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**Report of the centralized in-depth review of
the second, third and fourth national communication of Croatia**

According to decision 4/CP.8, Parties included in Annex I to the Convention are requested to submit to the secretariat, in accordance with Article 12, paragraphs 1 and 2, of the Convention, a fourth national communication by 1 January 2006, and those Parties that have not submitted their first, second or third national communication are urged to do so as soon as possible. This report presents the results of the in-depth review of the second, third and fourth national communication of Croatia conducted by an expert review team in accordance with relevant provisions of the Convention.

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I. Introduction and summary

A. Introduction

1. Croatia has been a Party to the Convention since 1996 and to its Kyoto Protocol since 2007. Under the Kyoto Protocol, Croatia committed itself to reducing its greenhouse gas (GHG) emissions by 5 per cent in relation to the 1990 level during the first commitment period from 2008 to 2012. Pursuant to decision 4/CP.3, Annex I to the Convention was amended to include Croatia. In 2004, Croatia acquired the status of a European Union (EU) candidate country and, in 2005, negotiations for EU accession commenced.

2. This report covers the centralized in-depth review (IDR) of the second, third and fourth national communication (hereinafter referred to as the NC4)¹ of Croatia, coordinated by the UNFCCC secretariat, in accordance with decision 7/CP.11. The review took place from 11 to 16 May 2009 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Ms. Amrita Narayan Achanta (India); Mr. Matjaz Cesen (Slovenia); Mr. Gebru J. Endalew (Ethiopia); Mr. Eric De Brabanter (Luxembourg); Ms. Svetlana Dolgikh (Kazakhstan); Ms. Agnieszka Janowska (European Community); Ms. Diana Harutyunyan (Armenia); Ms. Asta Mikalauskiene (Lithuania); Ms. Valia Peeva (Energy Charter); and Mr. Janis Rekis (Latvia). Ms. Achanta and Ms. Peeva were the lead reviewers. The review was coordinated by Ms. Ruta Bubniene (UNFCCC secretariat).

3. During the IDR, the expert review team (ERT) examined each part of the NC4. Croatia ratified the Kyoto Protocol on 30 May 2007 and it entered into force on 28 August 2007; therefore, the provision of Article 3, paragraph 2, of the Kyoto Protocol, regarding making demonstrable progress by 2005, is not mandatory. The NC4 was submitted under the Convention. Since Croatia had not yet ratified the Kyoto Protocol at the time of submission of the NC4, the ERT did not consider the NC4 in terms of the Kyoto Protocol review requirements.

4. The ERT noted the flexibility granted to Croatia in accordance with Article 4, paragraph 6, of the Convention. Unlike other Parties with economies in transition, for which a base year other than 1990 was chosen, in this instance Croatia was allowed, under decision 7/CP.12, to add 3.5 million tonnes of carbon dioxide equivalent (Mt CO₂ eq) to its 1990 level of GHG emissions not controlled by the Montreal Protocol for the purpose of establishing the level of emissions for the base year.

5. A draft version of this report was communicated to the Government of Croatia, which informed the ERT that Croatia had no comments to make on the draft report. It also informed the ERT that it was currently preparing the Party's fifth national communication and that the recommendations made by the ERT on the NC4 would be incorporated into it.

B. Summary

6. The ERT noted that Croatia's NC4 complies in general with 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" (hereinafter referred to as the UNFCCC reporting guidelines). The information required by these guidelines has been presented in a well-structured manner. Croatia included an executive summary in the NC4. However, Croatia did not provide references to any relevant additional background information in an annex to the NC4.

¹ Croatia submitted its second, third and fourth national communications as a single document.

1. Completeness

7. The ERT noted that the NC4 covers all of the sections required by the UNFCCC reporting guidelines, although the headings used are not identical to those contained in the guidelines and the NC4 does not contain any projections for fluorinated gases (F-gases). The NC4 also does not contain a chapter on financial resources and technology transfer, as Croatia, being a Party with an economy in transition, is not required to report on this.

2. Timeliness

8. The NC4 was submitted on 6 February 2007. Decision 4/CP.8 requested Parties to submit their NC4 by 1 January 2006.

3. Transparency

9. The ERT acknowledged that Croatia's NC4 is comprehensive and well structured. It provides reasonably clear information on all aspects of implementation of the Convention, except for the description of projections. In the course of the review, the ERT formulated a number of recommendations that could help Croatia to further increase the transparency of its reporting, such as that Croatia include in its national communication the effects of policies and measures (PaMs) and a presentation of projections in tabular format.

II. Technical assessment of the reviewed elements

A. National circumstances relevant to greenhouse gas emissions and removals

10. In its NC4, Croatia has provided a description of its national circumstances, following the headings given in the UNFCCC reporting guidelines, and has added additional information on inland waters and coastal areas. The ERT acknowledged that, while national circumstances were very well described, the analysis of how these national circumstances and changes in national circumstances affected GHG emissions and removals over time could have been clearer. According to the NC4, the main drivers of the emission trends in Croatia include: trends in fossil fuel combustion in electricity generation, development of transport flows and associated fuel consumption, trends in cement and ammonia production, trends in fugitive emissions, amount of waste disposed of on land and development of agricultural activities, trends in road transportation, nitric acid production and agricultural activities. Croatia has included F-gases in the NC4, which display a rather unusual trend for the period 1990–2003 for which no clear explanation has been provided. Table 1 illustrates the national circumstances of the country by providing some indicators relevant to GHG emissions and removals.

11. Croatia has provided a summary of information on GHG emission trends for the period 1990–2003; however, according to the UNFCCC reporting guidelines, Parties should provide data for the period from 1990 to the last but one year prior to submission of the NC4, which would be 2005 for Croatia. Information in the NC4 is broadly consistent with the 2005 GHG inventory submission and the most recent 2009 national GHG inventory submission. However, the ERT noted inconsistencies between the NC4 and the 2009 inventory submission resulting from recalculations made in the land use, land-use change and forestry (LULUCF), industrial processes and waste sectors and, to a lesser extent, the agriculture sector. Emission estimates for the industrial processes sector were higher in the 2009 inventory submission than in the NC4, while emission estimates for the waste sector and removals from LULUCF were considerably lower in the 2009 inventory submission than in the NC4. Emission estimates for the agriculture sector in the 2009 inventory submission were sometimes higher and sometimes lower than the estimates contained in the NC4. For the energy sector, the differences between emission estimates in the 2009 inventory submission and those in the NC4 ranged from –1.5 per cent to +1.0 per cent during the time series.

