the BR5 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres to the UNFCCC reporting guidelines on BRs. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

3. Assessment of achievement of the quantified economy-wide emission reduction target

70. In assessing the Party's contribution towards achievement of the 2020 joint EU target on the basis of the information reported in its BR5, the ERT noted that, under the EU 2020 climate and energy package, Bulgaria committed to limiting its emissions growth under the ESD to 20 per cent above the 2005 level by 2020 (see para. 34 above). This target has been translated into binding quantified AEAs for 2013–2020. In 2020 Bulgaria's ESD emissions were 0.03 per cent (807.61 kt CO_2 eq) below the AEA. Bulgaria has a cumulative surplus of 8,526.94 kt CO_2 eq with respect to its AEAs between 2013 and 2020 (taking into account AEAs transferred to other EU member States). The ERT noted that the Party did not make use of units from market-based mechanisms in 2020.

71. The ERT noted that the Party reported that the total GHG emissions excluding LULUCF of the EU and including the use of units from market-based mechanisms do not exceed the emission level corresponding to the target in 2020, and thus that the EU has achieved its joint target. See the report on the review of the BR5 of the EU for further details.

Therefore, the ERT concluded that, on the basis of the information reported in the BR5 and provided during the review, Bulgaria has met its 2020 commitment under the Convention through its contribution to achieving the joint EU target. The ERT noted that the Party's ESD emissions in 2020 do not exceed its AEA for 2020. The ERT also noted that, to achieve its target under the ESD, Bulgaria used its surplus AEAs from prior years under the flexibility allowed under the ESD to cover its AEA deficit.

F. Projections

1. Projections overview, methodology and results

(a) Technical assessment of the reported information

72. Bulgaria reported in its BR5 and NC8 updated projections for 2030–2035 relative to actual inventory data for 2020 under the WEM scenario. The WEM scenario reported by Bulgaria includes PaMs implemented and adopted until 2020. Bulgaria also reported the WAM scenario, which includes PaMs adopted or planned for after 2020.

73. Bulgaria provided a definition of its scenarios, explaining that its WEM scenario includes all implemented and adopted PaMs to reduce GHG emissions in the country by the end of 2020. The WEM scenario was explained during the review as being consistent with the NECP. The WAM scenario comprises GHG mitigation policies planned for after 2020, although it is not clear in the projections chapter of the NC8 which specific measures are included in this scenario for some sectors. During the review, Bulgaria clarified that all planned PaMs were considered under the WAM scenario and that information on PaMs is provided in the PaMs chapter only. The definitions indicate that the scenarios were prepared in accordance with the UNFCCC reporting guidelines on BRs.

74. The projections are presented on a sectoral basis, using the same sectoral categories as those used in the reporting on mitigation actions, except for the households and services sector mitigation actions, which are included under the energy sector in the projections. Projections are presented 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) for 2030–2035. The projections are also provided in an aggregated format for each sector and for a Party total using GWP values from the AR4. Bulgaria reported on factors and activities affecting emissions for each sector. However, they were not provided in a tabular format.

75. Bulgaria also reported emission projections for the indirect GHGs CO, NO_X, NMVOCs and SO_X.

76. Bulgaria also separately reported GHG emission projections related to fuel sold to ships and aircraft engaged in international transport. They were not included in the totals.

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

77. The methodology used for the preparation of the projections is different from that used for the preparation of the emission projections for the NC7. Bulgaria provided information on changes since the submission of its NC7 in the assumptions, methodologies, models and approaches used for the projection scenarios, including on the new model, (B)EST, used to update the GHG emission projections. (B)EST was created for Bulgaria by consultants under a technical support project financed by the European Commission.

78. The ERT noted that the trends shown in the projections are different from those reported in the NC7 and BR4. During the review, the Party clarified that the reason for the differences is that the (B)EST model was used for estimating the GHG projections for the current submission while a different tool was used for estimating the projections for previous submissions. The previously used Excel-based tool included only limited macroeconomic indicators, such as GDP, gross domestic value and population, whereas the (B)EST model takes into account a wide range of parameters, such as carbon price, as well as a number of updated assumptions. This methodological update led to significant changes in the projected emissions currently reported compared with those reported in the NC7 and BR4.

79. To prepare its projections, Bulgaria relied on key underlying assumptions relating to GDP growth, population, and prices of oil, gas and coal. These variables and assumptions, common to the WEM and WAM scenarios, were reported in CTF table 5. The assumptions were updated on the basis of the most recent economic developments known at the time of the preparation of the projections. The macroeconomic forecasts, including for GDP and population growth, required by the (B)EST model were provided by the Bulgarian Agency for Economic Analysis and Forecasting and the Ministry of Finance.

80. A sensitivity analysis was conducted for GDP growth. The results of the analysis show that the GDP growth rate has a direct and significant impact on GHG emissions. Energy intensity is correlated with population size and GDP. On the basis of information provided by Bulgaria during the review, the ERT noted that expected emissions in 2030 could range from 10 Mt under the reference scenario with a lower GDP to 72 Mt under the reference scenario with a higher GDP.

(c) Results of projections

81. The projected emission levels under different scenarios and information on the quantified economy-wide emission reduction target are presented in table 7 and figure 1.

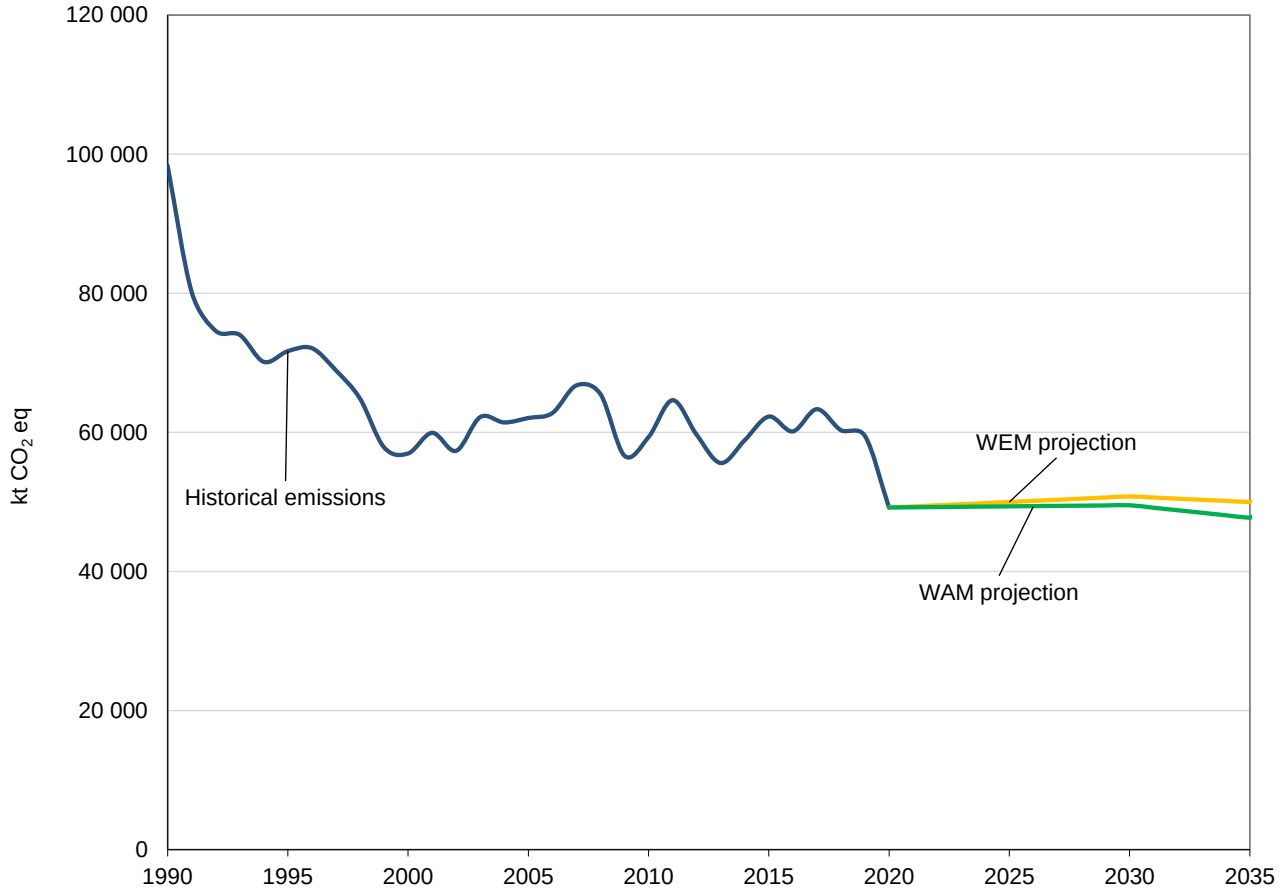
Table 7
Summary of greenhouse gas emission projections for Bulgaria

