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Report of the review of the initial report of Croatia

According to decision 13/CMP.1, each Annex I Party with a commitment inscribed in Annex B to the Kyoto Protocol shall submit to the secretariat, prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later, a report (the 'initial report') to facilitate the calculation of the Party's assigned amount pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, and to demonstrate its capacity to account for emissions and the assigned amount. This report reflects the results of the review of the initial report of Croatia conducted by an expert review team in accordance with Article 8 of the Kyoto Protocol.

CONTENTS

I. Introduction and summary

A. Introduction

1. This report covers the in-country review of the initial report of Croatia, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines). The review took place from 20 to 25 October 2008 in Zagreb, Croatia, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Riitta Pipatti (Finland); energy – Mr. Matej Gasperič (Slovenia); industrial processes – Ms. Barbara Muik (Austria); agriculture – Mr. Jorge Alvarez (Peru); land use, land-use change and forestry (LULUCF) – Mr. N.H. Ravindranath (India); and waste – Ms. Sirintornthep Towprayoon (Thailand). Ms. Pipatti and Ms. Towprayoon were the lead reviewers. In addition the expert review team (ERT) reviewed the national system, the national registry, and the calculations of Croatia's assigned amount and commitment period reserve (CPR), and took note of the LULUCF parameters and the elected activities under Article 3, paragraph 4, of the Kyoto Protocol. The review was coordinated by Ms. Astrid Olsson and Mr. Javier Hanna (UNFCCC secretariat).

2. In accordance with the Article 8 review guidelines, a draft version of this report was communicated to the Government of Croatia, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Summary

1. Timeliness

3. Decision 13/CMP.1 requests Parties to submit the initial report prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later. The initial report of Croatia was submitted on 27 August 2008, which is in compliance with decision 13/CMP.1. In its initial report Croatia refers to its 2008 greenhouse gas (GHG) inventory submission, comprising common reporting format (CRF) tables received on 24 May 2008 and a national inventory report (NIR) received on 27 May 2008. Croatia submitted additional information to the initial report and revised emission estimates on 8 December 2008, 19 January 2009 and 9 February 2009, in response to questions raised by the ERT during and after the in-country review, in accordance with the Article 8 review guidelines. Croatia submitted final revised estimates for the period 1990–2006 on 16 June 2009, which are considered in this review report.

2. Completeness

4. Table 1 below provides information on the mandatory elements that have been included in the initial report and revised calculations for the assigned amount and commitment period reserve provided by Croatia, and as calculated by the ERT, as a result of the review process. These revised calculations are based on revisions of emission estimates of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) from solid fuels (coke oven gas) in 1.A.1.a public electricity and heat production, 1.A.1.c manufacture of solid fuels and other energy industries and 1.A.2.f other (1990–1994) or in 1.A.2.d pulp, paper and print, 1.A.2.e food, beverages and tobacco and 1.A.2.f other (mineral industry) (2001–2006) (see para. 53); CO_2, CH_4 and N_2O from solid fuels (blast furnace gas) in 1.A.2.f other (see para. 54); CO_2 and CH_4 from gaseous fuels (gas work gas) in 1.A.2.f other, 1.A.4.a commercial/institutional and 1.A.4.b residential (see para. 61); CO_2, CH_4 and N_2O from gaseous fuels (natural gas) in 1.A.4.a commercial/institutional (see para. 62); CO_2, CH_4 and N_2O from liquid fuels in 1.A.4.a commercial/institutional (see para. 59); CO_2, CH_4 and N_2O from liquid fuels in 1.A.3.a civil aviation (see para. 66); CO_2 from 2.A.1 cement production (see para. 75); CO_2, CH_4 and N_2O from 2.B.1 ammonia

production (see para. 81); N_2O from 2.B.2 nitric acid production (see para. 78); CO_2 from 2.C.1 iron and steel production (1990) (see para. 74); CO_2 from 2.C.2 ferroalloys production (1990) (see para. 82); hydrofluorocarbons (HFCs) (1990) and sulphur hexafluoride (SF_6) from 2.F consumption of halocarbons and SF_6 (see para. 89); CO_2 from 2.G other (non-energy use of fuels) (see para. 91); CH_4 from 4.A enteric fermentation (see para. 100); N_2O from 4.D agricultural soils (see para. 105); CH_4 and N_2O from 4.B manure management (see para. 106); and CH_4 from 6.B.1 industrial wastewater (see para. 125). These revised estimates resulted in revisions of the total GHG emissions in the base year from 32,527,325 t CO_2 eq as reported originally by Croatia to 31,321,790 t CO_2 eq (see paras. 129 and 130) and revisions of the estimates of the 2006 inventory from the 30,833,982 t CO_2 eq as originally reported to 30,573,312 t CO_2 eq (see para. 131). The indicated revisions are addressed in more detail in the sectoral sections of this report.

Table 1. Summary of the reporting on mandatory elements in the initial report

Item	Provided	Value/year/comment
Complete greenhouse gas inventory from the base year (1990) to the most recent year available (2006)	Yes	Base year: 1990
Base year for HFCs, PFCs and SF_6	Yes	1990
Agreement under Article 4	No	Not applicable
Land use, land-use change and forestry parameters	Yes	Minimum tree crown cover: 10% Minimum land area: 0.1 ha Minimum tree height: 2 m
Election of and accounting period for Article 3, paragraphs 3 and 4, activities	Yes	Forest management was elected under Article 3, paragraph 4 Croatia has chosen to account for each activity under Article 3, paragraphs 3 and 4, for the entire commitment period.
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8 and decision 7/CP.12, as submitted by Croatia	Yes	171 129 792 t CO_2 eq[a]
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8 and decision 7/CP.12, revised value, as submitted by Croatia		165 403 503 t CO_2 eq[a]
Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8, revised value, as calculated by the ERT		148 778 503 t CO_2 eq
Calculation of the commitment period reserve, as submitted by Croatia	Yes	147 159 297 t CO_2 eq[a]
Calculation of the commitment period reserve, revised value, as submitted by Croatia		148 863 153 t CO_2 eq[a]
Calculation of the commitment period reserve, revised value, as calculated by the ERT		133 900 653 t CO_2 eq
Description of national system in accordance with the guidelines for national systems under Article 5, paragraph 1	Yes	
Description of national registry in accordance with the requirements contained in the annex to decision 13/CMP.1, the annex to decision 5/CMP.1 and the technical standards for data exchange between registry systems adopted by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	Yes	The registry was not operational and the independent assessment report was not available at the time of the in-country review

[a] In the calculation of its assigned amount, Croatia has added 3.5 million t CO_2 eq to its base year following decision 7/CP.12. The ERT considers that the addition of 3.5 million t CO_2 eq to the base year for the calculation of Croatia's assigned amount is not in accordance with Article 3, paragraphs 7 and 8 of the Kyoto Protocol and the modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol (decision 13/CMP.1). This calculation also has an impact on the calculation of the commitment period reserve carried out in accordance with paragraph 6 of the annex to decision 11/CMP.1.

5. The information in the initial report generally covers the elements required by decision 13/CMP.1, chapter I of the annex to decision 15/CMP.1, and relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). The initial report does not include information on how Croatia's national system will identify land areas associated with the

activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. However, after the in-country review Croatia provided this information in its response to a request of the ERT (see para. 146).

6. The national registry was not operational at the time of the in-country review owing to the required software still being adapted to Croatian circumstances. The ERT recommended that Croatia expedite the implementation schedule. After the in-country review, Croatia informed the ERT that all tests, including the initialization test, as well as documentation required for the national registry, were completed on 15 April 2009. The results of the technical assessment of the national registry as reported in the independent assessment report, including the results of standardized testing, were forwarded to the ERT by the administrator of the international transaction log (ITL), pursuant to decision 16/CP.10, on 30 April 2009.

7. The 2008 GHG inventory submission of Croatia contains a complete set of CRF tables for the years 1990–2006 and an NIR. In the CRF tables, Croatia included data on all relevant gases, sectors and categories. The inventory is complete in terms of geographical coverage.

3. Transparency

8. The descriptions of the GHG inventory, the national system and the national registry, activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and the calculation of the assigned amount and commitment period reserve in the initial report are transparent. In the NIR, there are some cases identified by the ERT where transparency should be further improved (see para. 29).

4. Emission profile in the base year, trends and emission reduction target

9. In the base year (1990 for CO_2, CH_4, N_2O, HFCs, perfluorocarbons (PFCs) and SF_6), the most important GHG in Croatia was CO_2, contributing 73.7 per cent to total[1] GHG emissions expressed in CO_2 eq,[2] followed by N_2O, 12.3 per cent, and CH_4, 10.9 per cent (see figure 1). HFCs, PFCs and SF_6 taken together contributed 3.0 per cent of the overall GHG emissions in the base year. The energy sector accounted for 70.7 per cent of the total GHG emissions in the base year, followed by agriculture, 13.8 per cent, industrial processes, 13.4 per cent, waste 1.8 per cent, and solvent and other product use 0.3 per cent (see figure 2). Total GHG emissions amounted to 31,321.79 Gg CO_2 eq and decreased by 2.4 per cent from the base year to 2006. The trends of the different gases and sectors are reasonable and similar to other Parties with similar national circumstances.