Table 1. Indicators relevant to greenhouse gas emissions and removals for Croatia

	1990	1995	2000	2006	Change 1990–2000 (%)	Change 2000–2006 (%)	Change 1990–2006 (%)
Population (million)	4.78	4.67	4.50	4.44	-5.8	-1.4	-7.1
GDP (2000 USD billion using PPP)	47.89	34.72	41.04	53.98	-14.3	31.5	12.7
TPES (Mtoe)	9.11	7.15	7.80	8.96	-14.3	14.8	-1.6
GDP per capita (2000 USD thousand using PPP)	10.02	7.43	9.11	12.15	-9.0	33.4	21.3
TPES per capita (toe)	1.91	1.53	1.73	2.02	-9.0	16.4	5.9
GHG emissions without LULUCF (Tg CO ₂ eq)	31.37	22.86	25.96	30.77	-17.3	18.5	-1.9
GHG emissions with LULUCF (Tg CO ₂ eq)	27.19	13.71	20.67	23.28	-24.0	12.6	-14.4
CO ₂ emissions per capita (Mg)	4.83	3.63	4.43	5.30	-8.3	19.6	9.6
CO ₂ emissions per GDP unit (kg per 2000 USD using PPP)	0.48	0.49	0.49	0.44	0.8	-10.3	-9.6
GHG emissions per capita (Mg CO ₂ eq)	6.56	4.90	5.76	6.93	-12.2	20.2	5.6
GHG emissions per GDP unit (kg CO ₂ eq per 2000 USD using PPP)	0.66	0.66	0.63	0.57	-3.5	-9.9	-13.0

Data sources: (1) GHG emissions data: Croatia's 2009 greenhouse gas inventory submission; (2) Population, GDP and TPES data: International Energy Agency (2008).

Abbreviations: GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, PPP = purchasing power parity, TPES = total primary energy supply.

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

12. Total GHG emissions excluding net emissions or removals from LULUCF increased by 3.2 per cent between 1990 and 2007. This was driven by an increase in CO₂ emissions by 7.6 per cent and in methane (CH₄) emissions by 1.8 per cent (excluding LULUCF) between 1990 and 2007. However, nitrous oxide (N₂O) emissions decreased by 8.9 per cent (excluding LULUCF) between 1990 and 2007. Driven by a 50.6 per cent increase in GHG removals from the LULUCF sector, total GHG emissions, including emissions and removals from LULUCF, decreased by 4.1 per cent between 1990 and 2007 (see table 2).

13. The growth in CO₂ emissions (by 7.6 per cent) between 1990 and 2007 was mainly driven by the increase in emissions from energy industries (by 7.2 per cent), the transport sector (by 59.1 per cent), fugitive emissions from oil and natural gas (by 59.9 per cent) and the cement industry (by 43.3 per cent). The NC4 states that the increase in fugitive emissions was the result of the purification of natural gas from gas fields in the Podravina region. The growth in CH₄ emissions was driven by the increase in fugitive emissions from oil and natural gas and the increasing amount of waste disposed of in landfills without CH₄ recovery. This growth in emissions was partly compensated by a decrease in CH₄ emissions from the agriculture sector. The decrease in N₂O emissions between 1990 and 2007 can be explained by emission reductions in the industrial processes (significant reductions in ammonia and nitric acid production) and agriculture sectors. However, N₂O emissions from transport increased by 283.2 per cent between 1990 and 2007 as a consequence of the increasing use of three-way catalysts in vehicles.

14. After a decrease in emissions between 1990 and 1994, CO₂ emissions steadily increased until 2007. A decrease in CH₄ emissions between 1998 and 2000 owing to a reduction of livestock was followed by a moderate increase in emissions until 2007. The N₂O emission trend follows a similar pattern. The slight upward trend in the latest year can be explained by the more frequent use of nitrogen fertilizers. The ERT noted a significant increase in emissions of F-gases, which is not clearly explained in the NC4. Table 2 provides an overview of GHG emissions by sector from 1990 to 2007 (see also discussion of sectoral trends in chapter II B).

Table 2. Greenhouse gas emissions by sector in Croatia, 1990–2007

	GHG emissions (Tg CO ₂ eq)						Change (%)		Shares ^a by sector (%)	
	1990	1995	2000	2005	2006	2007	1990–2007	2006–2007	1990	2007
1. Energy	22.15	16.39	18.82	22.29	22.42	23.80	7.5	6.2	70.6	73.5
A1. Energy industries	7.14	5.20	5.91	6.89	6.66	7.66	7.3	15.0	22.8	23.7
A2. Manufacturing industries and construction	5.48	2.94	3.09	3.67	3.76	3.89	-28.9	3.4	17.5	12.0
A3. Transport	4.07	3.46	4.57	5.73	6.12	6.57	61.4	7.4	13.0	20.3
A4.–A5. Other	3.79	2.92	3.51	3.98	3.74	3.40	-10.5	-9.2	12.1	10.5
B. Fugitive emissions	1.67	1.87	1.74	2.02	2.13	2.28	37.0	6.9	5.3	7.0
2. Industrial processes	4.19	2.57	3.22	3.68	3.86	4.07	-2.9	5.4	13.4	12.6
3. Solvent and other product use	0.13	0.12	0.12	0.20	0.23	0.23	77.6	0.5	0.4	0.7
4. Agriculture	4.32	3.04	3.15	3.46	3.42	3.41	-21.1	-0.2	13.8	10.5
5. LULUCF	-4.18	-9.15	-5.28	-7.73	-7.49	-6.30	50.6	-15.9	-13.3	-19.5
6. Waste	0.58	0.73	0.64	0.80	0.84	0.87	49.9	3.3	1.8	2.7
7. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GHG total with LULUCF	27.19	13.71	20.67	22.71	23.28	26.08	-4.1	12.0	86.7	80.5
GHG total without LULUCF	31.37	22.86	25.96	30.43	30.77	32.38	3.2	5.3	100.0	100.0

Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA = not applicable.

Note: The changes in emissions and the shares by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table.

^a The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF.

