

# Bulgaria

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## 1. SUMMARY

Bulgaria has ratified the Kyoto Protocol on 15 August 2002 with the commitment to reduce its GHG emissions by 8% as compared to the base year emission level. As its base year Bulgaria has chosen the year 1988 for CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O, and the year 1995 for the F-gases.

The level of the Bulgarian's base year emissions is provided in the Bulgarian's Initial Report which is currently under assessment of the Compliance Committee. In the submitted draft of the Initial Report it equals 132.619 Mt CO<sub>2</sub> eq. This means that the Assigned Amount for Bulgaria for the first commitment period equals 610,047 Mt CO<sub>2</sub> eq. altogether, or 122,009 Mt CO<sub>2</sub> eq. on average annually.

Bulgaria became a member state of the European Union on 1 January 2007. Pursuant to the Article 3(2) of the European Parliament and Council Decision No 280/2004/EC concerning a mechanism for monitoring Community GHG emissions and for implementing the Kyoto Protocol, Bulgaria has submitted its projections of GHG emissions by sources and withdrawals by sinks in June 2007. This allowed drawing preliminary conclusions whether Bulgaria will be in compliance with its Kyoto target.

Bulgaria has prepared the projections for four sectors (energy, industrial process, waste and agriculture), and for three gases (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O). The time horizon of the projections is 2020. The projections are prepared the projections for WOM, WEM, and WAM scenarios. Detailed modelling assumptions were provided for the energy sector. For the energy sector there are two WAM scenarios based on different assumptions about underlying energy consumption. In the other sectors (industrial processes, waste, agriculture) the underlying assumptions are presented with fewer details, but also for three scenarios.

There is a list of uncertainty factors provided. However, no uncertainty or sensitivity analysis has been carried out.

Based on the projections information, Bulgaria is significantly below its Kyoto target of 8% reduction as compared to the base year both under WEM and WAM scenarios. Under the WEM scenario in 2010 the GHG projections are estimated to be 73.1 % as compared to the base year emissions, and under the WAM scenario – 66.6% as compared to the base year level.

Policies and measures significantly contribute towards the de-coupling of the GDP growth from the GHG emissions growth. The main driving factors for GHG reduction are the improvement of conversion efficiency of fossil technologies, increase in the share of CHP and renewables, reduction of grid losses of heat and electricity, energy conservation and energy efficiency measures, expansion of the forest area.

Bulgaria participates already in Joint Implementation mechanism as a host party. The country has established the framework for the procedure for the national approval, and reserved the annual reserve in its Second NAP. The country does not plan to use the flexible mechanisms under the Kyoto Protocol for compliance purposes.

## 2. GHG PROJECTIONS AND PROGRESS TO KYOTO TARGETS

Three scenarios for GHG emission projections until 2020 were developed, analysed and compared: WOM, WEM, and WAM. These scenarios are developed in energy (without breaking the sector into the subsectors such as transportation, energy supply, etc), industrial processes, agriculture, and waste sectors as well as total for the whole economy. Transport, residential, forestry sectors are not covered implicitly. Also the projections are made for only three gases, namely CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O.

Detailed modelling assumptions were provided for the Energy sector. The information on the other three sectors was less detailed.

There is a list of uncertainty factors provided. However, no uncertainty or sensitivity analysis has been carried out.

Table 1 shows , for all gases and main sectors:

- GHG emission projections for the two scenarios 'with existing measures' (WEM) and 'with additional measures' (WAM), as reported by Bulgaria;
- Historic emissions (in the 'reference year') as reported together with projections.

For Bulgaria the reference year is the year 2000.

Table 2 shows, for all gases and main sectors:

- 1990 GHG emissions as reported in the latest (2008) GHG emissions inventory (1990-2006);
- Adjusted GHG emission projections for the WEM and WAM scenarios. This adjustment of the projections reported in Table 1 is carried out to allow consistency and comparability between projections and the latest (2008) GHG inventory data<sup>1</sup>. In the case of Bulgaria, the correction factor is small (1.07).

In Table 4, the same correction factor (1.07) used in Table 2 has been applied to the projections for 2010, 2015 and 2020. Please note that the projections under WM and WAM scenarios in the Table 2 represent the projection data for the year 2010. In the Table 4 the data represent an average value for five years of the First Commitment Period.

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<sup>1</sup> The adjustment consists in applying an adjustment factor to projections from Table 1. This factor is the ratio between total emissions in the reference year as reported in the 2008 GHG inventory report (or, if the reference year is the base-year under the Kyoto Protocol, in the report of the review of the initial report under the Kyoto Protocol) and total emissions in the reference year as reported by the country with projections (Table 1).