[1] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] In this report, the values for total and sectoral emissions for the entire time series, and in particular in the base year and in 2006, reflect the revised estimates submitted by Croatia in the course of the review. These estimates differ from Croatia's GHG inventory submitted in 2008.

Figure 1. Shares of gases in total greenhouse gas emissions, base year

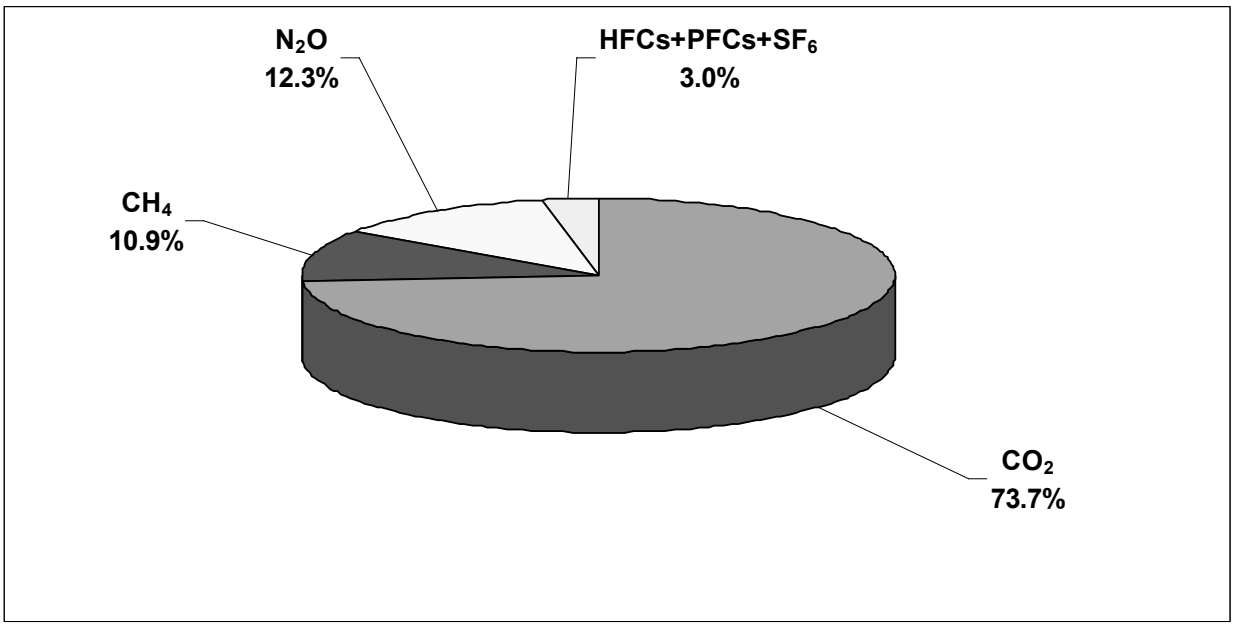
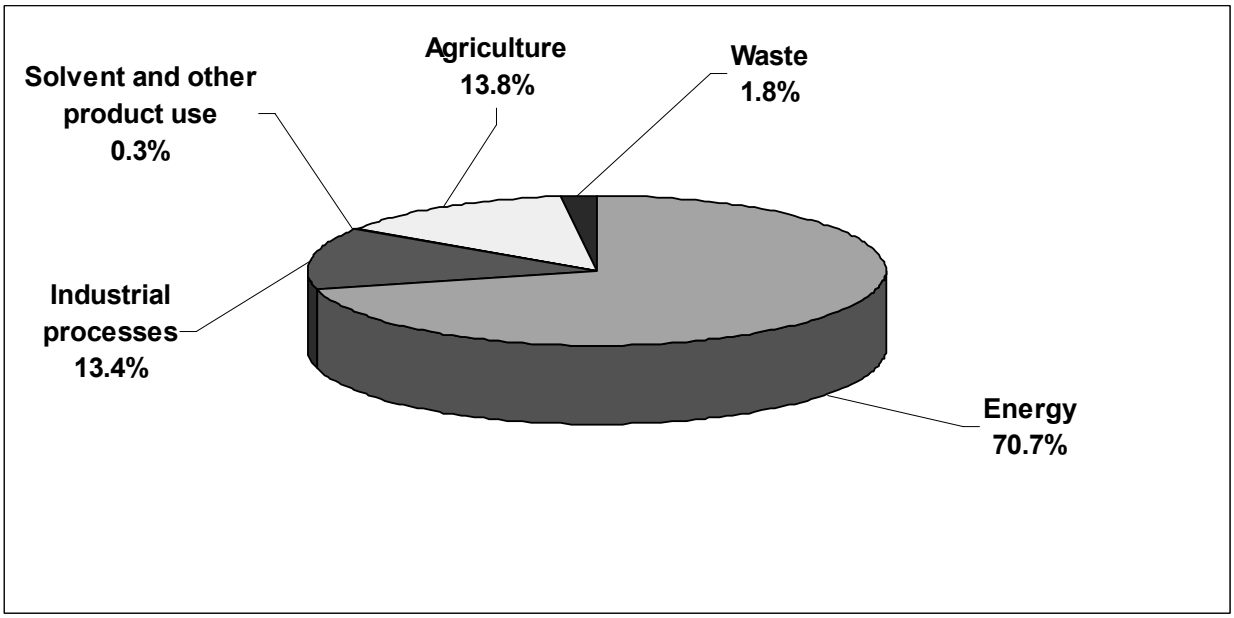


Figure 2. Shares of sectors in total greenhouse gas emissions, base year



10. Tables 2 and 3 show the GHG emissions by gas and by sector, respectively.

11. Croatia's quantified emission limitation is 95 per cent as included in Annex B to the Kyoto Protocol.

Table 2. Greenhouse gas emissions by gas, 1990–2006

GHG emissions (without LULUCF)	Gg CO_2 eq								Change
	Base year[a]	1990	1995	2000	2003	2004	2005	2006[a]	BY–2006 (%)
CO_2	23 080.45	23 080.45	16 914.67	19 937.66	23 433.90	22 994.44	23 401.24	23 505.95	1.8
CH_4	3 425.87	3 425.87	2 856.31	2 661.58	3 115.50	3 138.93	2 989.75	3 199.02	–6.6
N_2O	3 867.89	3 867.89	3 028.15	3 272.11	3 149.81	3 442.32	3 485.25	3 421.24	–11.5
HFCs	NO	NO	7.80	23.16	163.71	188.87	349.18	430.68	NA
PFCs	936.56	936.56	NO	NO	NO	NO	NA,NO	NA,NO	NA
SF_6	11.01	11.01	11.61	12.15	14.30	14.90	15.73	16.43	49.2

Abbreviations: BY = base year, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring.

[a] Croatia submitted revised estimates for the entire time series in the course of the initial review on 16 June 2009. The revised estimates are given in the table. These estimates differ from those provided in Croatia's GHG inventory submitted in 2008.

Table 3. Greenhouse gas emissions by sector, 1990–2006

Sectors	Gg CO_2 eq								Change
	Base year[a]	1990	1995	2000	2003	2004	2005	2006[a]	BY–2006 (%)
Energy	22 148.99	22 148.99	16 391.15	18 822.00	22 468.45	21 929.72	22 288.45	22 416.16	1.2
Industrial processes	4 185.46	4 185.46	2 566.71	3 218.26	3 240.07	3 498.89	3 672.42	3 855.34	–7.9
Solvent and other product use	80.21	80.21	80.16	68.68	107.51	134.95	155.05	182.39	127.4
Agriculture	4 328.40	4 328.40	3 048.17	3 153.91	3 196.06	3 390.12	3 468.60	3 422.86	–20.9
LULUCF	NA	–4 184.92	–9 154.24	–5 280.69	–6 276.47	–7 899.85	–7 726.37	–7 490.29	NA
Waste	578.72	578.72	732.35	643.81	865.13	825.78	656.64	696.56	20.4
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	27 136.87	13 664.30	20 625.96	23 600.75	21 879.61	22 514.79	23 083.02	NA
Total (without LULUCF)	31 321.79	31 321.79	22 818.54	25 906.65	29 877.22	29 779.46	30 241.16	30 573.31	–2.4

Abbreviations: BY = base year, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] Croatia submitted revised estimates for the entire time series in the course of the initial review on 16 June 2009. The revised estimates are given in the table. These estimates differ from those provided in Croatia's GHG inventory submitted in 2008.