	GHG emissions (kt CO_2 eq/year)	*Change in relation to 1990 level (%)*	*Change in relation to 2020 level (%)*
Inventory data 1990	98 356.81	NA	NA
Inventory data 2020	49 185.62	NA	NA
WEM projections for 2030	50 778.74	–48.4	3.2
WAM projections for 2030	49 507.75	–49.7	0.7
WEM projections for 2035	49 979.51	–49.2	1.6
WAM projections for 2035	47 706.07	–51.5	–3.0

Sources: Bulgaria's BR5 and BR5 CTF table 6.
Note: The projections are of GHG emissions excluding LULUCF and excluding indirect CO_2.

82. Bulgaria's total GHG emissions excluding LULUCF are projected under the WEM scenario to decrease by 48.4 and 49.2 per cent respectively below the 1990 level in 2030 and 2035. When including LULUCF, total GHG emissions are projected under the WEM scenario to decrease by 49.0 and 50.0 per cent respectively below the 1990 level in 2030 and 2035. Under the WAM scenario, total GHG emissions excluding LULUCF in 2030 and 2035 are projected to be lower than those in 1990 by 49.7 and 51.5 per cent respectively. When including LULUCF, total GHG emissions are projected under the WAM scenario to decrease by 50.9 and 53.2 per cent respectively below the 1990 level in 2030 and 2035.

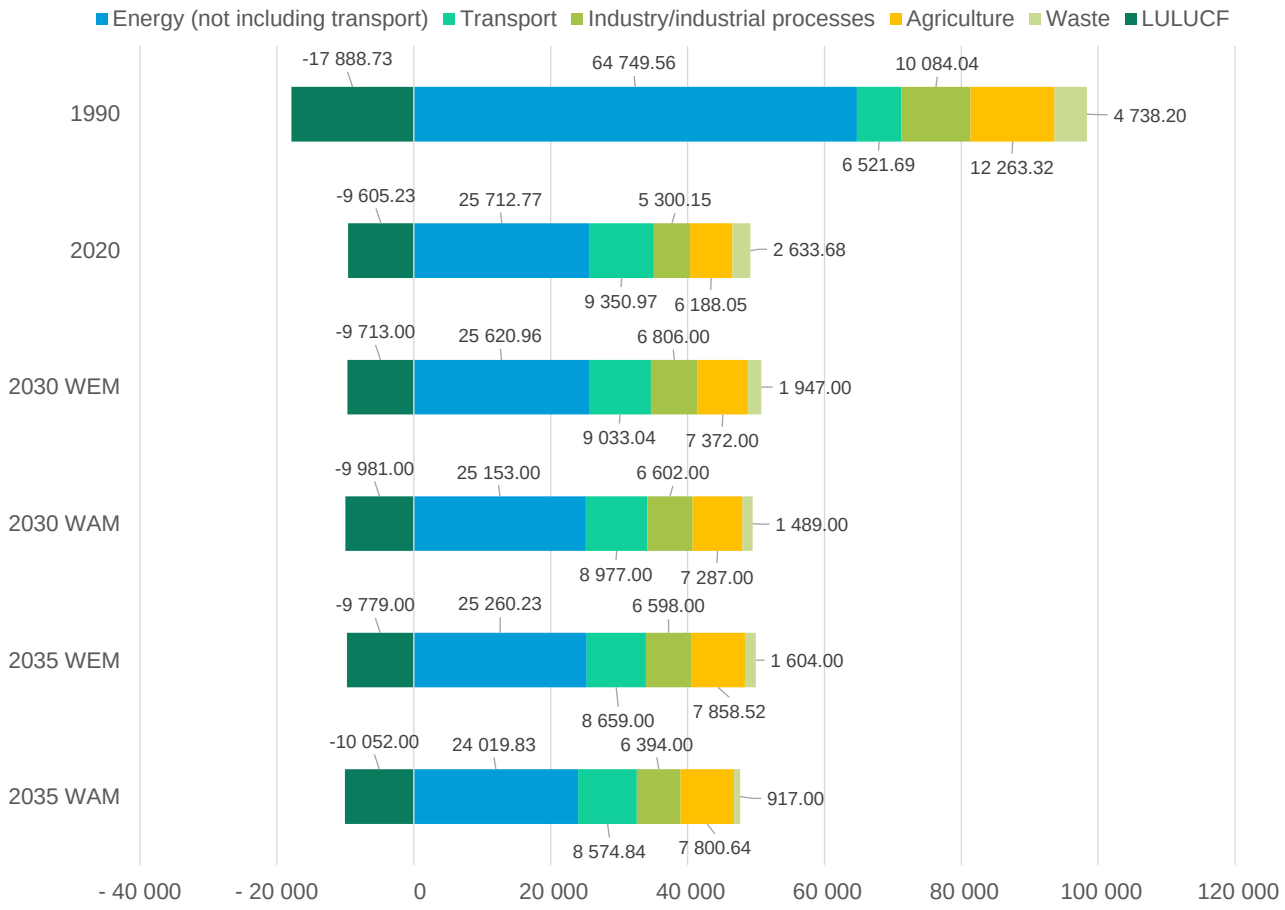
Figure 1
Greenhouse gas emission projections reported by Bulgaria



Sources: Bulgaria's BR5 and BR5 CTF tables 1 and 6 (total GHG emissions excluding LULUCF).

83. Bulgaria presented the WEM and WAM scenarios by sector for 2030 and 2035, as summarized in figure 2 and table 8.

Figure 2
Greenhouse gas emission projections for Bulgaria presented by sector
(kt CO_2 eq)



Sources: Bulgaria's BR5 CTF table 6. Updated projections, including data for 2035, were provided by Bulgaria during the review.

Table 8
Summary of greenhouse gas emission projections for Bulgaria presented by sector

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
		2030		*2035*		*1990–2030*		*1990–2035*	
Sector	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
Energy (not including transport)	64 749.56	25 620.70	25 153.00	25 259.98	24 019.83	–60.4	–61.2	–61.0	–62.9
Transport	6 521.69	9 033.04	8 977.00	8 659.00	8 574.84	38.5	37.6	32.8	31.5
Industry/industrial processes	10 084.04	6 806.00	6 602.00	6 598.00	6 394.00	–32.5	–34.5	–34.6	–36.6
Agriculture	12 263.32	7 372.00	7 287.00	7 858.52	7 800.64	–39.9	–40.6	–35.9	–36.4
LULUCF	–17 888.73	–9 713.00	–9 981.00	–9 779.00	–10 052.00	–45.7	–44.2	–45.3	–43.8
Waste	4 738.20	1 947.00	1 489.00	1 604.00	917.00	–58.9	–68.6	–66.1	–80.6
Other	0.00	0.00	0.00	0.00	0.00	–	–	–	–
Total GHG emissions excluding LULUCF	**98 356.81**	**50 778.74**	**49 507.75**	**49 979.51**	**47 706.07**	**–48.4**	**–49.7**	**–49.2**	**–51.5**

Source: Bulgaria's BR5 CTF table 6.