**Table 1. Summary of reported projections by sector and by gas in 2010 (Mt CO<sub>2</sub>-eq.)**

	Carbon dioxide			Methane			Nitrous oxide			F-gases (SF <sub>6</sub> , HFCs and PFCs)			Total		
	Reference year	2010 WEM	2010 WAM	Reference year	2010 WEM	2010 WAM	Reference year	2010 WEM	2010 WAM	Reference year	2010 WEM	2010 WAM	Reference year	2010 WEM	2010 WAM
<b>Energy (incl. transport)</b>	45.86	67.2	59.8	1.8	2.2	2.2	0.3	0.4	0.4	0.00	NE	NE	48.0	69.8	62.4
Energy supply	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Energy – industry, construction	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Energy – other (commercial, residential, agriculture)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
<b>Transport (energy)</b>	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
<b>Industrial processes</b>	4.3	6.5	6.3	0.1	0.1	0.1	1.3	1.2	1.	NE	NE	NE	5.7	7.7	1.2
<b>Waste</b>	NE	NE	NE	4.8	4.4	4.3	0.2	0.1	0.11	0.00	NE	NE	5.0	4.5	4.5
<b>Agriculture</b>	NE	NE	NE	2.3	4.1	3.9	3.1	4.6	4.3	0.00	NE	NE	5.4	8.6	8.3
<b>Other</b>	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
<b>Total (excl. LULUCF)</b>	50.2	73.6	66.1	9.0	10.8	10.5	4.9	6.2	5.9	0.00	0.00	0.00	64.2	90.6	82.5

**Key:**

Reference year: 2000

WEM: 'with existing measures' projection

WAM: 'with additional measures' projection

**Source:** Bulgaria' MM submission, June 2007

**Table 2. Summary of projections by sector and by gas in 2010 compared to 1990 emission (MtCO2eq)**

	Carbon dioxide			Methane			Nitrous oxide			F-gases (SF6, HFCs and PFCs)			Total		
	Reference year	2010 WEM	2010 WAM	Reference year	2010 WEM	2010 WAM	Reference year	2010 WEM	2010 WAM	Reference year	2010 WEM	2010 WAM	Reference year	2010 WEM	2010 WAM
<b>Energy incl. transportation</b>	NE	71.8	63.9	NE	2.4	2.3	NE	0.43	0.40	NE	NE	NE	NE	74.63	66.7
Energy (excl. transport)	67.8	NE	NE	2.29	NE	NE	0.36	NE	NE	NE	NE	NE	70.46	NE	NE
Energy supply	39.6	NE	NE	2.2	NE	NE	0.25	NE	NE	NE	NE	NE	42.08	NE	NE
Energy – industry, construction	21.8	NE	NE	0.007	NE	NE	0.07	NE	NE	NE	NE	NE	21.89	NE	NE
Energy – other (commercial, residential, agriculture)	6.4	NE	NE	0.06	NE	NE	0.05	NE	NE	NE	NE	NE	6.49	NE	NE
<b>Transport (energy)</b>	10.9	NE	NE	0.06	NE	NE	0.08	NE	NE	NE	NE	NE	11.0	NE	NE
<b>Industrial processes</b>	7.6	6.9	6.7	0.06	0.1	0.1	2.26	1.23	1.2	NE	NE	NE	98.9	8.22	7.98
<b>Waste</b>	NE	NE	NE	12.1	4.7	4.6	0.22	0.12	0.12	NE	NE	NE	12.33	4.80	4.75
<b>Agriculture</b>	0.0	NE	NE	5.4	4.4	4.2	7.51	4.87	4.64	NE	NE	NE	12.95	9.28	8.83
<b>Other</b>	0.02	NE	NE	NE	NE	NE	0.05	NE	NE	NE	NE	NE	0.07	NE	NE
<b>Total (excl. LULUCF)</b>	86.3	78.75	70.7	19.9	11.52	11.2	10.5	6.23	5.96	NE	NE	NE	116.71	96.93	88.27

**Key:**

WEM: 'with existing measures' projection

WAM: 'with additional measures' projection

**Source:** Bulgaria's MM submission, June 2007, and Annual greenhouse gas inventory 1990 – 2006, April 2008.

**Table 3: Summary of projections by sector and by gas in 2010 compared to 1990 (index 100 = reference year)**

	Carbon dioxide			Methane			Nitrous oxide			F-gases (SF6, HFCs and PFCs)			Total		
	1990	2010 WEM	2010 WAM	1990	2010 WEM	2010 WAM	1990	2010 WEM	2010 WAM	1990	2010 WEM	2010 WAM	1990	2010 WEM	2010 WAM
<b>Energy (incl. transport)</b>	100	91.3	81.3	100	100.2	98.2	100	99.3	91.7	100	NE	NE	100	91.6	81.9
Energy supply	100	NE	NE	100	NE	NE	100	NE	NE	100	NE	NE	100	NE	NE
Energy – industry, construction	100	NE	NE	100	NE	NE	100	NE	NE	100	NE	NE	100	NE	NE
Energy – other (commercial, residential, agriculture)	100	NE	NE	100	NE	NE	100	NE	NE	100	NE	NE	100	NE	NE
<b>Transport (energy)</b>	100	NE	NE	100	NE	NE	100	NE	NE	100	NE	NE	100	NE	NE
<b>Industrial processes</b>	100	91.3	88.7	100	108.0	106.2	100	54.6	53.0	100	NE	NE	100	83.1	80.7
<b>Waste</b>	100	NE	NE	100	38.7	38.3	100	54.8	53.3	100	NE	NE	100	38.9	38.6
<b>Agriculture</b>	100	NE	NE	100	81.3	77.3	100	64.7	61.6	100	NE	NE	100	71.7	68.2
<b>Other</b>	100	NE	NE		NE	NE		NE	NE		NE	NE		NE	NE
<b>Total (excl. LULUCF)</b>	100	91.3	82.0	100	57,7	56.2	100	59.3	56.7	100	NE	NE	100	83.0	75.6