II. Technical assessment of the elements reviewed

A. National system for the estimation of anthropogenic greenhouse gas emissions by sources and sinks

12. Croatia's national system is generally prepared in accordance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). The national system can perform the general and specific functions as required by the national systems guidelines. However, the ERT noted that Croatia uses tier 1 methodologies for several key categories. The ERT reiterates the encouragement from previous reviews that Croatia give higher priority to methodological issues and move from tier 1 methods to higher tiers for key categories.

13. Table 4 shows which of the specific functions of the national system are included and described in the initial report.

Table 4. Summary of reporting on the specific functions of the national system

Reporting element	Provided	Comments
Inventory planning		
Designated single national entity*	Yes	See section II.A.1
Defined/allocated specific responsibilities for inventory development process*	Yes	See section II.A.1
Established process for approving the inventory*	Yes	See section II.A.1
Quality assurance/quality control (QC) plan*	Yes	See section II.A.2
Ways to improve inventory quality	Yes	See section II.B.3
Inventory preparation		
Key category analysis*	Yes	See section II.B.1
Estimates prepared in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* and the *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories**	Partly	See section II.B.2
Sufficient activity data and emission factors collected to support methodology*	Yes	See section II.B
Quantitative uncertainty analysis*	Yes	See section II.B.2
Recalculations*	Yes	See section II.B.2
General QC (tier 1) procedures implemented*	Partly	See section II.A.2
Source/sink category-specific QC (tier 2) procedures implemented	No	See section II.A.2
Basic review by experts not involved in inventory	Yes	See section II.A.2
Extensive review for key categories	No	See section II.A.2
Periodic internal review of inventory preparation	Yes	See section II.A.2
Inventory management		
Archive inventory information*	Yes	See section II.A.3
Archive at single location	Yes	See section II.A.3
Provide expert review team with access to archived information*	Yes	See section II.A.3
Respond to requests for clarifying inventory information during review process*	Yes	See section II.A.1

* Mandatory elements of the national system.

1. Institutional, legal and procedural arrangements

14. During the in-country review, Croatia further explained the institutional arrangements, as part of the national system, for preparation of the inventory. The Ministry of Environmental Protection, Physical Planning and Construction (MEPPPC) is the designated single national entity. The ministry is responsible for the institutional and procedural arrangements and controls the use of methodologies; it approves the inventory and is responsible for the submissions to the UNFCCC secretariat. Other agencies and organizations are also involved in the preparation of the inventory and have specific responsibilities for the inventory development process. Among them, the Croatian Environmental

Agency (CEA) has overall responsibility for organizing the collection of activity data (AD) and emission and removal estimations, and reporting the GHG inventory. It is also responsible for the quality assurance/quality control (QA/QC) plan and its implementation, as well as the selection of the institution or institutions that prepare the inventory and the reporting on changes to the national system. The consultancy company Ekonerg was appointed by CEA to prepare the inventory and its submissions, including reporting on the registry units, based on a three-year contract. Ekonerg also prepares the air pollutant inventories under the Convention on Long-Range Transboundary Air Pollution under the UN ECE and has long-term experience in inventory preparation. Other organizations such as the Croatian statistical office and line ministries responsible for their respective sectors provide data and support the inventory preparation. CEA also oversees administration of the national registry and facilitation of the reviews.

15. Croatia has developed the Regulation on Greenhouse Gas Emissions Monitoring in the Republic of Croatia and made amendments to the Air Protection Act in order to define the institutional arrangements, support the inventory preparation and review process, and ensure AD collection for the inventory. The ERT commends Croatia for its comprehensive legal and institutional arrangements. At the same time, the ERT encourages Croatia to strengthen some functional aspects of its national system, namely, to: (1) focus its attention on methodological issues, because at present priority is given to AD collection; (2) enhance collaboration with expert and research organizations and initiate research and studies to support the inventory preparation, especially in the agriculture and LULUCF sectors, in order to enhance consideration of national circumstances; (3) strengthen the implementation of the QA/QC procedures; and (4) provide additional support for the sectoral experts compiling the inventory (such as support on cross-cutting issues, ensuring availability of backup staff and increasing interaction of experts across sectors). The ERT also noted that timely performance is a challenge for the inventory team owing to the late availability of AD during the year. The ERT encourages Croatia to consider whether additional resources are required to meet the requirements for timely submission of the inventory.

16. During the in-country review, Croatia informed the ERT that it will base the reporting of activities under Article 3, paragraph 3 and 4, of the Kyoto Protocol on bottom-up data from the Forest Management Plan for state forests that are under the authority of the state company Croatian forests, which is prepared every 10 years. Croatia intends to obtain information on private forests using a method combining field work and remote sensing data. Additional data will be obtained from the national forest inventory which, according to information presented to the ERT, was due to be finished at the end of 2008 (see also para. 146).

17. In Croatia there is an established process for the official consideration and approval of the inventory, including recalculations, prior to its submission to the UNFCCC secretariat and for responding to issues raised during the inventory review process. The responsible organization for this approval is the MEPPPC. During the in-country review the ERT was informed that the ministry will establish an expert group with 7 to 9 members to support the ministry in the approval process and QA of the inventory. The ERT welcomes these plans and encourages the ministry to establish this expert group as soon as possible.

2. Quality assurance/quality control

18. Croatia has elaborated a QA/QC plan in accordance with the *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* of the Intergovernmental Panel on Climate Change (IPCC) (hereinafter referred to as the IPCC good practice guidance). This includes general QC procedures (tier 1) as well as source/sink category-specific procedures (tier 2) for key categories and for those individual categories in which significant methodological and/or data revisions have been implemented. The QA/QC plan was developed as part of projects funded by the United Nations Development Programme/Global Environment Facility and the European Union/LIFE, and has been updated annually. For the 2009 annual inventory submission the responsibility for the QA/QC plan

was transferred to CEA from Ekonerg and a QA/QC coordinator appointed. The ERT commends Croatia for its comprehensive QA/QC plan.

19. During the in-country review, the ERT noted that Croatia's implementation of QC procedures has focused on AD and documentation included in the NIR, whereas methodological issues (e.g. choice of method and calculations) have received less attention. The ERT recommends that Croatia continue the annual updates of the QA/QC plan and set specific quality objectives for each sector and also for cross-cutting issues. The documentation and recording of QC measures implemented should be improved (e.g. in the calculation sheets) and consistency checks across sectors and categories, as well as between the CRF tables and the NIR, should be included in the plan. The ERT also encourages Croatia to implement the QA and verification measures included in the QA/QC plan for its next annual inventory submission, and develop these further based on the experience gained. At present no review is made of the estimates by experts who are not participating in the inventory preparation, but the expert group mentioned above (para. 17) is expected to perform this task in future submissions.

3. Inventory management

20. Croatia has a centralized archiving system at CEA. Ekonerg also archives relevant inventory information. The system includes the archiving of disaggregated emission factors (EFs), AD and documentation on how these factors and data have been generated in so-called inventory data record sheets. The archived information also includes the inventory submissions, annual QA/QC plans, references and other relevant information. Components of the archive, which are not available electronically, are archived in hard copy. During the in-country review, the ERT was provided with additional archived information as requested.

B. Greenhouse gas inventory

21. In conjunction with its initial report, Croatia has submitted a complete set of CRF tables for the years 1990–2006 and an NIR. Croatia officially resubmitted its final CRF tables for 1990–2006 on 16 June 2009 in response to questions raised by the ERT during and after the in-country review. Where needed the ERT also used previous years' submissions in its work, especially for evaluating progress in the inventory preparation and reviewing the recalculations.

22. During and after the in-country review Croatia provided the ERT with documents containing additional information sources. These documents are not part of the initial report submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

1. Key categories

23. Croatia has reported a key category analysis using the tier 1 approach, both level and trend assessment, but has not applied a qualitative approach in determining its key categories as part of its initial report submission. Croatia has included the LULUCF sector in its key category analysis. However, the ERT noted that Croatia has not taken into account equation 5.4.3 of the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) for categories in which the emissions in 2006 were zero. With this exception, the key category analysis performed by Croatia is in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT recommends that Croatia correct its key category analysis in accordance with the afore-mentioned equation 5.4.3.

24. The key category analysis performed by Croatia and the secretariat[3] produced somewhat different results. Croatia identified 24 key categories for 1990 in its 2008 submission, whereas the secretariat identified 20 key categories. The following categories were identified as key for 1990 by Croatia but not by the secretariat: CO_2 from lime production, CO_2 from ferroalloys production, CO_2 from aluminium production, HFCs from consumption of halocarbons and SF_6, and CO_2 from solvent and other product use. At the same time, the following categories were identified by the secretariat as key but not by Croatia: CO_2 from civil aviation, CH_4 from manure management and CO_2 from other – non-energy use of fuels (2.G). The differences are due to a more detailed category split used by Croatia and the error identified in paragraph 23 above.