84. According to the projections reported for 2030 under the WEM scenario, the most significant absolute emission reductions are expected to occur in the energy sector (not including transport), amounting to projected reductions of 60.4 per cent between 1990 and

2030. The next most significant emission reductions are expected to occur in the waste sector, for which emissions are projected to decrease by 58.9 per cent by 2030 compared with the 1990 level. Emissions are projected to increase for the transport sector only, for which an increase over the same period of 38.5 per cent is expected. The pattern of projected emissions reported for 2035 under the same scenario slightly changes owing to further emission reductions expected in all sectors except for agriculture, for which a 6.6 per cent increase is expected between 2030 and 2035. The ERT noted that the reductions in emissions primarily occur before 2000 and that compared with the latest inventory year (2020), projected emissions are expected to increase in industry and agriculture. These projected increases from 2020 result in total projected emissions, excluding LULUCF, increasing by 3.2 and 1.6 per cent for 2030 and 2035 respectively.

85. Bulgaria presented the WEM and WAM scenarios by gas for 2030 and 2035, as summarized in table 9.

Table 9
Summary of greenhouse gas emission projections for Bulgaria presented by gas

	GHG emissions and removals (kt CO_2 eq)					*Change (%)*			
		2030		*2035*		*1990–2030*		*1990–2035*	
Gas[a]	*1990*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*	*WEM*	*WAM*
CO_2	76 699.20	38 407.75	37 877.61	37 678.25	36 470.00	–49.9	–50.6	–49.9	–50.6
CH_4	13 063.80	5 444.64	4 968.21	5 247.46	4 534.37	–58.3	–62.0	–58.3	–62.0
N_2O	8 590.12	5 550.85	5 458.85	5 852.70	5 759.25	–35.4	–36.5	–35.4	–36.5
HFCs	NO	1 363.59	1 193.14	1 193.14	937.47	–	–	–	–
PFCs	NO	0.01	0.01	0.01	0.01	–	–	–	–
SF_6	3.69	11.90	9.92	7.94	4.96	222.6	168.8	222.6	168.8
NF_3	NO	NO	NO	NO	NO	–	–	–	–
Total GHG emissions without LULUCF	**98 356.81**	**50 778.74**	**49 507.75**	**49 979.51**	**47 706.07**	**–48.4**	**–49.7**	**–48.4**	**–49.7**

Source: Bulgaria's BR5 CTF table 6.
[a] Bulgaria did not include indirect CO_2 emissions in its projections.

86. The model used for projecting the emissions reported in the NC8 and BR5, the (B)EST model, has also been used to inform the NECP. (B)EST is an energy supply and demand model, designed as a single-country tool for producing detailed energy system projections, forecasting energy demand and planning for the power sector, as well as for conducting impact assessments of national climate and energy policy decisions with a horizon up until 2050. The (B)EST model has four modules: one for energy (which is the main module), one for process CO_2 emissions from IPPU, one for non-CO_2 emissions and one for LULUCF. This framework provides a fully integrated approach to projecting emissions for all relevant sectors and all GHGs, except for indirect GHGs. Bulgaria prepared estimates for indirect GHGs using the same bottom-up approach as that used for its air pollution projections. The ERT noted that the development and application of this new model has had a positive impact on the quality of Bulgaria's GHG projections.

(d) Assessment of adherence to the reporting guidelines

87. The ERT assessed the information reported in the NC8 and BR5 of Bulgaria and identified issues relating to completeness and transparency, and thus adherence to the UNFCCC reporting guidelines on NCs and the UNFCCC reporting guidelines on BRs. The findings are in tables I.3 and II.2.

2. Assessment of the total effect of policies and measures

(a) Technical assessment of the reported information

88. In its NC8 Bulgaria presented the estimated and expected effect of implemented and adopted PaMs. The Party did not provide an estimate of the total effect of its PaMs, in

accordance with the WEM scenario, compared with a situation without such PaMs. Information is presented in terms of GHG emissions avoided, expressed in CO_2 eq, in 2030 and 2035.

89. Bulgaria reported that the total estimated effect of its implemented and adopted PaMs is 11,490 kt CO_2 eq in 2030. According to the information reported in its NC8 (sectoral projections under the WEM and WAM scenarios) and calculations made by the ERT, the PaMs implemented in the energy sector will deliver the largest emission reductions, followed by the PaMs implemented in the waste and industry sectors. Table 10 provides an overview of the total effect of PaMs as reported by Bulgaria.

Table 10
Projected effects of Bulgaria's planned, implemented and adopted policies and measures in 2030 and 2035
(kt CO_2 eq)

	2030		*2035*	
Sector	*Effect of implemented and adopted measures*	*Effect of planned measures*	*Effect of implemented and adopted measures*	*Effect of planned measures*
Energy (without transport)	–	467.7	–	1 240.2
Transport	–	56.0	–	84.2
Industry/industrial processes	–	204.0	–	204.0
Agriculture	–	85.0	–	57.9
Land-use change and forestry	NA	NA	NA	NA
Waste management	–	458.0	–	687.0
Total	**11 490**	**1 271**	**12 289**	**2 274**

Sources: Bulgaria's NC8 and calculations made by the ERT on the basis of information included in the NC8.
Note: The total effect of implemented, adopted and planned PaMs was provided during the review by Bulgaria and is based on a comparison of total emission reductions reported in the NC8, NC7 and (B)EST model. The sectoral breakdown of the effect of planned PaMs was derived by the ERT from the difference between the WEM and the WAM scenarios reported in the NC8.

(b) Assessment of adherence to the reporting guidelines

90. The ERT assessed the information reported in the NC8 of Bulgaria and identified an issue relating to completeness, and thus adherence to the UNFCCC reporting guidelines on NCs. The finding is described in table I.3.

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

(a) Technical assessment of the reported information

91. In the NC8 Bulgaria provided information on how its use of the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol is supplemental to domestic action.

(b) Assessment of adherence to the reporting guidelines

92. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres to the reporting guidelines for supplementary information. No issues relating to the topics discussed in this chapter of the review report were raised during the review.

G. Provision of financial, technological and capacity-building support to developing country Parties

93. Bulgaria is not an Annex II Party and is therefore not obliged to adopt measures and fulfil obligations defined in Article 4, paragraphs 3–5, of the Convention. However, Bulgaria provided information in its NC8 and BR5 on its provision of support to developing country

Parties. The ERT commends Bulgaria for reporting this information and suggests that it continue to do so in future NCs.

94. At COP 21 in 2015 Bulgaria announced a voluntary contribution of EUR 100,000 to the Green Climate Fund. In 2020 the Party disbursed EUR 50,000 to the Fund. The Party also contributed EUR 84,170 to the United Nations Educational, Scientific and Cultural Organization.

95. Bulgarian foreign policy gives priority to projects that fulfil the aims of the EU fast-start finance initiative. As part of the initiative, Bulgaria provided capacity-building support in 2011 and 2012 to North Macedonia for the development of a monitoring, reporting and verification system for GHG inventories and emissions trading.

H. Vulnerability assessment, climate change impacts and adaptation measures

1. Technical assessment of the reported information

96. In its NC8 Bulgaria provided information on the expected impacts of climate change in the country; the adaptation policies covering regional, sectoral and cross-sectoral vulnerabilities and considerations; and an outline of the action taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation. Bulgaria provided a description of climate change vulnerability and impacts on agriculture and food security, biodiversity and ecosystem services, energy, forestry, human health, tourism, transport, urban environment and water resources, and highlighted the adaptation response actions taken and planned at different levels of government. Bulgaria has identified key vulnerable sectors in the National Climate Change Adaptation Strategy and Action Plan, which are agriculture and food security, biodiversity and ecosystem services, energy, forestry, human health, tourism, transport, the urban environment and water resources.

97. Bulgaria has addressed adaptation matters through the adoption of the National Climate Change Adaptation Strategy and Action Plan in 2019 (which drew on the National Climate Change Risk and Vulnerability Assessment), which provided further direction to government agencies on enhancing preparedness for climate change. Adaptation actions undertaken by the Government have been guided by priorities identified in the National Climate Change Adaptation Strategy and Action Plan. Under the overarching Strategy and Action Plan, government agencies implement sector-specific adaptation strategies and plans, which include priorities, activities, budgets, time frames, expected results, and performance indicators to be used to monitor implementation.

98. The key findings of Bulgaria's research on the impacts of climate change highlight issues such as average temperature rise, increased frequency of extreme weather events, sea level rise and increased occurrence of droughts and floods. The methodologies used by the Party for determining climate change impacts and vulnerabilities are based on the European Commission's *Guidelines on developing adaptation strategies* and the *IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations*.