**Key:**

WEM: 'with existing measures' projection

WAM: 'with additional measures' projection

**Source:** Bulgaria's MM submission, June 2007, and Annual greenhouse gas inventory 1990 – 2006, April 2008.

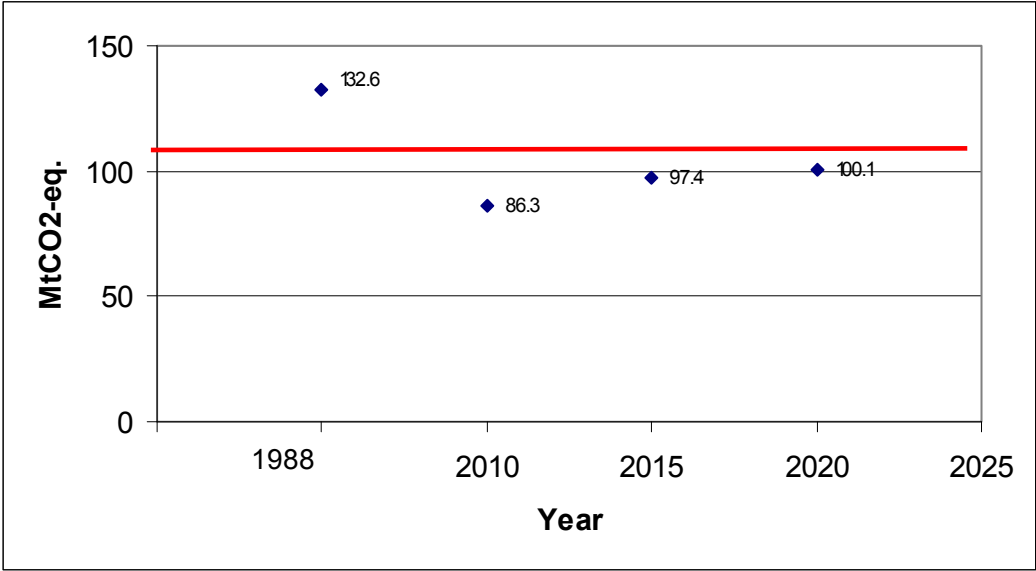
**Table 4: Summary of projections in 2010 compared to base year emissions under the Kyoto Protocol**

	Unit	Base-year emissions under the Kyoto Protocol	2010 projections 'with existing measures'	2010 projections 'with additional measures'
Total GHG emissions (excluding LULUCF)	Mt CO <sub>2</sub> -eq.	132.6	93.1	86.3
	Index (base-year emissions = 100)	100	73.1	66.6

**Source:** Bulgaria's MM submission, June 2007

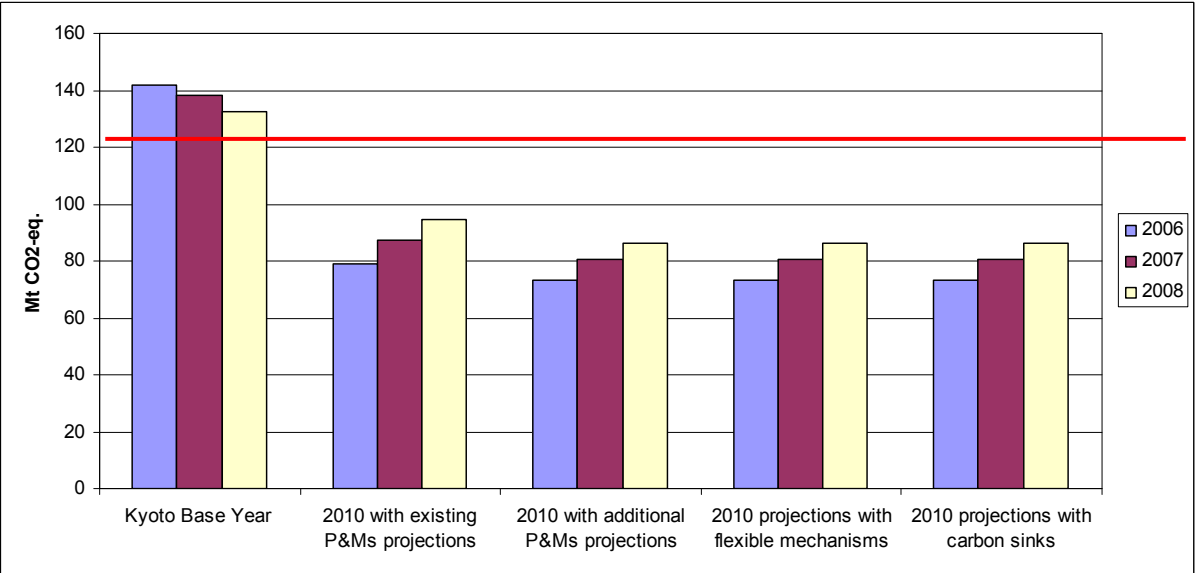
In Figure 1, the same correction factor (1.07) used in Table 2 has been applied to the projections for 2010, 2015 and 2020. Please note that the projections under WM and WAM scenarios in the Table 2 represent the projection data for the year 2010. In the Figure 1 and Figure 2 the data represent an average value for five years of the First Commitment Period.