25. The results of the key category analysis are not a main driving factor in the preparation of the inventory in Croatia, including the choice of methodologies. The key category analysis is not used in prioritizing inventory improvements, rather, improvements to the inventory were largely guided by the feedback from the UNFCCC inventory review process. The ERT recommends that Croatia use the results of the key category analysis in the future in the choice of methods and in prioritizing resources for inventory improvement. The ERT encourages Croatia to move to a tier 2 key category analysis, linked to the improvement of uncertainty estimation (see para. 35), to obtain a systematic tool for preparation, development and improvement of the inventory.

2. Cross-cutting topics

26. The inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, for several key categories tier 1 methods are used. Also, default EFs or parameters from the Revised 1996 IPCC Guidelines were used, even when updated values are provided in the IPCC good practice guidance. The ERT recommends that Croatia move to higher tier methods for key categories and update default EFs and parameters, where appropriate, for its next annual inventory submission (see sectoral chapters for details).

27. The inventory is compiled in accordance with Article 7, paragraph 1, of the Kyoto Protocol and decision 15/CMP.1.

Completeness

28. The inventory is complete in terms of years, geographical coverage and sectors, but estimates for some source and sink categories were not reported in the CRF tables or the NIR. In the LULUCF sector, estimates are provided only for the forest land remaining forest land category. Emissions from some categories in the industrial processes, solvent and other product use and waste sectors are reported as not estimated ("NE"). Croatia reported potential emissions of HFCs for the years 1990–2006, but no actual emissions. In the original 2008 GHG inventory submission, SF_6 emissions (actual and potential) for the whole time series, and CH_4 and N_2O emissions from industrial wastewater treatment are not reported. The ERT recommends that Croatia provide estimates for the missing categories, to the extent possible, in its next annual inventory submission.

[3] The secretariat identified, for each Party, those source categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF for the base year or base year period as well as the latest inventory year. Key categories according to the tier 1 trend assessment were also identified. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

Transparency

29. The NIR is structured in accordance with the outline recommended in the UNFCCC reporting guidelines for annual inventories and provides much of the information necessary to review the inventory. The level of detail in the documentation provided in the NIR varies by sector. The sections on agriculture and LULUCF in particular are short and do not provide sufficient information for full assessment of underlying assumptions and the rationale for choices of data, methods and other inventory parameters. The ERT recommends that Croatia provide in the NIR of its next annual inventory submission more data and documentation on trends (background information and explanation of fluctuations) and the reasoning behind choices of EFs and parameters, and a description of QA/QC measures implemented for all sectors of the inventory. Sector-specific recommendations are given in more detail in the sectoral chapters.

Consistency

30. The ERT found the inventory to be generally consistent over time and that the recalculations in the energy and agriculture sector have improved the consistency compared with the previous inventory submission. However, trends and inter-annual fluctuations in the emission estimates are generally not explained in the NIR. For instance, for the civil aviation category, the ERT noted that the emission level in the base year is much higher than in other years of the time series and that no explanation for this was provided in the NIR (see also paras. 65 and 66). The ERT commends Croatia for the improvements made to increase the consistency of the time series in many categories (e.g. use of statistical data to replace expert judgement and increased use of the same AD source for the whole times series) and it recommends that Croatia continue in its efforts to improve consistency in the inventory and explain the trends of important categories in the NIR of its next annual inventory submission.

Comparability

31. The inventory estimates and time series are generally comparable with those of other Parties with economies in transition. During the in-country review the ERT identified some exceptions to this. For example, HFC emissions for the beginning of the 1990s were estimated using extrapolation of the values for later years, resulting in a trend that deviates from those in other countries. Croatia corrected this trend in its response to the potential problems identified by the ERT during the in-country review (see paras. 86–89).

Accuracy

32. The inventory is generally accurate, as defined in the UNFCCC reporting guidelines. During the in-country review the ERT identified some categories where the methods or EFs were not fully in accordance with the IPCC good practice guidance and could lead to overestimation of the base year emissions, or underestimation of emissions in the latest years (see para. 4). In response to recommendations of the ERT during the in-country review, Croatia provided revised estimates for these categories after the review for the entire time series, most of which were revised in accordance with the ERT recommendations. Further details are provided in the sectoral chapters below.

Recalculations

33. The national system can generally ensure that recalculations of previously submitted estimates of GHG emissions by sources and removals by sinks are prepared in accordance with the IPCC good practice guidance.

34. The ERT noted that recalculations reported by Croatia of the time series from the base year to 2005 had been undertaken to take into account recommendations from the previous review report. The major changes are: using a higher tier method for estimation of CO_2 emissions from public electricity and heat production; increasing completeness of the inventory (e.g. by including information for all

cement production plants); improving the accuracy of AD (replacing expert judgement values with statistical data); and ensuring consistency with the IPCC good practice guidance for LULUCF (changing biomass expansion factor (BEF) values for estimation of carbon stock in biomass in accordance with national circumstances). The rationale for these recalculations is provided in the NIR and they have in most cases resulted in improvements to the inventory (for some exceptions see paras. 49 and 86–89). The ERT noted that recalculations are largely initiated and prepared by the sectoral experts in the inventory team, and encourages Croatia to develop the recalculations process, under its national system, with clear guidance on who initiates recalculations, who approves them and how the recalculations are prioritized. In its comments to the draft review report, Croatia stated that in accordance with the regulation on GHG emissions monitoring it is the MEPPPC that decides which emission estimation methodology to use, including recalculations.

Uncertainties

35. Croatia has provided an uncertainty analysis for each category and for the inventory in total, following the tier 1 approach of the IPCC good practice guidance and using default uncertainty values. Hence, national circumstances are not always reflected in the uncertainty estimates. Also, the uncertainty estimates do not always reflect changes and improvements made in the inventory in the latest submission. The ERT recommends that Croatia improve and update the uncertainty estimates, especially when changes are made in the inventory or when country-specific methods or EFs are used. The ERT also encourages Croatia to move in the long-term to a tier 2 method for estimating uncertainties and to take the results into consideration when improving the inventory (see para. 25).

3. Areas for further improvement identified by the Party

36. The NIR identifies several areas for improvement in an improvement plan that builds largely on recommendations from the previous review reports. Short-term and long-term goals for improving the inventory are presented by sector; general and institutional issues are also addressed. The principal aim of the plan is to improve data collection and to use higher tier methods when more detailed data are available, especially in the energy, industrial processes and agriculture sectors. In the LULUCF sector the aim is to develop a land-use database with higher quality data. The development of country-specific BEF values is another goal. The ERT commends Croatia for its improvement plan, and at the same time encourages Croatia to add to the plan more specificity and a time schedule for the planned improvements in the NIR of its next annual inventory submission.

4. Areas for further improvement identified by the ERT

37. The ERT identifies the following cross-cutting issues for improvement:

(a) Use increasingly higher tier methodologies for key categories, while enhancing collaboration with expert and research organizations as well as universities to achieve this goal;

(b) Provide more precise descriptions of methodologies that differ from those of the IPCC and the reasoning for choices of methods, EFs and parameters;

(c) Provide more resources and support for the inventory sectoral experts, including on cross-cutting issues (see para. 15);

(d) Improve the transparency of the inventory estimates by providing clarifications and reasons for trends and inter-annual fluctuations in the emissions;

(e) Develop the QA/QC plan to include more sector-specific considerations and strengthen its implementation;

(f) Enhance the process for recalculations and prioritization of inventory improvements, taking into account the results of the uncertainty and key category analyses;

(g) Improve and update the uncertainty estimates when national methods, AD and EFs are used.

38. Recommended improvements relating to specific categories are presented in the relevant sector sections of this report.

5. Energy

Sector overview

39. In the base year (1990 for CO_2, CH_4 and N_2O and also for HFCs, PFCs and SF_6), the energy sector in Croatia accounted for 70.7 per cent of total GHG emissions (22,148.99 Gg CO_2 eq). Fuel combustion contributed 65.4 per cent to the total GHG emissions and 92.5 per cent to total GHG emissions from the sector. Total GHG emissions from the energy sector increased by 1.2 per cent from the base year to 2006. In the base year the most important categories in the sector were energy industries and manufacturing industries and construction, contributing 32.3 and 24.7 per cent to the energy sector emissions, respectively. Transport contributed 18.4 per cent to the total energy sector emissions, other sectors contributed 17.1 per cent and fugitive emissions from fuels contributed 7.5 per cent. The percentage changes between the base year and 2006 for each GHG from the energy sector are: CO_2 +0.1 per cent, CH_4 +10.4 per cent and N_2O +91.0 per cent.