15. The findings of the ERT on the GHG emission trends in the 2009 GHG inventory submission confirm the Party's assessment of its emission trends in the NC4. The ERT commended Croatia on the explanations of GHG emission trends by gas and by sector. However, it encourages Croatia to provide explanations that better reflect the links between national circumstances (recent socio-economic and demographic trends) and GHG emissions, in particular detailed information on the emission estimates for F-gases, in its next national communication.

B. Policies and measures

16. As required by the UNFCCC reporting guidelines, Croatia has provided in its NC4 information on its package of PaMs. Each sector has its own textual description of the principal PaMs. Croatia has also provided information on how it believes its PaMs are modifying longer-term trends in anthropogenic GHG emissions and removals, consistent with the objective of the Convention. However, the ERT noted that Croatia did not provide the following reporting elements required by the UNFCCC reporting guidelines: information on PaMs, subdivided by GHG (except for the energy sector); summary tables on PaMs for the industrial processes, waste management, agriculture and forestry sectors; and information on each policy or measure under the following subject headings: objectives of the policy or measure, the GHG affected (except for the energy sector), type of policy or measure, and implementing entity.

17. The ERT noted that information on the mitigation impact of planned and additional PaMs for the energy sector was included in the NC4. Croatia also reports in the NC4 the aggregated reduction potentials for the industrial processes and waste management sectors. The reduction potential of PaMs in agriculture is presented only in graphical form and is aggregated at the sectoral level.

18. In response to a request made by the ERT during the review, Croatia provided additional information on some of its PaMs. Table 3 provides a summary of the reported information on the PaMs of Croatia.

Table 3. Summary of information on policies and measures

Major policies and measures	Examples/comments
Framework policies and cross-sectoral measures	
Integrated climate programme	Strategy and Action Plan for Mitigation of Climate Changes in the Republic of Croatia (2006); Strategic Framework of Development from 2006 to 2013; the National Programme of the Republic of Croatia for the Accession to the European Union; the Environmental Protection Act; the Air Protection Act; Energy Development Strategy (2002)
Fiscal/taxation instruments	Environmental Protection and Energy Efficiency Fund; special environmental charge for owners of motor vehicles in place since 2004
Policies and measures by sector	
Energy	
Combined heat and power generation	Use of biomass in cogeneration
Renewable energy sources	Installation of 17 MW wind power; installation of 2 MW landfill gas-fired power plant; use of biomass for generation of thermal energy; promotion of renewable energy sources (mitigation impact of implemented measures: 873.1 kt CO ₂ eq in 2010)
Energy efficiency improvements	USD 12.3 million project on promotion of energy efficiency in households and service facilities; USD 40 million energy efficiency project
Residential and commercial buildings	Ordinance on Energy Efficiency Labelling of Household Appliances
Transport	
Integrated transport planning	Transport Development Strategy of Croatia; the Public Roads Construction and Maintenance Programme for 2005–2008; promotion of combined transport
Alternative fuel	Project on Promotion of Biodiesel Production; regulation on biofuel quality; promotion of the use of biodiesel in public transport
Industrial processes	
Pollution prevention and control	Application of non-selective catalytic reduction in nitric acid production
Energy efficiency	Development of an action plan in the cement industry to improve energy efficiency, reduce the share of clinker in cement and use alternative fuels (5 per cent reduction in relation to 2006 emission level in 2008–2012)
Agriculture	
	Agriculture Act; improvements in the use of organic and mineral fertilizers; use of stable manure for the production of biogas and electricity
Waste management	
	Waste Act; Waste Management Strategy of the Republic of Croatia (2005); ordinances on management of different types of waste (packaging and packaging waste, waste tyre management, waste oils management); thermal treatment of waste including energy generation
Land use, land-use change and forestry	
	Forestry Act

19. The ERT recommends that Croatia, in its next national communication, provide comprehensive and well-structured information on its implemented, adopted and planned PaMs, in particular summary tables on PaMs and information on PaMs, subdivided by GHG, for the industrial processes, waste, agriculture and forestry sectors.

1. Policy framework and cross-sectoral measures

20. In Croatia, the executive and legislative bodies participate in the process of adopting and implementing environmental policy. The Ministry of Environmental Protection, Physical Planning and Construction plays a key role in creating environmental policy in accordance with the strategic objectives of environmental protection and in drafting laws and enforcement regulations, including those relating to climate change. The ERT noted that the Croatian Environment Agency, founded in June 2002, is the central agency responsible for collecting and consolidating environmental data at the national level, maintaining databases, and monitoring and reporting on the environment. The Croatian Environment Agency has a department for air and climate change that is responsible for activities relating to the monitoring of GHG emissions.

21. Croatia developed a Strategy and Action Plan for Mitigation of Climate Changes, scheduled for adoption by the end of 2006, which it was hoped would be key in defining the position and objectives of Croatia and the methods of fulfilling the Party's commitments under the Convention. In 2006, the Croatian Government adopted the Strategic Framework of Development from 2006 to

2013 and the National Programme of the Republic of Croatia for the Accession to the EU, which define the medium-term and long-term strategic objectives of Croatia, as well as the National Environmental Protection Strategy and the National Environmental Action Plan, which ensure integrated and effective environmental protection.

22. Two significant projects are taking place in Croatia. The joint project of the United Nations Development Programme and the Global Environment Facility (GEF) entitled “Climate change enabling activity (additional financing for capacity-building in priority areas)” has identified the following priority measures for reducing GHG emissions: use of wind power, use of biomass for the generation of thermal energy and cogeneration, improvement of thermal insulation and energy-efficient construction, and increased use of biodiesel. The project entitled “Capacity-building for implementation of the United Nations Framework Convention on Climate Change and the Kyoto Protocol in the Republic of Croatia” started in 2004.

23. The ERT recommends that Croatia in its next national communication include more comprehensive and better structured information on cross-cutting PaMs, especially those focused on climate change mitigation, including their GHG mitigation impact and a short description containing the objectives of the policy or measure, type of policy or measure, implementing entity and status of implementation.

2. Policies and measures in the energy sector

24. Between 1990 and 2007, GHG emissions from the energy sector increased by 7.5 per cent. The ERT noted that the trend in GHG emissions from fuel combustion in transport showed notable increases (by 61.4 per cent or 2,500.1 Gg), while emissions from manufacturing industries and construction decreased (by 28.9 per cent or 1,583.5 Gg).