**Figure 1. Greenhouse gas projections under WAM in 2010, 2015 and 2020 (Mt CO<sub>2</sub>-eq.)**



Source: Bulgaria's MM submission, June 2007.

**Figure 2. Comparison of 2010 projections reported in 2006, 2007 and 2008**



Source: Bulgaria's MM submission, June 2007 and Initial Report (revised version), May 2008.



### **3. CLIMATE CHANGE MITIGATION POLICIES AND MEASURES**

Despite the fact that Bulgaria will comply with its Kyoto target, the country implements the policies and measures leading towards the reductions of GHG emissions and enhancement of CO<sub>2</sub> withdrawals.

According to the latest MMS (MMS 2007), the WOM scenario is based on the assumption for intensive economic development with emphasis on energy intensive technologies and limited application of energy efficiency improvement measures in industry and agriculture. This scenario was originally developed in 1994 for the preparation of the First National Communication. It was considered 'business-as-usual' scenario incorporating all of the governmental policies and measures that have been adopted before 1994. GHG projections for the scenario have been based on a limited number of emission sources, reflecting the actual IPCC Inventory Guidelines for that period. To assure the emissions forecast in WOM scenario have been revised.

The WEM projection encompasses currently implemented and adopted policies and measures, and those measures that are given in the energy sector. It envisages a growth rate of electricity demand by 62.8% for the period 2000-2020 and increase in annual electricity export from 4 200 up to 7 000 GWh for the period after 2005. This scenario projects relevant measures in the energy sector, while the rest of the sectors rely on already applied measures. The key macroeconomic and energy characteristics of this scenario is decommissioning of old and commissioning of new power units in fossil, hydro, renewable, and nuclear sectors (see for details Chapter 3 of the MMS). GHG emissions mitigation could be expected due to the introduction of renewable energy sources (including Hydro Power), safe operation of NPP units after rehabilitation, and expansion of heat generation units in Sofia.

The WAM scenario comprises planned policies and measures for GHG mitigation. It is based on the same key macroeconomic characteristics. Though electricity demand increases for only 37.4% for the same period of 2000-2020, and electricity export stays stable at the level of 4 200 GWh.

The main differences between the WEM and WAM scenarios are bigger capacities installed at NPP Belene and HPP cascade Gorna Arda. Also this scenario is influenced by EC Directives on biofuels, and GHG Emission trading.

In the below Table 5, the data are provided on the effect of PaMs on the GHG emissions. In the columns related to the top-down approach this effect is calculated on the national scale. For estimating the effects of the existing measures the projected GHG in 2010 under WEM scenario are deducted from the projected GHG emission level under WOM scenario. To estimate the effect of the planned measures on the national level the projected emissions under WAM scenario are subtracted from the level of projected emissions under WEM scenario.

Reduction effects of the individual PAMs (implemented and planned) in each sector can not be fully estimated. The PAMs listed in the Table 6 and Table 7 can affect several sectors. Moreover, the effect of the individual PaMs cannot be always estimated. However, some preliminary summary has been done though it should be kept in mind that this is the

summarized effect of PaMs for which the assessment of their respective reduction effects has been done.

**Table 5. Summary of the effect of policies and measures included in the 2010 projections (Mt CO<sub>2</sub>-eq.)**

	Top down calculation		Bottom Up calculation	
	Existing Measures	Planned Measures	Existing Measures	Planned Measures
<b>Energy (total, excluding transport)</b>	7.8	7.4	3.2	2.3
Energy supply	NE	NE	3.2	2.3
Energy – industry, construction	NE	NE	NE	0.02
Energy – other (commercial, residential, agriculture)	NE	NE	NE	NE
<b>Transport (energy)</b>	NE	NE	0.090	0.070
<b>Industrial processes</b>	2.5	0.2	0.6	NE
<b>Waste</b>	5.6	0.05	NE	NE
<b>Agriculture</b>	0.7	0.4	0.2	NE
<b>Cross-sectoral</b>	NE	NE	NE	NE
Total (excluding LULUCF)	16.5	8.1	4.2	2.4

**Note:** The effects of measures detailed above are calculated firstly by determining the difference between total projections in each scenario ('top down calculation') and secondly by summing the reported effect of individual measures ('bottom up calculation'). The summarized reduction effect of individual measures can be considered as a rough preliminary estimation due to the lack of detailed data.