40. Croatia indicates in its NIR that the most important decrease in emissions occurred after 1990, largely as a consequence of the decline in industrial activities due to the war in Croatia (1991–1995). After the recovery of the national economy, emissions in the energy sector rapidly increased in the period 1996–2003 and stabilized in the period 2003–2006.

41. The IPCC tier 1 methods with default EFs are mainly used for fuel combustion. Tier 1 methods are also used to estimate fugitive emissions. The NIR and the CRF tables provided for the inventory estimates of the energy sector are generally complete. A minor omission in the estimates was identified regarding small quantities of liquid fuels in 1.A.4.a other sectors – commercial/institutional and CO_2 emissions from the sulphur dioxide (SO_2) scrubbing process (desulphurization) in thermal power plants were also not reported. Croatia provided emission estimates for these sources after the in-country review (see also paras. 55 and 59).

42. The ERT noted that energy statistics in Croatia are in general well documented and these include the base year. Since 1988, Croatia has published annual energy balances in the publication *Energija u Hrvatskoj* ("Energy in Croatia"). The first energy balance of Croatia was compiled in 1994 for the period 1988–1992 by the Hrvoje Požar Energy Institute. Before 1990, Croatia, like other former Yugoslav republics, had an independent statistical office which geographically covered the republic's territory. The ERT found that geographical coverage of emission estimates within the period 1990–2006 is consistent, whereas time-series consistency is difficult to evaluate in the period 1991–1995 owing to the war in Croatia. This issue is also reflected in low availability of data and fluctuations in AD for that period. For example, in the period 1990–2000, Croatia reports aggregated information for the whole manufacturing industries and construction category under 1.A.2.f other, whereas for the later years Croatia reports disaggregated information under each subcategory of the manufacturing industries and construction category.

43. In the base year, the estimated uncertainties for CO_2 in the energy sector are 7 per cent, which the ERT considers rather low, taking into account that some AD (e.g. for aviation and maritime transport) for the base year are not based on statistics, but on expert estimates and extrapolations, and some net

calorific values (NCV) and all EFs used for the estimates are based on the IPCC default values. The ERT recommends that Croatia improve and update the uncertainty estimates (see also para. 35).

44. In response to the potential problems identified by the ERT, after the in-country review Croatia revised its estimates of: CO_2, CH_4 and N_2O from solid fuels (coke oven gas) in 1.A.1.a public electricity and heat production, 1.A.1.c manufacture of solid fuels and other energy industries and 1.A.2.f other (1990–1994) or in 1.A.2.d pulp, paper and print, 1.A.2.e food, beverages and tobacco and 1.A.2.f other (mineral industry) (2001–2006) (see para. 53); CO_2, CH_4 and N_2O from solid fuels (blast furnace gas) in 1.A.2.f other (see para. 54); CO_2 and CH_4 from gaseous fuels (gas work gas) in 1.A.2.f other, 1.A.4.a commercial/institutional and 1.A.4.b residential (see para. 61); CO_2, CH_4 and N_2O from gaseous fuels (natural gas) in 1.A.4.a commercial/institutional (see para. 62); CO_2, CH_4 and N_2O from liquid fuels in 1.A.4.a commercial/institutional (see para. 59); and CO_2, CH_4 and N_2O from liquid fuels in 1.A.3.a civil aviation (see para. 66). These revisions have resulted in a 3.2 per cent decrease in the estimate of emissions in the base year for the energy sector, from 22,881.80 Gg CO_2 eq to 22,148.99 Gg CO_2 eq. The impact for 2006 was a decrease in the estimated emissions by 0.6 per cent, from 22,548.37 Gg CO_2 eq to 22,416.16 Gg CO_2 eq.

Reference and sectoral approaches

Comparison of the reference approach with the sectoral approach and international statistics

45. Croatia reported both reference approach and sectoral approach calculations for CO_2 emissions from fuel combustion for the base year. The difference between the reference and sectoral approaches was 2.59 per cent for energy consumption and 4.47 per cent for CO_2 emissions. The major differences in energy consumption occur in solid fuels (17.77 per cent) and for CO_2 emissions from gaseous fuels (25.18 per cent). According to the NIR differences could be explained by the fact that feedstock and non-energy use of fuels accounted under the industrial processes sector is not correctly reflected in the reference approach. The ERT noted that for gaseous fuels the difference in the estimates for consumption using the two approaches is small (1.64 per cent) whereas the difference in the emission estimates is significant (as indicated above). A minor difference is also caused by adding gasworks gas under other gaseous fuels in the reference approach. Since gasworks gas is a secondary fuel, its production should not be included in the reference approach as a primary fuel. The ERT therefore recommends that Croatia explore possibilities to better reflect the feedstock use in the reference approach and include the explanations provided to the ERT during the in-country review in the NIR of its next annual inventory submission. The ERT also recommends that Croatia remove production of gasworks gas from the CRF table 1.A(b) in its next annual inventory submission.

46. The ERT encourages Croatia to correct, where appropriate, fuel quantities and fractions of carbon stored in the CRF table 1.A.(d), (see paras. 52–56 and 60–63 for a detailed discussion on solid and gaseous fuels, respectively, and para. 50 for feedstock and non-energy use of fuels). The ERT was not able to compare the apparent consumption estimate for the base year reported in Croatia's reference approach with the International Energy Agency (IEA) data, as the latter were not available during the in-country review.

International bunker fuels

47. Insufficient information is provided in the NIR and the documentation box of the CRF table 1.C about the methodology used for allocating fuel consumption between domestic and international aviation and navigation and the methodology used for the emission estimates.

48. Data on marine bunkers until 1994 are based on expert judgement; after this year data are taken from the energy balances. The ERT recommends that Croatia provide detailed information on disaggregation of fuels between domestic navigation and international marine bunkers in its next annual inventory submission.

49. In the 2008 inventory submission, disaggregation of fuel consumption between international and domestic aviation and emission estimates were recalculated for 1990–1995 based on the IEA data and following the recommendations of the previous review report. The NIR reports that data for international aviation bunkers were included for the first time in the energy balances in 2004. Recalculations for the base year significantly increased the estimates for emissions from domestic aviation and decreased the estimates for emissions from aviation bunkers. The background information for initial estimates and subsequent recalculation was not provided in the NIR and the methodology is not described. During the in-country review, the ERT recommended that Croatia revise its emission estimates using the number of passengers travelled on domestic and international routes and average kilometres travelled per passenger on domestic and international routes, since these data are available from Croatia's national statistics, in particular for the base year. The ERT also recommended that Croatia use detailed information from aircraft carriers operating on domestic routes on fuel consumption and number of flights, and that it provide emission estimates, including estimates for international aviation, in particular for recent years and continue with this practice in its subsequent annual inventory submissions. In response to these recommendations, after the in-country review Croatia provided revised estimates of CO_2, CH_4 and N_2O emissions from domestic and international aviation (see para. 66).

Feedstocks and non-energy use of fuels

50. In table 1.A(d), Croatia reports information on carbon stored in feedstocks and non-energy use of fuels, using IPCC default values for the fraction of carbon stored except for naphtha (0.80). AD on feedstocks and non-energy use of fuels are available in the country's energy balance. During the in-country review Croatia provided the ERT with background information on natural gas used as a feedstock for production of ammonia. However, detailed information on other products and inputs to industrial processes is not available in the NIR. Croatia included emissions from oxidation of non-energy use of fuels (lubricants and naphtha in 1990 and lubricants, ethane and other derivatives in 2006) under the industrial processes sector. During the in-country review Croatia was not able to provide background information on categories of products included and reported under non-energy use and the purpose of their use. The ERT therefore recommended that Croatia either provide documented information on the possible oxidation or use of these substances or remove emissions from non-energy use of fuels from the industrial processes sector because of the lack of transparency and revise its CO_2 emission estimates. After the in-country review, Croatia decided to follow the recommendation of the ERT and removed these emissions from the inventory (see paras. 90 and 91 for more details).

Country-specific issues

51. Under the fugitive emissions from oil, natural gas and other sources category, Croatia reports CO_2 emissions from scrubbing to reduce the excessive CO_2 content in domestic raw natural gas (more than 15 per cent in weight). The estimates of CO_2 emissions are based on the mass balance of the scrubbing plants. There is no recommended IPCC method for estimating emissions from this process. Croatia has followed the recommendation from the previous review report and reported the CO_2 emissions under subcategory 1.B.2.b(ii) production/processing. During the in-country review Croatia provided the ERT with additional information on CO_2 scrubbing. The ERT encourages Croatia to include all relevant information, including the natural gas composition before and after scrubbing, in its next annual inventory submission.