99. Bulgaria reported on its assessment of expected impacts and vulnerability. The assessment was based on projected changes in mean surface air temperature, precipitation and extreme weather events in 2050, in 2080 and at the end of the twenty-first century. Bulgaria's climate modelling indicates that the climate will undergo significant changes over the coming decades, including an increase in average temperature and a decrease in rainfall, which will cause declines in agricultural production and water supply. There will also be an increase in the number of extreme events, such as floods (resulting from an increase in precipitation intensity) and heatwaves (resulting from an increase in average temperature). Table 11 summarizes the information on vulnerability and adaptation to climate change presented in the NC8 of Bulgaria.

Table 11
Summary of information on vulnerability and adaptation to climate change reported by Bulgaria

Vulnerable area	*Examples/comments/adaptation measures reported*
Agriculture and food security	Vulnerability: Change in the length of the growing season and with resulting decrease in crop production; increase in the risk of the spread of pests, diseases and weeds; adverse effects on livestock production; increase in the risk of soil aridity, erosion, desertification and salinization; risk of water shortages.
	Adaptation: Adjusting the timing of farm operations and growing thermophilic crops; diversifying livestock farming and saving pastures for grazing; managing natural resources and developing suitable irrigation systems; building adaptive capacity; and developing insurance and risk management programmes.
Biodiversity and ecosystem services	Vulnerability: Loss of genetic diversity and disruption of species life cycles; decrease in ecosystem services; and a reduction of wetlands and coastal zone ecosystems.
	Adaptation: Developing and adopting new strategies and an action plan for biodiversity and green infrastructure; creating specialized ecosystem education programmes; organizing traditional knowledge; and estimating the carrying capacity of essential ecosystems and the capacity for ecosystem restoration.
Energy	Vulnerability: Damage to infrastructure and equipment; reduction in the efficiency of power plants and availability of water for cooling; and decrease in the efficiency of solar and wind power generation.
	Adaptation: Building institutional capacity; mainstreaming climate change issues in energy sector policies, plans and financial mechanisms; and incorporating climate resilience into design and engineering.
Forestry	Vulnerability: Species physiological responses; increase in the incidence of forest fires; increase in invasive species; decline in the potential for forest growth; forest health problems; and stress in forest ecosystems.
	Adaptation: Creating a national forestry extension service and enhancing forest nursery capacity; updating current building standards to include the use of wood as a building material; building a national fire detection and response system; and creating a programme of modern energy and heat production systems for households, businesses and small communities.
Human health	Vulnerability: Health effects related to changes in temperature and humidity, increased incidence of extreme weather events, and changes in precipitation.
	Adaptation: Developing a national strategy and action plan on health and climate change; creating awareness and building national monitoring and early warning systems; and conducting knowledge base research on the vulnerability of human health to climate change.
Tourism	Vulnerability: Lower number and shorter average stay of tourists; damage to tourist infrastructure; and poorer access to tourist destinations.
	Adaptation: Mainstreaming climate change issues in tourism sector policies; creating awareness and building adaptive capacity; developing insurance and risk management programmes; developing a climate change adaptation national database; and conducting research programmes on tourism development.
Transport	Vulnerability: Damage to road and railway infrastructure; higher operation costs; and increased risk of road accidents.
	Adaptation: Building institutional capacity and the knowledge base of the transport sector; and mainstreaming climate change adaptation planning and decision-making processes in the transport sector.
Urban environment	Vulnerability: Damage to buildings and urban infrastructure; impacts on the supply of food and electricity; and increased financial pressure on municipalities for the maintenance of infrastructure and provision of emergency aid.
	Adaptation: Strengthening the policy and legal framework; building adaptive capacity; developing financial, social and risk management policies; enhancing knowledge management for adaptation; and conducting research and education on adaptation.
Water resources	Vulnerability: Reduction in water resource availability; risks to hydroelectricity generation; and risks to infrastructure and water services.

Vulnerable area	*Examples/comments/adaptation measures reported*
	Adaptation: Enhancing adaptive governance; strengthening the knowledge base; raising awareness of adaptation; and enhancing adaptive management of water system infrastructure.

100. Bulgaria provided information on bilateral cooperation with developing countries on adaptation. The Party contributes annually to the core budget of the secretariat; part of this contribution is used to support developing countries in adapting to climate change. Some initiatives supported by these funds involve the protection and rehabilitation of areas in Africa affected by drought and desertification.

2. Assessment of adherence to the reporting guidelines

101. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres 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.

I. Research and systematic observation

1. Technical assessment of the reported information

102. In its NC8 Bulgaria 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, GCOS and the IPCC. Bulgaria did not provide 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.

103. Bulgaria has implemented and planned 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. Bulgaria implements several research projects with national and international partners to support innovation in the areas of mitigation and adaptation. Bulgaria focuses mostly on atmospheric air quality, GHG emission reduction from LULUCF, low-carbon energy for transport and households, meteorology, agrometeorology and hydrology. The Bulgarian Academy of Sciences carries out research and other activities on climate change and cooperates with research organizations in EU member States. In its NC8 Bulgaria reported that it is involved with 69 projects related to the protection of the environment, water and the climate.

104. In terms of activities related to systematic observation, Bulgaria provided information on activities at the national and international level. However, the Party did not report on national plans, programmes and support for ground- and space-based climate observing systems, including satellite and non-satellite climate observation, or on challenges related to the maintenance of a consistent and comprehensive observation system.

105. There are no GCOS Surface Network and GCOS Upper-Air Network stations located in Bulgaria, but Bulgaria has 40 synoptic and more than 90 climatic stations across the country. The National Institute of Geophysics, Geodesy and Geography, which is the leading scientific institution in the field of research and systematic observation in the country, is involved in the recording and data processing, analysis and interpretation of seismicity and the geomagnetic field, ionosphere and ultraviolet radiation level above the country and region. The Institute of Oceanology carries out studies on the physical, chemical and biological parameters of the seawater and seabed in the western part of the Black Sea. The Space Research and Technology Institute participates in national and international space-based observation programmes. Bulgaria uses satellite images for research and as the main source of information for developing geoinformation systems, and it uses aerospace tools to investigate the Earth's surface.

106. The NC8 reflects actions taken to support capacity-building and the establishment and maintenance of observation systems and related data and monitoring systems in developing countries. Bulgaria reported that as a country with an economy in transition it provides

financial assistance on a voluntary basis, including support to related capacity-building activities in developing countries.

2. Assessment of adherence to the reporting guidelines

107. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres 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.

J. Education, training and public awareness

1. Technical assessment of the reported information

108. In its NC8 Bulgaria provided information on its actions relating to education, training and public awareness at the domestic and international 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; resource or information centres; and its participation in international activities. Bulgaria reported that the Ministry of Education and Science is responsible for implementing the national policies on climate education.

109. In its NC8, Bulgaria reported that several universities in the country offer programmes in climate change adaptation and mitigation at the undergraduate and postgraduate level. The Bulgarian Academy of Sciences has developed a syllabus for training teachers and lecturers. In addition, doctoral students have taken part in various scientific forums (conferences, seminars, workshops, scientific networks, expert bodies, scientific unions, associations, societies, etc.) related to climate change.

110. In the NC8, Bulgaria reported on actions taken to raise public awareness on the environment and climate change through information dissemination via radio and television. Bulgaria also reported that its climate change policy is periodically updated and information on the policy is made accessible to the public on the MoEW website. MoEW is actively involved with non-governmental organizations in training and public awareness actions and plans. Climate change policy is presented at various forums, meetings with non-governmental organizations and businesses, conferences, seminars and training sessions in order to familiarize stakeholders with relevant and up-to-date aspects of policy development. The Party further reported that the preparation of the NC8 was done in collaboration with various ministries, public companies, research institutions, regional authorities and non-governmental organizations.

2. Assessment of adherence to the reporting guidelines

111. The ERT assessed the information reported in the NC8 of Bulgaria and recognized that the reporting is complete and transparent, and thus adheres 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

112. The ERT conducted a technical review of the information reported in the NC8 of Bulgaria in accordance with the UNFCCC reporting guidelines on NCs. The ERT concluded that the reported information mostly adheres to the UNFCCC reporting guidelines on NCs and that the NC8 provides an overview of the national climate policy of Bulgaria.