**Source:** Bulgaria's MM submission, June 2007, for the top down calculation; ECCP Policies and Measures database, June 2008, for the bottom up calculation.

**Table 6. Detailed information on Existing Policies and measures**

Sector	Name	Type	GHG	Status	Absolute Reduction [kt CO2 eq. p.a.]			Costs [EUR/t]
					2005	2010	2020	
Cross-cutting	Act amending Environmental Protection Act	Economic Regulatory	CO2	NE	NE	NE	NE	NE
Cross-cutting	Ratification act of Bilateral Cooperation Agreements	Economic Regulatory	CO2 CH4 N2O SF6 PFS HFS	NE	NE	NE	NE	NE
Energy Supply	Improvement of the operation of the nuclear power plant Kozloduy (NPP-K)	Economic	CO2	Implemented	NE	946	NE	NE
Energy Supply	Accelerated development of hydro energy	Economic Regulatory	CO2	Implemented	NE	NE	NE	NE
Energy Supply	Small and micro HPP	Economic Regulatory	CO2	Implemented	NE	200	NE	NE
Energy Supply	Upgrading of cogeneration plants and district heating boilers	Economic Regulatory	CO2	Implemented	NE	867	NE	NE
Energy Supply	Electricity transmission and distribution losses	Economic Regulatory	CO2 CH4	Implemented	NE	1100	NE	NE
Energy Supply	Heat Transmission and distribution losses	Economic Regulatory	CO2 CH4	Implemented	NE	900	NE	NE
Energy Supply	Biomass for electricity and heat production	Economic Regulatory	CO2	Implemented	NE	50	NE	NE
Energy Supply	Natural gas supply to the industry by development of gas infrastructure	Economic	CO2	Implemented	NE	50	NE	NE
Energy consumption/Industrial processes	Reduction of thermal losses in industry	Economic Regulatory	CO2	Implemented	NE	120	NE	NE
Energy consumption/Industrial processes	Introduction of monitoring systems for energy consumption	Voluntary/negotiated agreement	CO2	NE	NE	110	NE	NE
Energy consumption/Industrial processes	Renovation of construction machines	Regulatory	CO2	NE	NE	70	NE	NE
Energy consumption/Industrial processes	Reduction of fuel consumption in production of building materials	Regulatory	CO2	Implemented	NE	340	NE	NE
Transport	Railway transport power dispatching system	Economic	CO2	Implemented	NE	90	NE	NE
Agriculture	Manure Management	Regulatory	CH4	Implemented	NE	70	NE	NE
Agriculture	Fertilization and irrigation	Economic Regulatory	N2O	Implemented	NE	170	NE	NE
		Research						

**Source:** Öko Institut, (accessed June/2008), Policies and Measures database, <http://www.oeko.de/service/pam/index.php>

**Table 7. Detailed information on Planned Policies and measures**

Sector	Name	Type	GHG	Status	Absolute Reduction [kt CO2 eq. p.a.]			Costs [EUR/t]
					2005	2010	2020	
Energy Supply	Gas supply to households	Economic information	CO2	Planned	NE	2300	NE	NE
Energy Supply	Solar collectors	Economic	CO2	Planned	NE	20	NE	NE
Energy consumption/Industrial processes	Upgrading of steam and heat generators and compressed-air plants	Economic Regulatory Voluntary/negotiated agreement	CO2	Planned	NE	20	NE	NE
Transport	Transports dispatching system	Fiscal Information	CO2	Planned	NE	30	NE	NE
Transport	Modernization of railways	Regulatory	CO2	Planned	NE	40	NE	NE
Transport	Improving the public transportation, reducing transportation flow in cities and renewing the transport park	Economic Fiscal Information Regulatory	CO2	Planned	NE	NE	NE	NE
Transport	Introduction biofuels	Economic Fiscal Information Regulatory	CO2	Planned	NE	Ne	NE	NE
Waste	Utilization of captured methane for production of electricity	Economic Regulatory	CH4	Planned	NE	90	NE	NE

**Source:** Öko Institut, (accessed June/2008), Policies and Measures database, <http://www.oeko.de/service/pam/index.php>

**Table 8. Status of national policies and measures (PAM) in relation to European common and coordinated policies and measures (CCPM)**