Key categories

Stationary combustion: solid fuels – CO_2

52. Stationary combustion of fossil fuels in 1990 in Croatia is dominated by domestic and imported other bituminous coal (brown coal) and lignite, which are widely used in manufacturing industries and thermal power plants. The CO_2 EFs used for coke oven coke, coking coal, lignite, brown coal, coke oven gas and blast furnace gas for fuel combustion were estimated using the IPCC default values.

53. The ERT noted during the in-country review that Croatia applied the EF of gas coke (29.5 t C/TJ) to coke oven gas, which has an EF of 13 t C/TJ according to the Revised 1996 IPCC Guidelines, for its CO_2 estimates in categories 1.A.1.a public electricity and heat production, 1.A.1.c manufacture of solid fuels and other energy industries and 1.A.2.f other (manufacturing industries and construction total for 1990–2000) or for 2001–2006 in 1.A.2.d pulp, paper and print,1.A.2.e food, beverages and tobacco and 1.A.2.f other (mineral industry). During the in-country review the ERT recommended that Croatia apply the correct IPCC default EF for coke oven gas and revise its CO_2 emission estimates in the categories where this mistake occurred as indicated above. After the in-country review, Croatia followed this recommendation and applied the correct EF for coke oven gas and revised its CO_2 estimates for these categories and in addition corrected inconsistencies in the use of the CH_4 and N_2O EFs for the complete time series. The ERT recommends that Croatia reallocate the emission estimates from coke oven gas from gaseous fuels to solid fuels in accordance with the IPCC classification in its next annual inventory submission.

54. In 1990 and 1991, for its estimates of CO_2, CH_4 and N_2O emissions from solid fuels used in iron and steel under the category 1.A.2.f other (manufacturing industries and construction total for 1990–2000), Croatia assumed full oxidation of coke oven coke. This means that emissions from blast furnace gas, the secondary fuel obtained as a by-product of the process, were also included in the estimates. In addition, Croatia has reported CO_2, CH_4 and N_2O emissions from combustion of blast furnace gas under this category. The ERT considered this to be double counting of emissions and therefore recommended during the in-country review that Croatia remove CO_2, CH_4 and N_2O emissions from combustion of blast furnace gas. After the in-country review, Croatia followed the recommendation of the ERT for the base year and 1991.

55. During the in-country review, the ERT also noted that since 2002 Croatia has applied a SO_2 scrubbing process (desulphurization) in thermal power plants and recommended that Croatia include the CO_2 emissions from this process in its future emission estimates. In response to this recommendation, during the in-country review, Croatia provided very detailed information on AD for the period 2002–2006 needed for the CO_2 emission estimates, and after the in-country review Croatia provided CO_2 emission estimates from the SO_2 scrubbing process using the stochiometric ratio of $CO_2/CaSO_4$ instead of $CO_2/CaSO_4*2H_2O$, leading to a conservative estimation of CO_2 emissions from desulphurization during the period 2002–2006. The ERT encourages Croatia to revise its emission estimates using the correct ratio or calculate the CO_2 emissions based on calcium carbonate ($CaCO_3$) input multiplied with an EF of 0.44 t CO_2/t $CaCO_3$ in its next annual inventory submission. In addition the ERT recommends that Croatia reallocate the emission estimates from the SO_2 scrubbing process from the public electricity and heat production category to the limestone and dolomite use under the industrial processes sector in accordance with the Revised 1996 IPCC Guidelines in its next annual inventory submission.

56. The overall impact of the revisions for this category discussed above on the energy sector totals was a decrease of 2.0 per cent in the estimate of GHG emissions for the base year, from 22,881.80 Gg CO_2 eq to 22,414.99 Gg CO_2 eq. The impact for 2006 was an increase of 0.003 per cent, from 22,548.37 Gg CO_2 eq to 22,549.03 Gg CO_2 eq.

Stationary combustion: liquid fuels – CO_2

57. Croatia estimates CO_2 emissions from this category using AD from the country's energy balance, compiled by the Hrvoje Požar Energy Institute.

58. During the in-country review, the ERT noted that in Croatia there are some significant activities in the oil industry. As indicated in the NIR, Croatia has two oil refineries in Rijeka and Sisak, and lubricants are produced in facilities in Rijeka and Zagreb. The national energy balance provides separate values for own use of energy in refineries but fuel used for heating/cogeneration plants (CHP) is aggregated under other sub-sectors. The ERT considers that carbon flow in refineries is not clearly

defined since inputs and outputs of feedstocks and products together with own use of energy for CHP are not clearly separated. The ERT encourages Croatia to provide information on oil products used for non-energy purposes as a feedstock and if possible to provide information on carbon flow (carbon balance) in petroleum refineries in order to improve transparency, define an appropriate fraction of carbon stored for liquid fuels and therefore fully justify the negative difference (–3.10 per cent in 1990) between the estimates derived from the reference and sectoral approaches for CO_2 emissions from liquid fuels.

59. During the in-country review, the ERT noted that 1.5 Gg of heavy fuel oil allocated in the national energy balance under road, aviation and public transport was not accounted for in the emission estimates for the base year. The ERT considered that this fuel was very likely to have been used in stationary combustion (e.g. for heating airport premises or public services buildings). The ERT recommended that Croatia include emissions resulting from combustion of heavy fuel oil and report them under 1.A.4.a commercial/institutional. In response to the ERT's recommendations, after the in-country review Croatia provided CO_2, CH_4 and N_2O emission estimates from heavy fuel oil for this category, as well as emission estimates from small amounts of petroleum, diesel oil, light heating oil and petroleum coke that were used for the same purpose and had not been accounted for in the base year. The impact of the revision for this category on the energy sector totals was an increase of 0.1 per cent in the estimate of GHG emissions for the base year, from 22,881.80 Gg CO_2 eq to 22,910.69 Gg CO_2 eq.

Stationary combustion: gaseous fuels – CO_2

60. The CO_2 emissions from combustion of gaseous fuels have been identified as a key category, and the ERT therefore recommends that Croatia use a higher-tier method for its estimates under this category and determine a national weighted CO_2 EF for natural gas, taking into account the different compositions of imported and domestic natural gas.

61. The ERT noted that Croatia applied the EF of 29.5 t C/TJ to gas works gas, which has a similar carbon content to coke oven gas (13 t C/TJ), for its CO_2 estimates in the categories 1.A.2.f other (manufacturing industries and construction total for 1990–2000), 1.A.4.a commercial/institutional and 1.A.4.b residential. During the in-country review the ERT recommended that Croatia apply the correct IPCC default EF for gas works gas and revise its CO_2 emission estimates in the three categories where this mistake occurred. After the in-country review, in response to the ERT's recommendations, Croatia applied the appropriate EF for gas works gas, revised its CO_2 estimates for these categories and in addition corrected inconsistencies in the use of the CH_4 EFs for the complete time series.

62. The ERT noted that Croatia reported consumption of 102.5 million m^3 of natural gas under the category 1.A.4.a commercial/institutional. This includes 19.6 million m^3 of natural gas used in gas works as a feedstock for gas works gas production and 0.9 million m^3 of natural gas already accounted for under 1.A.1.c. manufacture of solid fuels and other energy industries. During the in-country review, the ERT recommended that Croatia remove these amounts of natural gas from its emission estimates in order to avoid double counting. After the in-country review, Croatia revised its CO_2, CH_4 and N_2O emission estimates from natural gas use accordingly.

63. The overall impact of the revised estimates for this category on the energy sector totals was a decrease of 0.4 per cent in the estimate of GHG emissions for the base year, from 22,881.80 Gg CO_2 eq to 22,782.74 Gg CO_2 eq. The impact for 2006 was a decrease of 0.1 per cent, from 22,548.37 Gg CO_2 eq to 22,525.87 Gg CO_2 eq.

Road transportation – CO_2 and N_2O

64. According to the NIR, the COPERT III model (tier 2/3 method) with COPERT III EFs for each fuel type was used to estimate CO_2, CH_4 and N_2O emissions from road transportation in the period from 1990 to 2006. The ERT noted that very little information on AD for road transportation is provided in the NIR. The EFs used are also not presented in the NIR. The ERT recommends that Croatia improve

the transparency of its reporting for this category and provide in the NIR of its next annual inventory submission information on the vehicle fleet (e.g. fuel type, age, type of catalysts used, etc.), EFs and other relevant parameters such as average distance travelled per vehicle type that were used as input to the COPERT III model.

Civil aviation – CO_2, CH_4 and N_2O

65. In the 2008 inventory submission, disaggregation of fuel consumption between domestic and international aviation and emission estimates were recalculated for 1990–1995 based on IEA data and following the recommendations of the previous review report. The NIR reports that data for international aviation bunkers were included separately for the first time in the national energy balances in 2004. However, no information is provided in the NIR about the methodology used for emission estimates under this category. Recalculations in the base year significantly increased the estimate of emissions from domestic aviation. The background information for these recalculations was not provided in the NIR.