113. The information provided in the NC8 includes all elements of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol. Bulgaria reported on the national system, the national registry, supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol, PaMs in accordance with Article 2 of the Kyoto Protocol, domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures. 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 Bulgaria in its 2022 annual submission.

114. The ERT conducted a technical review of the information reported in the BR5 and BR5 CTF tables of Bulgaria in accordance with the UNFCCC reporting guidelines on BRs. The ERT concluded that the reported information mostly adheres to the UNFCCC reporting guidelines on BRs and that the BR5 and its CTF tables provide an overview of emissions and removals related to the Party's quantified economy-wide emission reduction target; assumptions, conditions and methodologies related to the attainment of the target; and the progress of Bulgaria towards achieving its target.

115. In its NC8 Bulgaria reported on its key national circumstances related to GHG emissions and removals, including the national governmental structure, national legislation, the population profile, GDP, geography and land use, the climate profile, the economic profile, the status of the energy and transport sector, industry and energy consumption, tax and trade status, agriculture and forestry, and the waste sector, that affect GHG emissions over time. The Party reported that GDP, one of the most direct and significant factors impacting GHG emissions, rose by 4 per cent in 2019 but decreased by 4 per cent in 2020 owing to the COVID-19 pandemic.

116. Bulgaria's total GHG emissions excluding LULUCF were estimated to be 50.0 per cent below its 1990 level. Emissions peaked in 2017 and decreased thereafter. The changes in total emissions were driven mainly by Bulgaria's transition from a centrally planned economy to a market-based economy, which led to a decrease in power production from thermal power stations, structural changes in industry and changes in agriculture such as a decline in cattle and sheep populations and in the use of fertilizers. The observed reduction in emissions in 2020, particularly in the energy and IPPU sectors (12.8 and 48.6 per cent respectively), was primarily driven by the impacts of the COVID-19 pandemic.

117. As reported in the BR5, under the Convention Bulgaria committed to contributing to the achievement of the joint EU quantified economy-wide target of a 20 per cent reduction in emissions below the 1990 level by 2020. The target covers all sectors and CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, expressed using GWP values from the AR4. Emissions and removals from the LULUCF sector are not included. Under the ESD Bulgaria has a target of limiting its emission growth to 20 per cent above the 2005 level by 2020.

118. The EU has a joint 2030 emission reduction target of at least 55 per cent below the 1990 level. This will be primarily implemented through the EU ETS and ESR, which have targets to reduce emissions by 2030 by 62 and 40 per cent respectively compared with the 2005 level.

119. The ERT noted that the total GHG emissions of the EU excluding LULUCF do not exceed the emission level corresponding to the target in 2020, and thus that the EU has achieved its joint target. The ERT therefore concluded that Bulgaria has met its 2020 commitment under the Convention through its contribution to achieving the joint target of the EU. See the report on the review of the BR5 of the EU for further details. The ERT noted that the Party met its 2020 ESD target because its ESD emissions in 2020 do not exceed its AEA for 2020 and by using the flexibility allowed under the ESD to use its surplus AEAs from prior years.

120. The GHG emission projections provided by Bulgaria in its NC8 and BR5 correspond to the WEM and WAM scenarios. Under the WEM scenario, emissions in 2030 are projected to be 49.0 per cent below the 1990 level and 3.8 per cent above the 2020 level. Under the WAM scenario, emissions in 2030 are projected to be 50.9 per cent below the 1990 level and 0.1 per cent below the 2020 level.

121. Bulgaria's main policy framework relating to energy and climate change is rooted in the Climate Change Mitigation Act and the third NAPCC. In addition, key directions and objectives for further actions are outlined in the NECP and the Long-term Climate Change Mitigation Strategy until 2050. The Party described the mitigation actions that it has implemented to help it achieve its 2020 and longer-term targets, which include PaMs in all economic sectors, with a focus on energy, transport, households and services, and waste.

These PaMs mainly stem from EU legislation. The EU ETS is the key overarching measure addressing GHG emissions from the energy and industry sectors. The efficiency of power generation facilities and solid fuel substitution offer the greatest mitigation potential. Owing to geopolitical changes affecting natural gas supply and demand, the envisaged substitution of coal by gas will focus on other energy sources, including RES and hydrogen. Measures in the transport sector focus on the development and promotion of clean modes of transport, especially for public transport. A switch from solid fuels to other energy sources, including gas and RES, is also promoted in the households and services sector. PaMs in the waste sector focus on solid waste disposal on land, the treatment and recovery of compost and biomass, and the capture and flaring of biogas from landfills.

122. Bulgaria is not an Annex II Party and is therefore not obliged to adopt measures and fulfil obligations defined in Article 4, paragraphs 3–5, of the Convention. However, it provided information in its BR5 and NC8 on its provision of support to developing country Parties. In 2015 Bulgaria announced a voluntary contribution of EUR 100,000 to the Green Climate Fund and in 2020 disbursed EUR 50,000 to the Fund.

123. In its NC8 Bulgaria provided information on the expected impacts of climate change in the country; the adaptation policies covering regional, sectoral and cross-sectoral vulnerabilities and considerations; and an outline of the action taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation. Bulgaria indicated that the key sectors vulnerable to climate change are agriculture and food security, biodiversity and ecosystem services, energy, forestry, human health, tourism, transport, the urban environment and water resources. Adaptation to climate change is covered by the National Climate Change Adaptation Strategy and Action Plan, which is mainly aimed at capacity-building; mainstreaming climate change issues in all policy sectors; building adaptive capacity; and developing strategies, action plans and programmes to increase the resilience of all sectors to climate change.

124. In its NC8 Bulgaria provided information on its activities relating to research and systematic observation. The information covered general policy and funding relating to research and systematic observation, and to domestic and international activities, and included a summary of its GCOS activities. Research activities mostly focus on atmospheric air quality, GHG emission reduction from LULUCF, low-carbon energy for transport and households, meteorology, agrometeorology and hydrology. The Bulgarian Academy of Sciences carries out research and other activities on climate change and cooperates with research organizations in EU member States. In its NC8 Bulgaria reported that it is involved with 69 projects related to the protection of the environment, water and the climate. Activities related to systematic observation are closely linked to Bulgaria's provision of meteorological services, for which it uses 40 synoptic and more than 90 climatic stations all over the country.

125. In its NC8 Bulgaria provided information on its actions relating to education, training and public awareness, covering, for example, primary and secondary education. The Ministry of Education and Science is responsible for implementing the national policy on climate education. Bulgaria raises public awareness on the environment and climate change through information dissemination via radio and television. Climate change policy is periodically updated and information on the policy is made accessible to the public on the MoEW website.

126. In the course of the review, the ERT formulated the following recommendations for Bulgaria to improve its adherence to the UNFCCC reporting guidelines on NCs in its next NC:

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

(i) Providing a brief description of the estimation methods used for the determination of the effects of its PaMs (see issue 4 in table I.2);

(ii) Providing information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals (see issue 5 in table I.2);

(iii) Providing an estimate of the total effect of its PaMs in accordance with the WEM scenario compared with a situation without such PaMs (see issue 3 in table I.3);

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

(i) Providing consistent information on the status and starting year of the implementation of all PaMs described (see issue 3 in table I.2);

(ii) Explaining which PaMs are included in the WEM and WAM scenarios (see issue 2 in table I.3).

127. In the course of the review of Bulgaria's BR5, the ERT formulated the following recommendations relating to adherence to the UNFCCC reporting guidelines on BRs: issues with the transparency of its reporting relating to:

(a) Information provided on mitigation actions in relation to status and starting year of implementation (see issue 1 in table II.1);

(b) Explanation of which PaMs are included in the WEM and WAM scenarios (see issue 2 in table II.2);

(c) Information in relation to projections with regard to the base year of the target (see issue 3 in table II.2).

Annex I

Assessment of adherence to the reporting guidelines for the eighth national communication of Bulgaria

Tables I.1–I.4 summarize the ERT assessment of adherence to the UNFCCC reporting guidelines on NCs for Bulgaria's NC8.