25. Among the implemented and planned PaMs in the energy sector, the NC4 reports a number of items of legislation, such as the Energy Act and its amendment the Ordinance on Energy Efficiency Labelling of Household Appliances, and the Energy Development Strategy. These items of legislation aim to improve energy efficiency, energy security, the diversification of energy forms and sources (use of renewable energy sources (RES)), the regulation of energy prices, the development of an energy market and entrepreneurship, and environmental protection. The promotion of RES has resulted in investments in wind power and the use of landfill gas. The NC4 describes two future projects, funded by the Croatian Government, the GEF and the European Bank for Reconstruction and Development, which aim to promote the application of energy-efficient technologies in the household and services sectors, as well as to increase consumer demand and market-based supply for services and energy efficiency projects. The mitigation potential of implemented PaMs in the energy sector is estimated to be 873.1 kt CO₂ eq in 2010.

26. **Transport.** The ERT noted the PaMs included under the transport sector, which include the testing of exhaust gases, promotion of biofuels (including the initiative to promote the use of biofuels in public transport), as well as an environmental charge on motor vehicles, which is paid into the Environmental Protection and Energy Efficiency Fund. The ERT noted the conclusion in the NC4 that although the Transport Development Strategy of Croatia mentions the need to introduce combined transport, it does not sufficiently address environmental considerations related to transport.

27. The ERT recommends that Croatia report on PaMs in the energy sector covering all of the elements required by the UNFCCC reporting guidelines, especially subdividing PaMs by gas and indicating the type and objectives of the policy or measure, and the implementing entity.

3. Policies and measures in other sectors

28. Between 1990 and 2007, GHG emissions from the industrial processes (including solvent and other product use), agriculture and waste sectors, which represented 26.5 per cent of total GHG emissions in 2007 (excluding LULUCF), decreased by 7.0 per cent (from 9,224.8 to 8,582.4 Gg CO₂ eq). In the period 1990–2007, emissions from the waste sector increased by 49.9 per cent, driven by an almost 90 per cent increase in CH₄ emissions from waste disposal on land. GHG emissions from the solvent and other product use sector increased by 77.6 per cent in the same period. However, this sector only accounted for 0.6 per cent of the total GHG emissions in 2007, excluding LULUCF, and, therefore, the increase in emissions from this sector does not significantly influence the overall GHG emission trend.

29. Between 1990 and 2007, GHG emissions from the industrial processes sector and the agriculture sector decreased by 2.9 per cent and 21.1 per cent, respectively. In the industrial processes sector, GHG emissions decreased significantly in the chemical industry owing to a reduction in ammonia and nitric acid production. CO₂ emissions from the metal industry decreased over the same period. However, CO₂ emissions from cement production (the main source of CO₂ emissions in the industrial processes sector) grew between 1990 and 2007. In the agriculture sector, GHG emissions decreased between 1990 and 2007. CH₄ emissions from enteric fermentation fell by 35.5 per cent and CH₄ emissions from manure management fell by 26.9 per cent. N₂O emissions from manure management and from agricultural soils, the main source of N₂O emissions in this sector, decreased by 41.2 per cent and 10.4 per cent, respectively.

30. **Industrial processes.** In 2007, industrial processes accounted for 12.6 per cent of total GHG emissions, excluding LULUCF. Most GHG emissions in this sector came from production of mineral products (46.6 per cent of sectoral emissions). Cement production and the chemical industry accounted for 41.6 per cent of sectoral emissions, of which most emissions came from ammonia and nitric acid production.

31. The NC4 describes the drivers of GHG emission trends for the period 1990–2003. GHG emissions from cement production increased as a result of the industry's switch from natural gas and heavy fuel oil to coal and petroleum coke for reasons of competitiveness. F-gases accounted for 11.4 per cent of the total emissions from industrial processes. The Ministry of Environmental Protection, Physical Planning and Construction initiated a programme which required cement producers to cut their emissions by at least 5 per cent during the period 2008–2012. This programme includes measures such as improving energy efficiency, reducing the share of clinker in cement production and using alternative fuel sources (mainly waste). The NC4 reports that the nitric acid producer has included in its business strategy the intention to use selective catalytic reduction. All of these measures are presented as additional measures in chapter 5 of the NC4 and are estimated to be able to reduce emissions by 0.8 Mt CO₂ eq compared with the 'without measures' scenario.

32. The ERT noted that, when examining the NC4, it is difficult to identify any PaMs in the industrial processes sector. The NC4 does not report any PaMs for the mitigation of emissions of F-gases. Croatia indicated in the NC4 that, after acquiring the status of an EU candidate country, it started the process of harmonizing its national legislation with the EU, including European Commission Regulation 842/2006 on certain fluorinated GHGs.

33. **Agriculture.** In 2007, agriculture accounted for 10.5 per cent of total GHG emissions, excluding LULUCF. A total of 65.5 per cent of GHG emissions from agriculture came from agricultural soils, with the main sources of emissions being synthetic fertilizers and nitrogen leaching and run-off. Enteric fermentation accounted for 23.1 per cent of total sectoral emissions in 2007, with cattle as the main source of emissions (85 per cent of the total CH₄ emissions were from enteric fermentation). Manure management represented 11.4 per cent of sectoral emissions.

The sectoral emissions were composed of CH₄ (40 per cent of sectoral emissions, with swine and cattle manure as the main source) and N₂O (60 per cent of sectoral emissions, with animal waste management systems as the main source).

34. According to the NC4, the Ministry of Agriculture, Forestry and Water Management is responsible for the implementation of PaMs in the agriculture sector. The NC4 highlights some mitigation actions, such as: increasing the use of organic and mineral fertilizers instead of nitrogen fertilizers, altering agricultural practices in order to increase carbon uptake by soils, and developing the production of biogas from animal manure. Additional measures for mitigation in the agriculture sector are reported in chapter 5 of the NC4 and should lead to emission reductions ranging between 0.62 and 0.73 Mt CO₂ eq compared with the 'without measures' scenario. However, it is not clear whether these reductions include the impact of some or all of the PaMs indicated in chapter 5 of the NC4. The ERT noted that it is difficult to characterize PaMs reported under the agriculture sector.

35. **Forestry.** Forest policy and management falls within the competence of the Ministry of Agriculture, Forestry and Water Management. The NC4 reports on afforestation measures and the use of forest biomass (firewood, bark and logging residues) only. Croatia estimated the effect of afforestation only, which is expected to remove about 2 Mt CO₂ eq.