<b>Status</b>	<b>CCPM</b>	<b>Sector</b>
National policies and measures already in force <b>before</b> CCPM was adopted	Kyoto Protocol project mechanisms 2004/101/EC	Cross-cutting
Existing national policies and measures <b>reinforced</b> by CCPM	Integrated pollution prevention and control 96/61/EC Energy performance of buildings 2002/91/EC End-use efficiency and energy services 2006/32/EC Landfill directive 1999/31/EC	Cross-cutting Energy consumption Energy consumption Waste
<b>New</b> national policies and measures implemented after CCPM was adopted	Emissions trading 2003/87/EC Promotion of cogeneration 2004/8/EC Promotion of electricity from RE sources 2001/77/EC Internal electricity market 2003/54/EC Internal market in natural gas 98/30/EC Directives on energy labeling of appliances Eco-management & audit scheme (EMAS) EC 761/2001 Energy labeling for office equipment 2422/2001 Efficiency fluorescent lighting 2000/55/EC Efficiency of hot water boilers 92/42/EEC Promotion of biofuels for transport 2003/30/EC Transport modal shift to rail 2001/12/EC etc.	Cross-cutting Energy supply Energy supply Energy supply Energy supply Energy consumption Energy consumption Energy consumption Energy consumption Energy consumption Transport Transport
Status of national policy or measure <b>not reported</b>	Taxation of energy products 2003/96/EC Ecodesign requirements for energy-using products 2005/32/EC Motor challenge, voluntary EC programme Integrated European railway area (COM(2002)18 final) Consumer information on cars 1999/94/EC Agreement with car manufacturers ACEA etc. Marco Polo programme on freight transport HFCs in mobile air conditioning 2006/40/EC Support under CAP (1782/2003) Support under CAP - amendment (1783/2003) Rural development support and CAP(2603/1999, 1698/2005 and 1290/2005) Support scheme for energy crops under CAP (795/2004) Support for rural development from EAGGF (1257/1999)	Energy supply Energy consumption Energy consumption Transport Transport Transport Transport Industrial processes Agriculture Agriculture Agriculture Agriculture Agriculture Agriculture Waste Waste

Source: MS responses to the CCPMs questionnaire, 2005. Personal communications.

Due to the fact that Bulgaria has been an Accession country before 2007, its PaMs reflects the structure of the European CCPMs. As a result the majority of PaMs were implemented simultaneously with CCPMs. This is the reason why there is a significant number of CCPMs are presented as 'new'.

## 4. METADATA

### Sources of information

Bulgaria's national report submitted to the European Commission under Article 3(2) of the Monitoring Mechanism, Decision 280/2004/EC. Report dated (hereinafter MMS), June 2007

Bulgaria's Fourth National Communication under the United Nations Framework Convention on Climate Change, 2006 (hereinafter 4th NC)

Annual greenhouse gas inventory 1990 - 2006 and inventory report, 15 April 2008, Sofia, Bulgaria

Second National Action Plan on Climate Change, 2005-2008, Sofia, Bulgaria, 2006

European Climate Change Programme (ECCP), Database on Policies and Measures in Europe <http://www.oeko.de/service/pam/index.php>

Base-year emissions from the UNFCCC website,  
[http://unfccc.int/ghg\\_data/kp\\_data\\_unfccc/base\\_year\\_data/items/4354.php](http://unfccc.int/ghg_data/kp_data_unfccc/base_year_data/items/4354.php)

### Kyoto base-year emissions

Kyoto base-year emissions (1988) are presented throughout, except Table 1 which presents projections reference year emissions (see below) and Table 2 which presents the GHG emissions reported in the latest National Inventory for the year 1990. Kyoto base year emissions of greenhouse gases were calculated using 1988 emissions for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) and 1995 emissions for fluorinated gases (SF<sub>6</sub>, HFCs and PFCs).

Kyoto base-year emissions have now been reviewed and set for all EEA countries. For Bulgaria the final decision is expected to be made in November 2008.

### Projections reference year emissions

Projections reference year (2000) emissions are presented in Table 1.

Projections reference year emissions are defined as projections-consistent emissions data for a given historic year, as chosen by the Member State. In the Bulgarian case it is the year 2000. Inventory recalculations from year to year may mean that latest inventory data cannot be compared with projections based on older inventory data. Where such an inconsistency has arisen, MS projections have been corrected by applying the following formula, in Table 2:

Corrected projection = reported projections \* latest inventory total GHG emissions / Table 1 reported total GHG emissions for the same reference year. For Bulgaria the correction factor is 1.07

The same correction factor has been applied to the Table 4, Figure 1 and Figure 2. Please note that the projections under WEM and WAM scenarios in the Table 2 represent the projection data for the year 2010. In the Table 4, Figure 1, and Figure 2 the data represent an average value for five years of the First Commitment Period. .

## Quality of Reporting

Member State reporting in the sources detailed above was assessed semi-qualitatively. Scoring was attributed according to the level of detail and clarity: from 0 (representing not reported) to +++ (representing very detailed and/or clear reporting). Guidance used for this assessment included the reporting requirements laid down in:

- EU legislation: Monitoring Mechanism (280/2004/EC) and Implementing Provisions (2005/166/EC)
- UNFCCC reporting guidelines for national communications available in English, French, Spanish ('Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications - FCCC/CP/1999/7')

The following tables detail reporting considered to be best practice for the purposes of this assessment.