Table I.1
Findings on national circumstances relevant to greenhouse gas emissions and removals from the review of the eighth national communication of Bulgaria

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 3 Issue type: completeness Assessment: encouragement	The Party reported brief information on national circumstances, including the governmental structure, geography, climate, population and economic profile. However, the Party did not report information on how its national circumstances are relevant to factors affecting GHG emissions and removals, including disaggregated indicators, to explain the relationship between the national circumstances and emissions or removals. During the review, Bulgaria explained that national circumstances relevant to factors affecting GHG emissions and removals are presented in detail in the 2022 national inventory report, which is summarized in chapter 4 of the NC8. The ERT reiterates the encouragement from the previous review report for Bulgaria to improve the completeness of its reporting by providing in its next NC information on how its national circumstances are relevant to factors affecting GHG emissions and removals in order to explain the relationship between national circumstances and the trend of emissions or removals. The ERT notes that this information could include details on issues such as the impact of population size and economic profile on GHG trends and could cover an analysis of the relationship between population growth and GHG trends and an analysis of the relationship between GDP and GHG emissions per capita.

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 and transparent, and thus adheres to the UNFCCC reporting guidelines on NCs.

Table I.2
Findings on policies and measures from the review of the eighth national communication of Bulgaria

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 12 Issue type: completeness Assessment: encouragement	The Party did not report on actions taken to implement its commitments under Article 4, paragraph 2(e)(ii), of the Convention, which requires it to identify and periodically update its own policies and practices that encourage activities that lead to greater levels of anthropogenic GHG emissions than would otherwise occur. During the review, the Party explained that the overall policy of Bulgaria is to implement EU policy, which does not foresee a possibility for policies that could lead to higher GHG emissions. Therefore, the Party finds it difficult to identify any policies or practices that could lead to higher levels of GHG emissions. The ERT reiterates the encouragement from the previous review report for Bulgaria to improve the completeness of its reporting by providing in its next NC information on the actions taken to identify, and periodically update, its policies and practices that encourage activities that lead to greater levels of anthropogenic GHG emissions than would otherwise occur.
2	Reporting requirement specified in paragraph 14 Issue type: transparency	The Party did not report PaMs influencing GHG emissions from international transport under the transport sector. However, information on activities aimed at promoting the decisions of ICAO and IMO is reported in the NC8. The ERT notes that this information also covers PaMs related to international transport, such as the EU ETS for aviation and the EU monitoring, reporting and verification system for CO_2 emissions from maritime transport.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
	Assessment: encouragement	During the review, Bulgaria informed the ERT that as an EU member State, it takes action to reduce emissions from international transport in line with EU policies. Further, it noted that as an EU border country it is particularly vulnerable to the effects of international transport regarding, for example, fuel sales, especially so owing to the current geopolitical situation. New measures concerning international transport are under consideration and will be taken into account in the work on updating the NECP. The ERT encourages Bulgaria to improve the transparency of its reporting by including in its next NC information on PaMs that influence GHG emissions from international transport in the transport sector, complementing the information reported elsewhere on ICAO and IMO.
3	Reporting requirement specified in paragraph 19 Issue type: transparency Assessment: recommendation	The Party provided information under each of the subheadings specified in paragraph 19 for each policy or measure. However, there is inconsistency in the information reported in table 5.17 of the NC8 and in CTF table 3 on the status and starting year of the implementation of measure 6 (renovation of communal, public and state buildings). In table 5.17 this measure is reported as planned, with 2023 as the starting year of its implementation, whereas the information in CTF table 3 indicates that the measure is implemented, with 2015 as the starting year of its implementation. During the review, Bulgaria explained that the correct information is provided in table 5.17 and the measure is planned. The ERT recommends that the Party improve the transparency of its reporting by providing in its next NC consistent information on the status and starting year of the implementation of all PaMs described.
4	Reporting requirement specified in paragraph 20 Issue type: completeness Assessment: recommendation	The Party reported quantitative estimates of the effects of all PaMs in table 5.17 of the NC8. However, the Party did not provide a brief description of the estimation methods used. The NC8 only notes that the data reported for the annual GHG effects of individual PaMs are based on information provided by relevant institutions and other bodies responsible for the implementation of these PaMs. During the review, Bulgaria did not provide further information on the methods used to calculate the effects of PaMs in table 5.17. However, the Party explained that the methodology used to calculate the data reported as the annual GHG effects of individual PaMs differs from the methodology used to assess the cumulative effects of PaMs presented in the textual part of the NC8. The ERT recommends that Bulgaria improve the completeness of its reporting by providing in its next NC a brief description of the estimation methods used for the determination of the effects of its PaMs.
5	Reporting requirement specified in paragraph 22 Issue type: completeness Assessment: recommendation	Bulgaria provided in its NC8 information on the effects of its PaMs. However, the Party did not report on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals. During the review, the Party explained that GHG emissions and removals up until 2030 are described in the NECP, GHG emissions and removals up until 2040 are described in Bulgaria's 2021 Projection Report in accordance with article 18 of EU regulation 2018/1999, and GHG emissions and removals up until 2050 are described in Bulgaria's Long-term Climate Change Mitigation Strategy until 2050. However, the Party did not provide data or descriptive information, including the conclusions of the aforementioned reports. The ERT reiterates the recommendation from the previous review report for Bulgaria to improve the completeness of its reporting by providing in its next NC information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals.

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 and transparent, and thus adheres to the UNFCCC reporting guidelines on NCs.

Table I.3
Findings on projections including aggregate effects of policies and measures reported in the eighth national communication of Bulgaria

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 25 Issue type: completeness Assessment: encouragement	Bulgaria did not report WOM projections in its NC8. During the review, Bulgaria explained that it considers it not necessary to report WOM projections because it is not a mandatory reporting requirement and that such projections are not available. The ERT encourages Bulgaria to provide in its next NC WOM projections or an explanation as to why developing such projections is not appropriate given the national circumstances.
2	Reporting requirement specified in paragraph 26 Issue type: transparency Assessment: recommendation	Bulgaria reported a WEM projection scenario that encompasses all currently implemented and adopted PaMs, in line with the allocation of measures as defined in paragraph 26, and a WAM projection scenario. However, the ERT noted that the PaMs chapter of the NC8 does not contain transparent information on the PaMs considered and the mitigation impacts included under the WAM scenario. In addition, the projections for the WEM scenario differ from those for the WAM scenario even for the sectors for which no additional planned PaMs are indicated in the NC8, such as agriculture and waste. Finally, for the WEM scenario, the PaMs chapter outlines quantified measures for the households and services sector, however, in the projections chapter it is not clear in which sector the effect of these PaMs is included. During the review, Bulgaria clarified that for the estimation of projections, all the PaMs (implemented, adopted and planned) are considered under the WEM and WAM scenarios by the (B)EST model and that the information on the PaMs is provided in the PaMs chapter only. The PaMs for the households and services sector are aggregated under the energy sector rather than being presented separately because this sector is considered a minor source of emissions compared with energy industries, transport, and manufacturing industries and construction. This approach is consistent with the projections presented in the NECP. The ERT reiterates the recommendation from the previous review report for Bulgaria to improve the transparency of its reporting by explaining in its next NC which implemented and adopted PaMs are considered under the WEM scenario and which planned PaMs are considered under the WAM scenario, which could be done by including a complete list of the PaMs and considering their potential mitigation impacts under each scenario.
3	Reporting requirement specified in paragraph 37 Issue type: completeness Assessment: recommendation	Bulgaria did not provide in its NC8 an estimate of the total effect of its PaMs in accordance with the WEM scenario compared with a situation without such PaMs. During the review, Bulgaria confirmed that this estimate is not available. The ERT reiterates the recommendation from the previous review report for Bulgaria to improve the completeness of its reporting by providing in its next NC an estimate of the total effect of its PaMs in accordance with the WEM scenario compared with a situation without such PaMs, presented in terms of GHG emissions avoided by gas.
4	Reporting requirement specified in paragraph 38 Issue type: transparency Assessment: encouragement	Bulgaria did not include in the NC8 a transparent explanation for how the total effect of its PaMs was calculated. The ERT noted that there are significant discrepancies between the estimated emission reductions presented when the reductions, as reported in table 5.17, are summed versus the total effect of PaMs, as presented in the textual part of the NC8. During the review, Bulgaria explained that the individual effects of the implemented, adopted and planned PaMs presented in table 5.17 are estimated using a different methodology than the methodology used for calculating the total effect of its PaMs, which is the (B)EST model. The ERT reiterates the encouragement from the previous review report for Bulgaria to improve the transparency of its reporting by providing in its next NC an explanation of the approach used to calculate the total effect of its PaMs. The ERT notes that in this context the Party should explain the reasons for the discrepancies observed in the total