36. **Waste.** In 2007, emissions from the waste sector accounted for 2.7 per cent of total GHG emissions, excluding LULUCF. CH₄ emissions from solid waste disposal on land accounted for 69.5 per cent of total sectoral emissions. About 60 per cent of these emissions were from managed waste disposal sites; the rest were from unmanaged waste disposal sites. Emissions from wastewater handling accounted for 30.5 per cent of sectoral emissions. Emissions from waste incineration were very low (0.08 Gg CO₂ eq), accounting for less than 0.1 per cent of total sectoral emissions.

37. In Croatia, waste management is controlled by the Waste Act, which was transposed by the Waste Management Strategy of the Republic of Croatia (adopted in 2005), which contains measures for reducing waste generation and for sustainable management of generated waste. Croatia has also reported on the charges levied on packaging waste. The mitigation potentials of PaMs implemented in the waste sector are not provided in the NC4.

38. The ERT concluded that it has not been made clear in the NC4 what the status is of each policy or measure (i.e. whether it has been implemented, adopted or planned) and which PaMs would have a significant impact on future GHG emissions. Implementing entities and types of PaMs are not clearly explained. The effect of the PaMs is provided by sector but not by policy or by measure and, therefore, it was difficult for the ERT to determine the effects of these PaMs. The ERT recommends that Croatia improve the completeness and transparency of the reporting of its PaMs in its next national communication. It also encourages Croatia to add more references to and description of the PaMs and their mitigation potentials. Croatia may wish to discuss the effects of the PaMs that have been implemented, such as measurable results (ex-post quantification), obstacles to the successful implementation of the measure, and acceptance of the measure by the target group.

C. Projections and the total effect of policies and measures

1. Projections

39. The GHG emission projections provided by Croatia in the NC4 include a 'with measures', a 'with additional measures' and a 'without measures' scenario until 2020, and are presented relative to actual inventory data for 1990, 1995 and 2000. Projections are presented on a sectoral basis, using the same sectoral categories used in the PaMs section, in an aggregated format for each sector as well as for a national total, using global warming potential (GWP) values, in chart form.

However, the ERT noted that Croatia did not provide the following reporting elements required by the UNFCCC reporting guidelines: projections presented in tabular format by sector, to the extent possible, using the same sectoral categories used in the PaMs section; projections presented on a gas-by-gas basis and in an aggregated format for each sector as well as for a national total, using GWP values, for the following GHGs: CO₂, CH₄, N₂O, perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF₆) (treating PFCs and HFCs collectively in each case); and emission projections related to fuel sold to ships and aircraft engaged in international transport reported separately and not included in the totals. Table 4 and the figure below provide a summary of GHG emission projections for Croatia.

Table 4. Summary of greenhouse gas emission projections for Croatia

	Greenhouse gas emissions (Tg CO ₂ eq per year)	Changes in relation to base year level (%)
Inventory data 1990 ^a	31.37	-12.9
Inventory data 2007 ^a	32.39	-0.1
Kyoto Protocol base year ^b	36.03	NA
Kyoto Protocol target ^b	34.23	-5.0
'With measures' projections for 2010 ^c	35.54	-1.4
'With additional measures' projections for 2010 ^c	31.55	-12.4

Abbreviation: NA = not applicable.

^a *Data source:* Croatia's 2009 greenhouse gas (GHG) inventory submission; the emissions are without land use, land-use change and forestry (LULUCF).

^b *Data source:* Initial report of the Republic of Croatia under the Kyoto Protocol. This figure includes the 3.5 Mt CO₂ eq added to the 1990 emission level in accordance with decision 7/CP.12. According to the initial review report (FCCC/IRR/2008/HRV), emissions for the Kyoto Protocol base year were equal to 31,321,790 t CO₂ eq; the corresponding Kyoto Protocol target was equal to 29,755,701 t CO₂ eq. Croatia disagreed with these figures and the initial review report with questions of implementation was submitted to the Compliance Committee for its further consideration. At the time of the centralized in-depth review, the conclusion of the Compliance Committee was not available.

^c *Data source:* Croatia's second, third and fourth national communication; the projections are for GHG emissions without LULUCF.

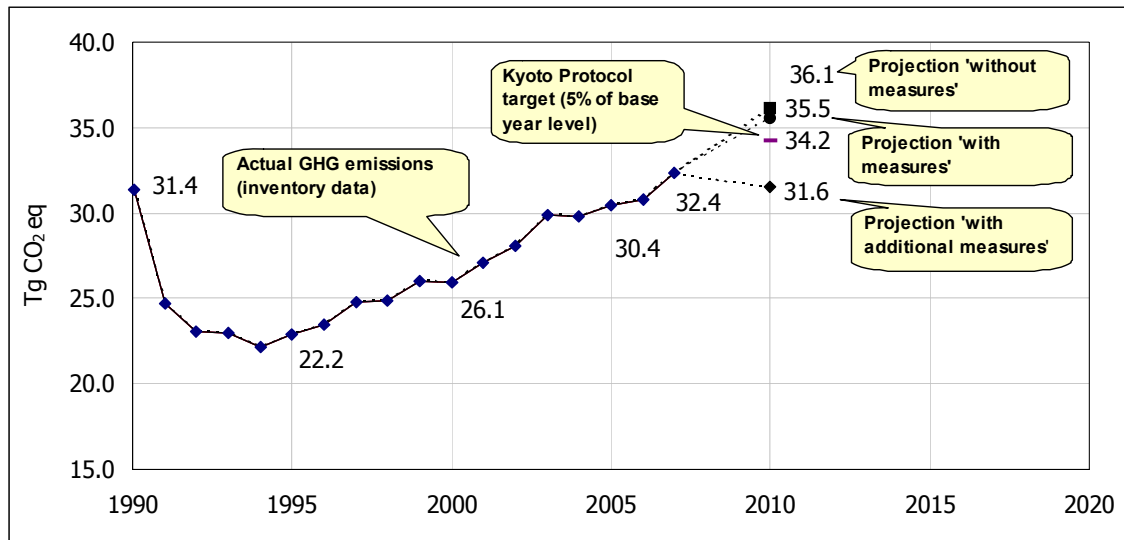
40. The ERT noted that Croatia's NC4 does not contain a description of the methodologies used in the preparation of projections and that the description of the key assumptions used is very limited and presented only on a qualitative basis.