Information provided	Example of good practice
Policy names	Clear names and description provided with unique identifier.
Objectives of policies	Good description of objectives
Types of policies	Type of policy instrument specified e.g. regulatory, fiscal
Which greenhouse gases?	Specifies which gases each PAM affects
Status of Implementation	Clear for each PAM: planned, adopted, implemented, expired
Implementation body	Clear which authorities are responsible for implementation
Quantitative assessment of emission reduction effect and cost of policies	Almost all PAMs are actually quantified. Total effect of all PAMs specified. WOM projection provided.
Interaction with other national and EU level policies	Detailed discussion and analysis of policy interactions.
Measures implementing community legislation	Report details which national policies are implementing individual pieces of EU legislation.
Arrangements for flexible mechanisms	Details arrangements for use of flexible mechanisms.
Balance between domestic action and flexible mechanisms	Regarding reductions required to meet Kyoto target, details proportion to result from domestic action and flexible mechanisms.

Category of Information	Example of good practice
Projection scenarios	'With existing measures' and 'with additional measures' projections required, 'without measures projection' optional.
Policies included in each projection	Clear presentation of the policies included in each projections scenario.
Expressed relative to historic reference year data	Projections are presented alongside consistent historic emissions.
Starting year	Starting year and emissions used as basis for for projections is detailed.
Split of projections	Projection split by all 6 gases (or F-gases together), all sectors and years
Presentation of results	Clear, both tables and graphs provided and/or used excel reporting template.
Description of methodologies	Description of approach, model and assumptions
Sensitivity analysis	Was an analysis carried out to determine the sensitivity of projections to variance in the input parameters? Are high medium and low scenarios presented?
Discussion of uncertainty	Is an uncertainty range for the projections provided?
Details of parameters and assumptions	Are parameters as required under Monitoring Mechanism 280/2004/EC reported?
Indicators for projections	Are indicators for projections as required under Monitoring Mechanism 280/2004/EC reported?



**Table 9. Information provided on policies and Kyoto flexible mechanisms**

Information provided	Level of information provided	Comments
Policy names	+++	Names are chosen reflecting the essence of the policies
Objectives of policies	+++	Objectives are clearly described in the text and in overview table
Types of policies	+++	Types of policies are identified.
Which greenhouse gases?	+	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, no F-gases
Status of Implementation	++	Status of implementation is provided only under WAM scenario
Implementation body	0	Implementation bodies are not specified
Quantitative assessment of emission reduction effect and cost of policies	++	Assessment provided for policies and measures only under WAM scenario
Interaction with other national and EU level policies	+++	WAM scenario specifies which EU Directives and national laws are implemented through the mentioned policies and measures
Measures implementing community legislation	++	Measures described in the MMS specify the clauses within community legislation which are implemented through these measures
Arrangements for flexible mechanisms	++	the framework for the JI projects is established
Balance between domestic action and flexible mechanisms	0	Bulgaria is an exclusively host country, so flexible mechanisms are not necessary for the country to meet its Kyoto target

**Table 10. Information provided on projections**

Category of Information	Level of information provided	Comments
Scenarios considered	+++	All three scenarios (WOM, WEM, and WAM are considered)
Policies included in each projection	++	It is clear what is included in WAM projections. It is not always clear what is included in WEM projections
Expressed relative to historic reference year data	0	No
Starting year	+++	2000
Split of projections	+	Only four sectors Energy (without Transportation)< Industrial Processes< Agriculture, and Waste)
Presentation of results	+++	Graphs and tables
Description of methodologies	++	Information on the models used in the Energy sector is provided. Modules, assumptions and key inputs of the model are described thoroughly.
Sensitivity analysis	0	
Discussion of uncertainty	+	A list of uncertainty factors are provided
Details of parameters and assumptions	++	Extensive list of parameters is provided only for the Energy sector
Indicators for projections	+	Only few indicators