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
		effect between that calculated using the (B)EST model and that obtained when adding together the effects of individual measures, as presented in table 5.17 of the NC8.
5	Reporting requirement specified in paragraph 41	Bulgaria did not provide in the NC8 references to more detailed information related to the information referred to in paragraph 40(a–e) concerning the model used for the projections.
	Issue type: completeness Assessment: encouragement	During the review, Bulgaria explained that there are no external references to the (B)EST model used for the projections because it was created by consultants solely for use by Bulgaria. It was not considered relevant to include a reference to the user manual in the NC8.
		The ERT encourages Bulgaria to improve the completeness of its reporting by including in its next NC a reference to the (B)EST user manual along with references to documents, if available, of the National Energy and Climate Modelling and Forecasting for Bulgaria project.
6	Reporting requirement specified in paragraph 43	Bulgaria reported a sensitivity analysis of its projections. The analysis specifically addressed the impact on emissions of changes in the assumed growth of GDP. Bulgaria did not report on the sensitivity of the projections to other important underlying assumptions.
	Issue type: transparency Assessment: encouragement	During the review, Bulgaria clarified that it used the Logarithmic Mean Divisia Index Decomposition Analysis tool to estimate the sensitivity and assess the relative change in total GHG emissions for different values of GDP, population and final energy use. The input parameters were modified on the basis of an analysis of the relevant national circumstances during the preparation of the projections (i.e. expert judgment).
		The ERT reiterates the encouragement from the previous review report for Bulgaria to improve the transparency of its reporting by discussing in its next NC qualitatively, and where possible quantitatively, the sensitivity of its projections to the remaining underlying assumptions in addition to GDP growth. The ERT notes that the quantitative results of the sensitivity analysis for total GHG emissions could be presented in a tabular format for ease of reference.
7	Reporting requirement specified in paragraph 45	Bulgaria did not report factors that facilitate understanding of the emission trends in the past and in future projections in a tabular format from 1990 to at least 15 years from the most recent inventory year. Bulgaria reported factors only for 2020, 2025 and 2030.
	Issue type: completeness	During the review, Bulgaria noted that it considers only factors for 2020, 2025 and 2030 are relevant for projections and these were provided in table 5.25 of the NC8.
	Assessment: encouragement	The ERT reiterates the encouragement from the previous review report for Bulgaria to improve the completeness of its reporting by providing in its next NC, in tabular format, factors that can explain emission trends from 1990 onward. The ERT notes that including key factors on a sectoral basis, for example energy supply by fuel type and/or energy demand, and how these factors are assumed to change across the projection period, would aid the transparency of the sectoral projected emission trends.

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 and transparent, and thus adheres to the UNFCCC reporting guidelines on NCs.

Table I.4
Findings on research and systematic observation from the review of the eighth national communication of Bulgaria

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in paragraph 65	The Party did not report 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 in its NC8.
	Issue type: completeness Assessment: encouragement	During the review, Bulgaria explained that it contributes to free data exchange as its National Institute of Meteorology and Hydrology belongs to and participates in data exchanges with the World Meteorological Organization. Moreover, Bulgaria collaborates with various international organizations and programmes that promote the free and open transfer of information internationally.

No.	*Reporting requirement, issue type and assessment*	*Description of the finding with recommendation or encouragement*
		The ERT reiterates the encouragement from the previous review report for Bulgaria to improve the completeness of its reporting by including in its next NC information on identified opportunities for and barriers to free and open international exchange of data and on action taken to overcome such barriers. The ERT notes that this information could cover data exchange and collaboration with other organizations, as described by the Party during the review.

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 and transparent, and thus adheres to the UNFCCC reporting guidelines on NCs.

Annex II

Assessment of adherence to the reporting guidelines for the fifth biennial report of Bulgaria

The BR5 of Bulgaria is the final BR under the measurement, reporting and verification system established under the Convention.[1] Nevertheless, ERTs continue to provide recommendations and encouragements to the Parties on completeness, transparency and adherence to the UNFCCC reporting guidelines on BRs. Parties may find these recommendations and encouragements relevant, as appropriate, when preparing their initial biennial transparency report under the enhanced transparency framework of the Paris Agreement. Tables II.1–II.2 summarize the ERT assessment of adherence to the UNFCCC reporting guidelines on BRs for Bulgaria's BR5.

Table II.1
Findings on mitigation actions and their effects from the review of the fifth biennial report of Bulgaria

No.	*Reporting requirement and issue type*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement specified in CTF table 3 Issue type: transparency Assessment: recommendation	The Party provided information under each of the subheadings specified in paragraph 19 for each policy or measure. However, there is inconsistency in the information reported in table 5.17 of the NC8 and CTF table 3 on the status and starting year of the implementation of measure 6 (renovation of communal, public and state buildings). In table 5.17 this measure is reported as planned, with 2023 as the starting year of its implementation, whereas the information in CTF table 3 indicates that the measure is implemented, with 2015 as the starting year of its implementation. During the review, Bulgaria explained that the correct information is provided in table 5.17 and the measure is planned. The ERT recommends that the Party improve the transparency of its reporting by providing consistent information on the status and starting year of the implementation of all PaMs described.

Note: Item listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on BRs or to the CTF table number from the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications". The reporting on the requirements not included in this table is considered to be complete and transparent, and thus adheres to the UNFCCC reporting guidelines on BRs.

Table II.2
Findings on projections reported in the fifth biennial report of Bulgaria

No.	*Reporting requirement and issue type*	*Description of the finding with recommendation or encouragement*
1	Reporting requirement[a] specified in paragraph 25 Issue type: completeness Assessment: encouragement	Bulgaria did not report WOM projections in its BR5. During the review, Bulgaria explained that it considers it not necessary to report WOM projections as this is not a mandatory requirement and that such projections are not available. The ERT encourages Bulgaria to provide WOM projections or an explanation as to why developing such projections is not appropriate given the national circumstances.
2	Reporting requirement[a] specified in paragraph 26	Bulgaria reported a WEM projection scenario that encompasses all currently implemented and adopted PaMs, in line with the allocation of measures as defined in paragraph 26, and a WAM projection scenario. However, the ERT noted that the PaMs chapter of the NC8 does not contain transparent information on the PaMs considered and the mitigation impacts included under the WAM scenario. In addition, the

[1] The COP, by decision 1/CP.24, decided that the final biennial reports shall be those submitted to the secretariat no later than 31 December 2022 and reaffirmed that, for Parties to the Paris Agreement, following the submission of the final biennial report, the modalities, procedures and guidelines contained in the annex to decision 18/CMA.1 will supersede the measurement, reporting and verification system established under decision 1/CP.16, paras. 40–47 and 60–64, and decision 2/CP.17, paras. 12–62.