41. The ERT noted that Croatia did not provide in its NC4 emission projections in tabular format for the energy sector. The Party provided these projections in a chart only and did not include emissions of PFCs, HFCs and SF₆ in the projections. The ERT calculated emissions from the energy sector for the 'with measures' scenario for 2010 based on the figures provided in the projections section of the NC4 and estimated that planned measures will reduce emissions to 26.948 Mt CO₂ eq in 2010. The NC4 includes emission projections for 'with additional measures' and 'without measures' scenarios.

42. The ERT also noted that emissions from the energy sector in the 'with additional measures' scenario reported in the NC4 for 2010 are 10.5 per cent higher than the emissions in 1990, thereby projecting these emissions in 2010 to be 24.850 Mt CO₂ eq. According to the 'with additional measures' scenario, emissions from non-energy sectors are expected to be 6.704 Mt CO₂ eq in 2010. Therefore, total GHG emissions in 2010 for the 'with additional measures' scenario are estimated to be 31.554 Mt CO₂ eq, excluding F-gases. According to the calculations performed by the ERT, the emission projection for 2010 for the 'with measures' scenario is 35.540 Mt CO₂ eq and for the 'without measures' scenario is 36.141 Mt CO₂ eq. According to the projections in the NC4, emissions in 2010 will be lower than the base year emissions contained in the initial report (36.03 Mt CO₂ eq) by 1.4 per cent in the 'with measures' scenario and by 12.4 per cent in the

‘with additional measures’ scenario (compared with the base year emission level). The projected increases in GHG emissions in relation to the 1990 emission level under the ‘without measures’, ‘with measures’ and ‘with additional measures’ scenarios are 15.2 per cent, 13.3 per cent and 0.6 per cent, respectively.

Greenhouse gas emission projections



Note: The emissions are without land use, land-use change and forestry.

Data sources: (1) Data for the years 1990–2007: Croatia’s 2009 greenhouse gas inventory submission; the emissions are without land use, land-use change and forestry. (2) Data for projection ‘with measures’ and for projection ‘with additional measures’ for 2010: Croatia’s fourth national communication. (3) Data for Kyoto Protocol target: Initial report of the Republic of Croatia under the Kyoto Protocol. This figure includes the 3.5 Mt CO₂ eq added to the 1990 emission level in accordance with decision 7/CP.12. According to the initial review report (FCCC/IRR/2008/HRV), emissions for the Kyoto Protocol base year were equal to 31,321,790 t CO₂ eq; the corresponding Kyoto Protocol target was equal to 29,755,701 t CO₂ eq. Croatia disagreed with these figures and the initial review report with questions of implementation was submitted to the Compliance Committee for its further consideration. At the time of the centralized in-depth review, the conclusion of the Compliance Committee was not available.

43. The ERT recommends that Croatia present projections on a sectoral basis, to the extent possible, using the same sectoral categories used in the PaMs section, in an aggregated format for each sector as well as for a national total, using GWP values. The ERT also recommends that the Party present projections in tabular format and on a gas-by-gas basis for the following GHGs: CO₂, CH₄, N₂O, PFCs, HFCs and SF₆ (treating PFCs and HFCs collectively in each case), in its next national communication. The ERT further recommends that Croatia present projections related to fuel sold to ships and aircraft engaged in international transport reported separately and not included in the totals, and present the methodology used in the projections and information on key underlying assumptions.

2. Total effect of policies and measures

44. In the NC4, Croatia presents an estimate of the total effect of its PaMs, in accordance with the ‘with measures’ definition, compared with a situation without such PaMs, presented in terms of GHG emissions avoided or sequestered, by gas (on a CO₂ eq basis), in 2010 and 2020. The ERT noted that Croatia also presents in the NC4 the estimated effect of planned measures for the years 2010 and 2020 for the energy sector and for other sectors for the years 2005, 2010, 2015 and 2020. However, the ERT noted that Croatia did not provide the following reporting elements required by the UNFCCC reporting guidelines: the estimated and expected total effect of implemented and adopted PaMs for 2015 for the energy sector, an estimate of the total effect of its PaMs, in accordance with the ‘with measures’ definition, compared with a situation without such PaMs,

presented in terms of GHG emissions avoided or sequestered, by gas (on a CO₂ eq basis), in 1995 and 2000, and relevant information on factors and activities for each sector for the years 1990–2020. Table 5 provides an overview of the total effect of PaMs as reported by Croatia.

Table 5. Projected effects of planned, implemented and adopted policies and measures in 2010

Sector	Effect of implemented and adopted measures (Tg CO ₂ eq)	Relative value (% of base year emissions)	Effect of planned measures (Tg CO ₂ eq)	Relative value (% of base year emissions)
Energy (without CO ₂ from transport)	0.87	2.4	2.04	5.7
Transport – CO ₂	NA	NA	0.06	0.2
Industrial processes	NA	NA	0.82	2.3
Agriculture	NA	NA	0.72	2.0
Waste management	NA	NA	0.35	1.0
Total	0.87	2.4	3.99	11.2

Data source: Croatia's second, third and fourth national communication.

Abbreviation: NA = not available.

Note: The total effect of implemented, adopted and planned policies and measures is defined as the sum of the effect of individual measures.

45. The ERT noted that the total effect of implemented and adopted PaMs was estimated in the NC4 to be 0.87 Mt CO₂ eq. This only applies to the energy sector. The total effect of planned measures was estimated to be 3.99 Mt CO₂ eq, taking into account PaMs in all sectors. The PaMs had the greatest effect in the energy sector, accounting for more than half of the total effect (51 per cent). Croatia did not present any PaMs in the LULUCF sector or give details of the use of flexible mechanisms.

46. It is not clear from the NC4 which PaMs are considered in the 'without measures' and 'with measures' scenarios. The NC4 describes 'additional measures', such as the possible construction of a power plant that uses waste incineration as a primary source of energy. This measure should lead to emission reductions ranging from 0.35 to 0.55 Mt CO₂ eq compared with the 'without measures' scenario.

47. The ERT recommends that Croatia include in its next communication the following information: the estimated total effect of implemented and adopted PaMs for the years 1995 and 2000, and the estimated and expected total effect of implemented and adopted PaMs and planned PaMs for 2005, 2010, 2015 and 2020, presented in terms of GHG emissions avoided or sequestered, by gas (on a CO₂ eq basis). The ERT further recommends that the Party provide relevant information on factors and activities for each sector for the period 1990–2020.