66. During the in-country review, the ERT recommended that Croatia revise its emission estimates using the number of passengers travelled on domestic and international routes and average kilometres travelled per passenger on domestic and international routes, since these data are available from Croatia's national statistics, in particular for the base year. The ERT also recommended that Croatia use detailed information from aircraft carriers operating on domestic routes on fuel consumption and number of flights, and that it provide emissions estimates, including estimates for international aviation, in particular for recent years. In response to these recommendations, after the in-country review Croatia provided revised estimates of CO_2, CH_4 and N_2O emissions from domestic and international aviation. The overall impact of the revisions for this category on the energy sector totals was a decrease of 0.9 per cent for the base year, from 22,881.80 Gg CO_2 eq to 22,685.97 Gg CO_2 eq. The impact for 2006 was a decrease of 0.5 per cent, from 22,548.37 Gg CO_2 eq to 22,438.00 Gg CO_2 eq.

Non-key categories

Navigation – CO_2

67. Croatia has not reported any consumption of gasoline in the category 1.A.3.d navigation since 2004. The notation key not occurring ("NO") is used despite the fact that Croatia has an extensive fleet of pleasure boats and other boats that use gasoline. The ERT encourages Croatia to provide more information in its next annual inventory submission on gasoline consumption for navigation for the whole time series and estimate the corresponding GHG emissions as appropriate.

6. Industrial processes and solvent and other product use

Sector overview

68. In the base year (1990 for CO_2, CH_4 and N_2O and also for HFCs, PFCs and SF_6), the industrial processes sector accounted for 13.4 per cent (4,185 Gg CO_2 eq) of total GHG emissions. Emissions from this sector decreased by 7.9 per cent between the base year and 2006. A key driver for this trend is the end to aluminium production in 1991 in Croatia, causing a 100 per cent decrease in CO_2 emissions (111.37 Gg) and PFC emissions (936.56 Gg CO_2 eq) in the aluminium production category. Cement production was the most important category in 1990, contributing 25.9 per cent to total sectoral emissions, while aluminium production and ammonia production contributed 25.0 and 20.8 per cent, respectively. CO_2 is the dominant gas, contributing 57.8 per cent to total sector emissions, while the fluorinated gases (PFCs and SF_6), N_2O and CH_4 contributed 22.7, 19.2 and 0.4 per cent, respectively. The solvent and other product use sector contributed 0.3 per cent to total GHG emissions.

69. In general, Croatia has estimated emissions according to the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. A number of improvements were recommended by the ERT during the

in-country review, as explained in detail in the paragraphs below. Many of these were implemented by Croatia straight away during the in-country review (e.g. the revision of the N_2O EF for nitric acid production and the CO_2 EF for ammonia production).

70. The QA/QC activities implemented by Croatia were described to the ERT during the in-country review and are considered generally appropriate for the industrial processes sector. The ERT concluded that QC procedures should be extended by including plausibility checks of the data. The QA/QC activities are poorly documented in the NIR and in the calculation spreadsheets presented to the ERT. The ERT recommends that Croatia extend its QC procedures and improve the description of QA/QC activities for the industrial process categories in the NIR of its next annual inventory submission. In its comments to the draft review report Croatia stated that improvements to QA/QC activities for the industrial process categories will be implemented by finalizing the QA/QC Plan, as a component of the next annual inventory submission.

71. The original 2008 GHG inventory submission reported significant changes in emissions from the industrial processes and solvent and other product use sectors for 1990 and 2004 compared with the latest reviewed inventory submission (2006). These changes are mainly due to the inclusion of previously missing sources, such as CO_2 emissions from the non-energy use of fuels for all years of the time series and potential HFCs emissions in 1990 (included in national totals), and recalculation of CO_2 emissions from ammonia production for all years of the time series, as well as inclusion of indirect CO_2 emissions from solvent and other product use for all years of the time series. The ERT noted that not all these changes lead to improvements in the inventory of the industrial processes sector as they were not always performed in accordance with the Revised 1996 IPCC Guidelines (e.g. the estimate of potential HFC emissions from consumption of halocarbons and SF_6 (2.F) and CO_2 emissions from other – non-energy use of fuels (2.G)). The ERT therefore recommended that further revisions of these estimates be made (see paras. 86–89 and 90–91). The overall impact of the recalculations in the industrial processes sector as reported in the revised 2008 submission was a decrease in the estimate of emissions in 1990 by 20.41 Gg CO_2 eq (0.5 per cent) and an increase in the estimate of emissions in 2005 by 230.27 Gg CO_2 eq (6.7 per cent).

72. Croatia, in its 2008 submission, has addressed a number of the issues raised in the 2006 review report,[4] for example by developing a country-specific EF for cement production, filling gaps in the reporting of ferroalloys production and estimating CO_2 emissions from solvent and other product use. However, in a number of cases Croatia has not implemented the recommendations and the issues remain outstanding. For example, Croatia has not explained how time-series consistency is ensured in the estimates for limestone and dolomite use and soda ash use, or provided explanations for the calculation of actual emissions of HFCs and SF_6 and the calculation of N_2O emissions from solvent and other product use. In its comments to the draft review report Croatia stated that the NIR of the latest inventory submission (2009) provides explanations on data discrepancies and difficulties in data availability.

73. During the in-country review, the ERT found a double counting of CO_2 emissions from coke and coal used in ferroalloys production, an inconsistent CO_2 EF for natural gas used as feedstock and fuel in ammonia production and a wrong interpretation of non-energy use of fuels and associated CO_2 emissions. The ERT recommends that Croatia include consistency checks between the energy and industrial processes sectors in its QA/QC activities to avoid such inconsistencies in its next annual inventory submission. In its comments to the draft review report Croatia stated that the inventory team will strengthen its efforts to improve QA/QC activities and procedures to avoid inconsistencies in emission calculations in cross-sectoral activities (energy sector and industrial processes).

74. In response to the potential problems identified by the ERT, after the in-country review Croatia submitted revised emission estimates for a number of categories, namely: cement production, ammonia

[4] FCCC/ARR/2006/HRV.

production, nitric acid production, ferroalloys production, consumption of halocarbons and SF_6 and non-energy use of fuels. It also provided additional estimates of SF_6 emissions from electrical equipment. These revisions have resulted in a 9.2 per cent decrease in the estimate of emissions in the industrial process sector for the base year, from 4,608.89 Gg CO_2 eq to 4,185.46 Gg CO_2 eq. The impact for 2006 was a decrease in the estimated emissions of 3.7 per cent, from 4,004.40 Gg CO_2 eq to 3,855.34 Gg CO_2 eq. These revised estimates are addressed in more detail in the paragraphs below under each corresponding key category. In addition, as up-to-date data became available, Croatia revised its CO_2 emission estimates in the limestone and dolomite use category for 1992 and 1996 and for soda ash use for 1997–2003, as well as corrected AD errors and revised CO_2 emissions for the period 1990–1994 for iron and steel production (steel) (resulting in a decrease in the estimate for 1990 of 0.08 Gg CO_2 eq, or 9.6 per cent).

Key categories

Cement production – CO_2

75. Croatia uses a tier 2 approach based on plant-specific data to calculate CO_2 emissions from cement production. The ERT noted that the EF calculation is based on calcium oxide (CaO) and magnesium oxide (MgO) of clinker produced and that this EF is subsequently corrected by subtracting the difference in CaO and MgO content between the raw material and clinker. During the in-country review, the ERT was informed that the CaO and MgO content of the raw material is all carbonate, so this correction it is not in line with the IPCC good practice guidance. During the in-country review the ERT recommended that Croatia revise its emissions estimates from cement production at the plant-specific level and provide documentation on the emissions, EFs and assumptions used for its estimates. After the in-country review, Croatia followed this recommendation and revised its emission estimates from this category and provided all necessary background information. As a result, its estimate for CO_2 emissions from cement production in the base year increased by 1.6 per cent, from 1,069.06 Gg to 1,085.79 Gg, and the estimates for 2006 increased by 1.0 per cent, from 1,571.98 Gg to 1,588.04 Gg.

Nitric acid production – N_2O

76. For its estimates of N_2O emissions from nitric acid (HNO_3) production, Croatia uses the default EF of 9 kg N_2O/t HNO_3 taken from the IPCC good practice guidance, which is equal to the mean of the range given for European designed, dual-pressure, double absorption plants. The sole nitric acid producing company in Croatia does not continuously measure N_2O emissions; however, data from a measurement in 1997 are available. The measurement leads to an EF of 7.8 kg N_2O/t HNO_3.

77. Information on technology and relevant parameters was provided to the ERT during the in-country review. The ERT came to the conclusion that the use of a plant-specific EF is in accordance with the IPCC good practice guidance and also corresponds to ranges of EFs provided in published literature[5] for the reported parameters.