No.	Reporting requirement and issue type	Description of the finding with recommendation or encouragement
	Issue type: transparency Assessment: recommendation	projections for the WEM scenario differ from those for the WAM scenario even for the sectors for which no additional planned PaMs are indicated, such as agriculture and waste. Finally, for the WEM scenario, the PaMs chapter outlines quantified measures for the households and services sector, however, in the projections chapter it is not clear in which sector the effect of these PaMs is included. During the review, Bulgaria clarified that for the estimation of projections, all the PaMs (implemented, adopted and planned) are considered under the WEM and WAM scenarios by the (B)EST model and that the information on the PaMs is provided in the PaMs chapter only. The PaMs for the households and services sector are aggregated under the energy sector rather than being presented separately because this sector is considered a minor source of emissions compared with energy industries, transport, and manufacturing industries and construction. This approach is consistent with the projections presented in the NECP. The ERT reiterates the recommendation from the previous review report for Bulgaria to improve the transparency of its reporting by explaining which implemented and adopted PaMs are considered under the WEM scenario and which planned PaMs are considered under the WAM scenario, which could be done by including a complete list of the PaMs and considering their potential mitigation impacts under each scenario.
3	Reporting requirement[a] specified in paragraph 34 Issue type: transparency Assessment: recommendation	Bulgaria reported projection data in CTF tables 6(a) and 6(c). However, the data provided for the base year are different from the data reported for 1990. During the review, the Party confirmed that the base year for the EU 2020 target under the Convention is 1990 and that data for 1990 should be included in column B of tables 6(a) and 6(b), in line with the data in column C. The ERT recommends that Bulgaria improve transparency of reporting and provide correct data on the base year of its target.
4	Reporting requirement[a] specified in paragraph 41 Issue type: transparency Assessment: encouragement	Bulgaria did not provide references to more detailed information related to the information referred to in paragraph 40(a–e) concerning the model used for the projections. During the review, Bulgaria explained that there are no external references to the (B)EST model used for the projections because it was created by consultants solely for use by Bulgaria. It was not considered relevant to include a reference to the user manual in the NC8. The ERT encourages Bulgaria to improve the completeness of reporting by including a reference to the (B)EST user manual along with references to documents, if available, of the National Energy and Climate Modelling and Forecasting for Bulgaria project.
5	Reporting requirement[a] specified in paragraph 43 Issue type: transparency Assessment: encouragement	Bulgaria reported a sensitivity analysis of its projections. The analysis specifically addressed the impact on emissions of changes in the assumed growth of GDP. Bulgaria did not report on the sensitivity of the projections to other important underlying assumptions. During the review, Bulgaria clarified that it used the Logarithmic Mean Divisia Index Decomposition Analysis tool to estimate the sensitivity and assess the relative change in total GHG emissions for different values of GDP, population and final energy use. The input parameters were modified on the basis of an analysis of the relevant national circumstances during the preparation of the projections (i.e. expert judgment). The ERT reiterates the encouragement from the previous review report for Bulgaria to improve the transparency of its reporting by discussing qualitatively, and where possible quantitatively, the sensitivity of its projections to the remaining underlying assumptions in addition to GDP growth. The ERT notes that the quantitative results of the sensitivity analysis for total GHG emissions could be presented in a tabular format for ease of reference.
6	Reporting requirement[a] specified in paragraph 45 Issue type: completeness	Bulgaria did not report factors that facilitate understanding of the emission trends in the past and in future projections in a tabular format from 1990 to at least 15 years from the most recent inventory year. Bulgaria reported factors only for 2020, 2025 and 2030. During the review, Bulgaria noted that it considers only factors for 2020, 2025 and 2030 are relevant for projections and these were provided in table 5.25 of the NC8. The ERT reiterates the encouragement from the previous review report for Bulgaria to improve the completeness of its reporting by providing, in tabular format, factors that

No.	*Reporting requirement and issue type*	*Description of the finding with recommendation or encouragement*
	Assessment: encouragement	can explain emission trends from 1990 onward. The ERT notes that including key factors on a sectoral basis, for example energy supply by fuel type and/or energy demand, and how these factors are assumed to change across the projection period, would aid the transparency of the sectoral projected emission trends.

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

[a] Item listed under reporting requirement refers to the relevant paragraph of the UNFCCC reporting guidelines on NCs, as per para. 11 of the UNFCCC reporting guidelines on BRs.

Annex III

Documents and information used during the review

A. Reference documents

2022 GHG inventory submission of Bulgaria. Available at https://unfccc.int/ghg-inventories-annex-i-parties/2022.

BR4 of Bulgaria. Available at https://unfccc.int/BR4.

BR5 CTF tables of Bulgaria. Available at https://unfccc.int/BR5.

BR5 of the EU. Available at https://unfccc.int/BR5.

BR5 of Bulgaria. Available at https://unfccc.int/BR5.

"Common tabular format for 'UNFCCC biennial reporting guidelines for developed country Parties'". Annex to decision 19/CP.18. Available at https://unfccc.int/resource/docs/2012/cop18/eng/08a03.pdf.

"Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention". FCCC/SBSTA/2014/INF.6. Available at http://unfccc.int/resource/docs/2014/sbsta/eng/inf06.pdf.

European Green Deal. European Commission document COM(2019) 640 final. Available at https://ec.europa.eu/info/files/communication-european-green-deal_en.

"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/2019/13/Add.1. Available at https://unfccc.int/documents/210471.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex to 15/CMP.1. Available at https://unfccc.int/documents/4253.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Annex III to decision 3/CMP.11. Available at https://unfccc.int/documents/9101.

"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". Annex to decision 13/CP.20. Available at http://unfccc.int/resource/docs/2014/cop20/eng/10a03.pdf.

National energy and climate plan of Bulgaria. Available at https://energy.ec.europa.eu/system/files/2020-06/bg_final_necp_main_en_0.pdf.

NC8 of Bulgaria. Available at https://unfccc.int/NC8.

Report on the individual review of the annual submission of Bulgaria submitted in 2020. FCCC/ARR/2020/BGR. Available at https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/inventory-review-reports/inventory-review-reports-2020.

Report on the technical review of the BR4 of Bulgaria. FCCC/TRR.4/BGR. Available at https://unfccc.int/documents/231988.

Report on the technical review of the NC7 of Bulgaria. FCCC/IDR.7/BGR. Available at https://unfccc.int/documents/195748.

The third National Action Plan on Climate Change. Available at https://www.moew.government.bg/en/national-action-plans-on-climate-change-and-reports/.

"UNFCCC biennial reporting guidelines for developed country Parties". Annex I to decision 2/CP.17. Available at http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf.

B. Additional information provided by the Party

Responses to questions during the review were received from Detelina Petrova (MoEW), including additional material. The following references were provided by Bulgaria and may not conform to UNFCCC editorial style as some have been reproduced as received:

Ministry of Environment and Water of Bulgaria. 2022. *Report for Implementation of the Third National Action Plan on Climate Change 2013–2020.*

Integrated Plan in the Field of Energy and Climate of the Republic of Bulgaria 2021–2030. Available at https://www.me.government.bg/news/integriran-plan-v-oblastta-na-energetikata-i-klimata-na-republika-balgariya-2021-2030-2823.html.

Long-term Climate Change Mitigation Strategy until 2050 of the Republic of Bulgaria. 2022. Available at https://www.moew.government.bg/bg/dulgosrochna-strategiya-za-smekchavane-na-izmenenieto-na-klimata-do-2050-g-na-r-bulgariya/.

A Long-Term Strategy for the Renewal of the National Building Stock of Residential and Non-Residential Buildings until 2050. Available at https://www.me.government.bg/bg/themes/dalgosrochna-strategiya-za-obnovyavane-na-nacionalniya-sgraden-fond-ot-jilishtni-i-nejilishtni-sgradi-do-2050-g-2271-1545.html.

National Waste Management Plan 2021–2028. Available at https://www.moew.government.bg/bg/otpaduci/strategicheski-dokumenti/.

Strategy for the Transition to a Circular Economy of the Republic of Bulgaria for the Period 2022–2027. Available at https://www.moew.government.bg/bg/otpaduci/strategicheski-dokumenti/.

National Plan for the Development of the Combined Transport of the Republic of Bulgaria Until 2030. 2022. Available at https://www.mtc.government.bg/bg/category/42/nacionalen-plan-za-razvitie-na-kombiniraniya-transport-na-republika-blgariya-do-2030-g.

Program for the Development and Operation of the Railway Infrastructure 2020–2024. Available at https://www.mtc.government.bg/bg/category/42/programa-za-razvitieto-i-eksploataciyata-na-zhelezoptnata-infrastruktura-2020-2024-g.

Bulgaria's 2021 Projection Report. Available at https://reportnet.europa.eu/public/dataflow/112.

National Food Waste Prevention and Reduction Program 2021–2026. Available at https://www.mzh.government.bg/bg/politiki-i-programi/politiki-i-strategii/nacionalna-programa-za-predotvratyavane-i-namalyavane-na-zagubat/.