D. Vulnerability assessment, climate change impacts and adaptation measures

48. The ERT noted that Croatia has complied with the UNFCCC reporting guidelines in its reporting of vulnerability, climate change impacts and adaptation measures. In the NC4, Croatia has provided the required information on the expected impacts of climate change in the country and on adaptation options. However, the ERT noted that Croatia did not provide an outline of the action taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation for the majority of the vulnerable sectors. Table 6 summarizes the information on vulnerability and adaptation to climate change presented in the NC4.

49. The NC4 states that Croatia is expected to be very vulnerable to climate change. It presents in detail the expected impacts on hydrology and water resources, agriculture, forestry, biodiversity and natural terrestrial ecosystems, the coastline and coastal zones, marine ecosystems and fish resources, and human health. It also describes adaptation measures which have been implemented so far and those that are to be implemented in the future. The ERT encourages Croatia to report in its

next national communication on adaptation actions in the areas that are not currently presented in the NC4, namely coastal zones, forestry, human health and water resources.

Table 6. Summary of information on vulnerability and adaptation to climate change

Vulnerable area	Examples/comments/adaptation measures reported
Agriculture and food security	Vulnerability: An increase in air temperature, frequent drought and shortage of water during summer months may threaten spring crops, directly affect the appetite and health of animals and indirectly affect the profitability of livestock production Adaptation: Development/introduction of new varieties of crop that are better adapted to a longer vegetation period and a pronounced shortage of water in soil in June and July; improved irrigation to address drought problems
Biodiversity and natural ecosystems	Vulnerability: Climate change may affect the physiology of and interactions between plants, causing changes in the distribution of plants; milder winters are also expected to change spring phenological processes by 0.28 to 0.02 day/year Adaptation: Ex situ and in situ protection of threatened species; preservation of migratory corridors; adjustment of spatial plans and protected area management plans; planning/predicting changes in boundaries of protected areas; adjustment of protection programmes at the species level; development of infrastructure for scientific evaluation
Coastal zones	Vulnerability: The expected mean sea level rise accompanied by sea flooding may affect urban settlements along the west coast of Istria and the areas of Zadar, Split, Neretva River Delta and Rijeka Dubrovacka bay, and may affect the salt panes; increased salinity of fresh waters caused by diffusion of sea water may have an adverse effect on the fresh water supply and agricultural activities; higher incidence of stormy weather and blustery showers, high waves and sea flood
Fisheries	Vulnerability: Fluctuation and changes in oceanographic and hydrographic parameters have resulted in extensive migration of fish species, for example extension of the area of distribution of the thermophilous immigrant fish species from the Red Sea, the Indo-Pacific, the Atlantic and the Mediterranean; changes in spawning of commercially very important fish species Adaptation: Continued monitoring of and research into the biology and ecology of some of the migrating fish species
Forests	Vulnerability: Potential climate change is expected to change spatial distribution of forest vegetation; possible disappearance of existing vegetation or appearance of new types of vegetation; change in the density of certain tree species; productivity of forest ecosystems, ecological stability, forest health and the overall forest value may be affected
Human health	Vulnerability: The expected warmer and drier conditions may encourage the spread of flood- or water-borne diseases; more frequent heat waves would pose a serious threat to human health; spread of diseases outside areas where they were commonly found; increased incidence of respiratory allergies
Water resources	Vulnerability: The rise in temperature and annual evapo-transpiration followed by a decline in annual precipitation is expected to change the precipitation regime; melting of Alpine glaciers and less snow cover; frequent occurrence of extremely high water levels and flooding; soil erosion

E. Research and systematic observation

50. Croatia has provided information on its actions relating to research and systematic observation, and addressed both domestic and international activities, including the Global Earth Observation System of Systems, and the Global Climate Observing System (GCOS). Furthermore, in accordance with the UNFCCC reporting guidelines, Croatia has provided a summary of information on GCOS activities. However, the ERT noted that Croatia did not provide information on its actions taken to support related capacity-building activities in developing countries for the purpose of enabling the participation of the developing countries in research and development efforts, and on its actions taken to establish and maintain observing systems and related data and monitoring systems. The ERT encourages Croatia to provide this information in its next national communication.

51. In the NC4, Croatia has included its activities relating to research and systematic observation at the national and international level. The ERT noted that there is a long tradition of climate observation in Croatia. A dense network of observing stations is operational. However, during the previous IDR, some problems with the coordination of climate-related observations were observed at

the national level. Following the recommendations of the ERT of the first national communication, Croatia incorporated basic guidelines for the future planning of observing systems into the NC4.

F. Education, training and public awareness

52. In the NC4, Croatia has provided information on its actions relating to education, training and public awareness, as required by the UNFCCC reporting guidelines.

53. The two Ministries that deal with education, training and public awareness are the Ministry of Science, Education and Sports and the Ministry of Environmental Protection, Physical Planning and Construction. The ERT noted the view of the Ministry of Science, Education and Sports, which is responsible for institutional education, that all school subjects and activities must contribute to the development of ecological awareness and environmental education.

54. The ERT noted that environmental and sustainable education is integrated into the primary school syllabus. The NC4 states that knowledge of climate change is acquired through regular school lessons on nature and society, biology, chemistry and geography, and includes numerous out-of-school activities. The ERT observed that, since 1996, 130 schools have been involved in the Global Learning and Observation to Benefit the Environment programme, which involves school children taking systematic measurements (including measurements involving weather and climate; physical and chemical properties of water; soil structure and chemistry; vegetation cover; and biological characteristics of relevant areas). The application of information technology tools ensures connectivity and information exchange between 16,000 schools in 109 countries worldwide.

55. Reference is made in the NC4 to the Eco-Schools programme that is part of the Foundation for Environmental Education, which began in 1999, and is coordinated by the non-governmental organization (NGO) Nature's Friends Movement. In 2004, 184 schools and 67,700 students participated. The NC4 mentions the eco-quiz organized by this NGO, which takes place at the school, county and national level. With regard to education in universities, polytechnics and scientific and research institutes, the Government feels that current environmental education may be insufficient. The NC4 identifies institutes where postgraduate scientific studies in environment are currently offered, namely ecology, environmental protection and eco-engineering at the University of Zagreb and protection of nature and environment at the Josip Juraj Strossmayer University of Osijek.