Source: MMS 2007

**Table 11. Parameters for Projections**

<b>1. Mandatory parameters on projections</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>Units</b>
<b>Assumptions for general economic parameters</b>					
GDP (value at given years or annual growth rate and base year)	4.9	5.6	5.3	5	%
Population (value at given years or annual growth rate and base year)	7.67			6.9	ml
International coal prices at given years in euro per tonne or GJ (Gigajoule)					
International oil prices at given years in euro per barrel or GJ					
International gas prices at given years in euro per m3 or GJ					
<b>Assumptions for the energy sector</b>					
Total gross inland consumption (PJ) (split by oil, gas, coal, renewables, nuclear, other)					
Oil	162.9	175.46	175.04	179.65	PJ
Gas	99.25	84.17	120.6	134	PJ
Coal	364.74	332.08	342.13	299.41	PJ
Renewable	71.19	79.56	54.86	67	PJ
Nuclear	207.7	149.5	153.27	223.2	PJ
Net electricity import					PJ
Other	905.78	820.77	845.9	903.26	PJ
Total electricity production by fuel type (oil, gas, coal, renewables, nuclear, other)					
Energy demand by sector split by fuel (delivered)					
Industry	147.4	147.2	151.9	157.3	PJ
Residential	94.1	95	102.3	127.5	PJ
Transport	98.9	139.5	159.6	169.5	PJ
Assumptions on weather parameters, especially heating or cooling degree days					
<b>Assumptions for the industry sector</b>					
For Member States using macroeconomic models:					
The share of the industrial sector in GDP and growth rate					
For Member States using other models:					
The production index for industrial sector					
<b>Assumptions for the transport sector</b>					
For Member States using macroeconomic models:					
The growth of transport relative to GDP					
For Member States using other models:					
The growth of passenger person kilometres					
The growth of freight tonne kilometres					
<b>Assumptions for buildings (in residential and commercial or tertiary sector)</b>					
For Member States using macroeconomic models:					
The level of private consumption (excluding private transport)					
The share of the tertiary sector in GDP and the growth rate					
For Member States using other models:					
The rate of change of floor space for tertiary buildings and dwellings					
The number of dwellings and number of employees in the tertiary sector					
<b>Assumptions in the agriculture sector</b>					
For Member States using macroeconomic models:					
The share of the agriculture sector in GDP and relative growth					
For Member States using other models:					
Livestock numbers by animal type (for enteric fermentation beef, cows, sheep, for manure management pigs and poultry)					
The area of crops by crop type					
Emissions factors by type of livestock for enteric fermentation and manure management (t)					
<b>Assumptions in the waste sector</b>					
Waste generation per head of population or tonnes of municipal solid waste					
The organic fractions of municipal solid waste					
Municipal solid waste disposed to landfills, incinerated or composted (in tonnes or %)					

<b>Assumptions in the forestry sector</b>					
Forest definitions	Land area not less than 0.1 hectare in size covered with trees, the height of which in a natural site in the maturity age is not less than 5 meters, other forest plants as well as thinned or vegetation-lost forest due to the acts of nature or human activities (cutting areas, burnt areas, clearings). Tree lines up to 10 meters of width in fields, at roadsides, water bodies, in living areas and cemeteries, single trees and bushes, parks planted and grown by man in urban and rural areas are not defined as forests.				
Areas of:					
managed forests					
unmanaged forests					
<b>2. Recommended parameters on projections</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>Units</b>
<b>Assumptions for general economic parameters</b>					
GDP growth rates split by industrial sectors in relation to 2000					
Comparison projected data with official forecasts					
<b>Assumptions for the energy sector</b>					
National coal, oil and gas energy prices per sector (including taxes)					
National electricity prices per sector as above (may be model output)					
Total production of district heating by fuel type					
<b>Assumptions for the industry sector</b>					
Assumptions fluorinated gases:					
Aluminium production and emissions factors					
Magnesium production and emissions factors					
Foam production and emissions factors					
Stock of refrigerant and leakage rates					
For Member States using macroeconomic models:					
Share of GDP for different sectors and growth rates					
Rate of improvement of energy intensity (1990 = 100)					
For Member States using other models:					
Index of production for different sectors					
Rate of improvement or index of energy efficiency					
<b>Assumptions for buildings (in residential and commercial / tertiary sector)</b>					
For Member States using macroeconomic models:					
Share of tertiary and household sectors in GDP					
Rate of improvement of energy intensity					
For Member States using other models:					
Number of households					
Number of new buildings					
Rate of improvement of energy efficiency (1990 = 100)					
<b>Assumptions for the transport sector</b>					
For Member States using econometric models:					
Growth of transport relative to GDP split by passenger and freight					
Improvements in energy efficiency split by vehicle type					
Improvements in energy efficiency split by vehicle type, whole fleet/new cars					
Rate of change of modal split (passenger and freight)					
Growth of passenger road kilometres					
Growth of passenger rail kilometres					
Growth of passenger aviation kilometres					
Growth of freight tonne kilometres on road					
Growth of freight tonne kilometres by rail					
Growth of freight tonne kilometres by navigation					
<b>Assumptions for the agriculture sector</b>					
For Member States using econometric models:					
Agricultural trade (import/export)					
Domestic consumption (e.g. milk/beef consumption)					
For Member States using other models:					

Development of area of crops, grassland, arable, set-aside, conversion to forests etc					
Macroeconomic assumptions behind projections of agricultural activity					
Description of livestock (e.g. by nutrient balance, output/animal production, milk production)					
Development of farming types (e.g. intensive conventional, organic farming)					
Distribution of housing/grazing systems and housing/grazing period					
Parameters of fertiliser regime:					
Details of fertiliser use (type of fertiliser, timing of application, inorganic/organic ratio)					
Volatilisation rate of ammonia, following spreading of manure on the soil					
Efficiency of manure use					
Parameters of manure management system:					
Distribution of storage facilities (e.g. with or without cover):					
Nitrogen excretion rate of manures					
Methods of application of manure					
Extent of introduction of control measures (storage systems, manure application), use of best available techniques					
Parameters related to nitrous oxide emissions from agricultural soils					
Amount of manure treatment					

**Source:** Bulgaria's MM submission, June 2007