56. The ERT noted the development in 2002 of an educational tool in the form of a slide show on the causes and consequences of climate change, which was used in cooperation with the Education and Teacher Training Agency to train secondary school teachers in 2003. The Ministry of Environmental Protection, Physical Planning and Construction provides various informative materials to primary and secondary schools. The publication in 2005 of a guide to climate change for schools was referred to in the NC4.

57. The NC4 mentions the improvement in coverage of climate change issues by the media between 2002 and 2005, and the periodic activities of certain environmental associations, such as the "Environmental Knowledge Centre" in Zagreb, which organized educational activities with the aim of raising public awareness. The ERT noted that the Meteorological and Hydrological Service informs the public and the expert community on climate-related issues via its website as well as by publishing a bulletin on climate monitoring and evaluation each year. Similar websites include those of the Ministry of Environmental Protection, Physical Planning and Construction, the Society of Sustainable Development Design, the Hrvoje Požar Energy Institute and the Green Action Organization.

58. The ERT was informed through the NC4 that various areas of environmental protection, such as climate, climate change, harmful effects of natural disasters, and the use of renewable energy and biofuels, and the international commitments and activities of Croatia in implementing the

Convention get regular press coverage. In 2004, an educational supplement on ozone layer protection and climate change was produced in cooperation with the *Vecernji List* newspaper, the Ministry of Environmental Protection, Physical Planning and Construction, and the United Nations Environment Programme. This supplement was distributed to a number of primary and secondary schools. Radio and television stations occasionally inform the public on climate change via the news or scientific and educational broadcasts.

59. The NC4 mentions the publication entitled “Renewable energy sources” produced by the Ministry of Environmental Protection, Physical Planning and Construction, and the Hrvoje Požar Energy Institute’s publication on the energy efficiency of buildings. The ERT was informed of the No Car Day that takes place at the end of the European Mobility Week in September. The Science Ministry has sponsored a Science Festival since 2003, which comprises exhibitions and lectures and was focused on climate change in 2006.

60. There are 270 registered NGOs involved in environmental protection and conservation activities according to the Ministry of Environmental Protection, Physical Planning and Construction. Green Action, a branch of Friends of the Earth, has organized public forums, street events and conferences focusing on the solarization of Croatia and the adoption of RES. Green Network of Activist Groups is an NGO that promotes RES. Greenpeace has also been active in Croatia, hosting an exhibition on climate change and the benefits of renewable energy.

61. The ERT examined the NC4 in terms of supplementary reporting on education, training and public awareness, in relation to the New Delhi work programme on impacts, vulnerability and adaptation to climate change, and found that Croatia did not report on its efforts, if any, to implement the New Delhi work programme. Croatia may wish to report in the future on the involvement of the public in the preparation and domestic review of the national communication.

III. Conclusions

62. Total GHG emissions including emissions and removals from LULUCF decreased by 4.1 per cent between 1990 and 2007, whereas total GHG emissions excluding net emissions or removals from LULUCF increased by 3.2 per cent. This was mainly attributed to increases in CO₂ emissions (by 7.69 per cent) and CH₄ emissions (by 1.8 per cent) and a decrease in N₂O emissions (by 8.9 per cent), excluding LULUCF. The trends in GHG emissions are contained in the NC4.

63. In the NC4, Croatia presents GHG projections for the period 2005–2020. Three scenarios are included: (a) ‘without measures’; (b) ‘with measures’ (including the effect of currently implemented and adopted PaMs); and (c) ‘with additional measures’. The projected increases in GHG emissions in 2010 in relation to the 1990 emission level under the ‘without measures’, ‘with measures’ and ‘with additional measures’ scenarios are 15.2 per cent, 13.3 per cent and 0.6 per cent, respectively.

64. In the course of the IDR, the ERT formulated a number of recommendations relating to the completeness and transparency of Croatia’s reporting under the Convention. The key recommendations² are that Croatia in its next national communication:

- Improve the completeness and transparency of its description of PaMs by adding more references to and descriptive information on PaMs and their mitigation potentials, including differentiation by sector and by gas, as well as by elaborating on measurable results, obstacles to the implementation of the PaMs, and acceptance of the PaMs implemented;

² The recommendations are given in full in the relevant sections of this report.

- Provide projections by sector in an aggregated format for each sector as well as for a national total, using GWP values, as well as by gas for CO₂, CH₄, N₂O, PFCs, HFCs and SF₆ (treating PFCs and HFCs collectively in each case), in graphical and tabular format;
- Present the methodology used in the projections and information on key underlying assumptions at sectoral level;
- Present projections related to fuel sold to ships and aircraft engaged in international transport reported separately and not included in the totals;
- Present the estimated and expected total effect of implemented, adopted and planned measures separately for the years 1995, 2000, 2005, 2010, 2015 and 2020, by gas and for all sectors;
- Provide information on actions taken to support related capacity-building activities in developing countries.

65. The ERT encourages Croatia to include a description of how the public is involved in the preparation of national communications, and provide information about the support provided to developing countries to establish and maintain observing systems and related data and monitoring systems, in its next national communication.

Annex

Documents and information used during the review

A. Reference documents

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

FCCC/IDR.1/HRV. Report on the in-depth review of the first national communication of Croatia. Available at <<http://unfccc.int/resource/docs/idr/hrv01.pdf>>.

FCCC/SBI/2007/INF.6. Compilation and synthesis of fourth national communications. Available at <<http://unfccc.int/resource/docs/2007/sbi/eng/inf06.pdf>>.

FCCC/ARR/2006/HRV. Report of the individual review of the greenhouse gas inventory of Croatia submitted in 2006. Available at <<http://unfccc.int/resource/docs/2007/arr/hrv.pdf>>.

2009 greenhouse gas inventory submission of Croatia. Available at <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4771.php>.

The second, third and fourth national communication of the Republic of Croatia under the United Nations Framework Convention on Climate Change. Available at <<http://unfccc.int/resource/docs/natc/hrvnc4.pdf>>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Visnja Grgasovic (Ministry of Environmental Protection, Physical Planning and Construction), including additional material on updated policies and measures, greenhouse gas projections, the national registry and recent climate policy developments in Croatia.