78. During the in-country review the ERT recommended that Croatia use the plant-specific EF of 7.8 kg N_2O/t HNO_3 and revise its N_2O emissions accordingly. After the in-country review, Croatia followed this recommendation and provided revised estimates for nitric acid production using the recommended EF. As a result the revised N_2O emissions estimate for the base year were lower by 13.3 per cent, resulting in a decrease from 927.56 Gg CO_2 eq to 803.89 Gg CO_2 eq. The impact for 2006 was a decrease in the estimate of 13.3 per cent, from 774.48 Gg CO_2 eq to 671.21 Gg CO_2 eq.

[5] European Commission. 2007. *Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilisers*.

Ammonia production – CO_2

79. To estimate CO_2 emissions from ammonia production, Croatia uses the method based on natural gas consumption, applying a country-specific EF derived from measurements of natural gas composition. Country-specific CO_2 EFs are calculated for each year of the time series. This calculation is based on the percentage volume of the different components in natural gas. Subsequently, in the calculation Croatia applies the molar volume of an ideal gas (V°) for deriving the EF expressed in kg C/m^3 of natural gas. The V° is 22.415 l for normal conditions of pressure and temperature (1 atm, 0 °C). Croatia did not provide documentation on which standard was used for the measurements and whether the derived EFs were corrected for temperature.

80. The ERT noted that the country-specific EFs are high compared with those of other countries and could lead to an overestimate in emissions. During the in-country review the ERT recommended that Croatia collect the information on the standard used for the measurements and confirm or revise the estimation of the country-specific EFs accordingly. The ERT further recommended that Croatia apply the derived EFs to the total amount of natural gas used for ammonia production (feedstock and fuel) to calculate CO_2 emissions.

81. After the in-country review, in response to these recommendations, Croatia provided revised estimates for this category using an EF that was corrected for temperature and applied to the total amount of natural gas used in the process. The ERT appreciates the additional efforts made by Croatia to revise its GHG estimates for this category. It concluded that these revised country-specific EFs and the associated documentation were in accordance with the IPCC good practice guidance and considered them and the revised estimates appropriate. The overall impact of the revisions was an increase in the estimated GHG emissions of 1.1 per cent in the base year, from 862.61 Gg CO_2 eq to 871.83 Gg CO_2 eq. The impact for 2006 was a decrease in the estimated emissions by 0.9 per cent, from 879.49 Gg CO_2 eq to 871.24 Gg CO_2 eq.

Ferroalloys production – CO_2

82. Croatia used a method based on production of ferroalloys and default EFs from the Revised 1996 IPCC Guidelines. During the in-country review the ERT found that data for implementing a more accurate IPCC methodology based on consumption of reducing agents are available in the country, and concluded that applying a higher tier would also allow Croatia to avoid possible double counting of CO_2 emissions that may be already accounted for in the energy sector. The ERT recommended that Croatia use the most accurate methodology for calculation of CO_2 emissions from ferroalloys production, including only those fuels and reducing agents that are not accounted for in the energy sector and using the EFs consistently with those used in the energy sector.

83. After the in-country review, in response to the recommendation of the ERT, Croatia provided revised estimates for ferroalloys production. The impact of this revision is a decrease in the estimate of CO_2 emissions of 38.9 per cent for the base year, from 194.53 Gg to 118.84 Gg. The revision had no impact on the estimate of 2006 emissions, because ferroalloys production no longer occurs in the country. The ERT appreciates the efforts made by Croatia to revise the estimates and concluded that the revised method used and the associated estimates are appropriate and in accordance with the Revised 1996 IPCC Guidelines.

Aluminium production – PFCs

84. Croatia uses a tier 1 method based on aluminium production and IPCC default EFs (1.70 kg CF_4/t aluminium and 0.17 kg C_2F_6/t aluminium) for side-worked pre-baked (SWPB) electrodes to calculate PFC emissions from aluminium production. The IPCC good practice guidance provides a wide range of default EFs, depending on the technology used. During the in-country review, Croatia provided documentation on the type of electrodes used (pre-baked) in the process, but it was not able to provide

documentation on the technology used (whether it is side-worked or centre-worked). The ERT concluded that the application of the EF for SWPB electrodes was not justified sufficiently. Therefore, the ERT recommended that Croatia provide the necessary documentation on the technology used for aluminium production in the country and either confirm or revise the EF applied.

85. After the in-country review, in response to this recommendation, Croatia provided the necessary documentation and detailed additional background information to justify the applied EFs. The ERT recommends that Croatia provide this information in the NIR of its next annual inventory submission, in order to increase transparency.

Consumption of halocarbons and SF_6 – HFCs and SF_6

86. Croatia reported potential emissions of HFCs for the years 1990–2006, but no actual emissions. The ERT noted that data are provided by the MEPPPC and are based on import and export figures reported from industry. The ERT also noted that data on HFCs imports and exports are available from 1995 for HFC-134a, from 1996 for HFC–125 and HFC-143a, and from 2000 for HFC–32 onwards. Croatia used the extrapolation method to calculate 1990 emissions for all HFCs used in the country.

87. According to the IPCC good practice guidance, when detailed estimates have not been prepared for the base year or the most recent year in the inventory, it may be necessary to extrapolate estimates from the closest detailed estimate. Nevertheless, trend extrapolation should not be used if the emission growth trend is not constant over time, which is the case for most of the HFCs and was the case for Croatia. Extrapolation should also not be used over long periods of time without detailed checks at intervals to confirm the continued validity of the trend.

88. During the in-country review, the ERT recommended that Croatia change its method for estimating HFCs emissions in 1990, from the extrapolation method used to cluster analysis of emissions from countries with similar circumstances (e.g. Czech Republic, Hungary, Slovakia and Slovenia). This analysis showed that in these countries no consumption of HFCs occurred in 1990, and consequently the ERT recommended that Croatia remove its HFCs emission estimates from the base year. In addition, the ERT noted that SF_6 emissions (actual and potential) are not reported for the whole time series owing to lack of information, which could lead to underestimation of emissions for the whole time series.

89. After the in-country review, Croatia followed the recommendation of the ERT and applied the cluster analysis methodology for its estimates of HFCs in this category. The impact of the revisions was a decrease in the estimate of HFC emissions by 100 per cent in the base year, from 52.90 Gg CO_2 eq to 0 Gg CO_2 eq. The revisions had no impact on the 2006 estimate of HFC emissions. In addition, Croatia provided actual SF_6 emission estimates for the electrical equipment subcategory, amounting 11.01 Gg CO_2 eq in the base year and 16.43 Gg CO_2 eq in 2006. The overall impact of the revisions in this category was a decrease in the estimate of GHG emissions of 79.2 per cent in the base year, from 52.90 Gg CO_2 eq to 11.01 Gg CO_2 eq, and an increase of 3.8 per cent in 2006, from 430.68 Gg CO_2 eq to 447.11 Gg CO_2 eq. The ERT recommends that Croatia make the necessary efforts to estimate actual and potential emissions from HFCs and other fluorinated gases for the whole time series in its next annual inventory submission, in accordance with the IPCC good practice guidance. In its comments to the draft review report Croatia stated that it expects to have consumption data on each individual species of HFC available in the future to be able to use a tier 2 method. Croatia also informed the review team that this information has been provided in the NIR of its 2009 submission.

Non-key categories

Non-energy use of fuels – CO_2

90. To estimate CO_2 emissions from non-energy use of fuels reported under this category, Croatia used the IPCC default parameters for the fraction of oxidized carbon used for calculations in the

reference approach of the energy sector. AD on feedstocks and non-energy use of fuels in different processes are available from the country's energy balance. However, the ERT notes that CO_2 is emitted only when the products or their by-products of these processes are oxidized. During the in-country review, the ERT found that Croatia has no documented information on the possible oxidation or use of these fuels (lubricants and naphtha in 1990 and lubricants, ethane and other derivatives in 2006) in industrial processes, with the exception of natural gas, which is used as a feedstock for production of ammonia. The ERT also noted that "CO_2 emissions from the non-energy use of fuels" is not an identified category in the industrial processes sector in accordance with the Revised 1996 IPCC Guidelines. The ERT therefore recommended that Croatia continue reporting the non-energy use of fuels as carbon stored in the reference approach of the energy sector, provide documented information on the possible oxidation or use of these fuels in industrial processes, or remove emissions from non-energy use of fuels from the industrial processes sector and revise its CO_2 emission estimates accordingly.

91. After the in-country review, in the absence of adequate background information, Croatia decided to follow the recommendation of the ERT and removed these emissions from the inventory. The overall impact of the exclusion of emissions from oxidation of fuels for non-energy use was a decrease in the estimate of CO_2 emissions in this category of 100 per cent in the base year, from 208.05 Gg CO_2 to 0 Gg CO_2 and a decrease of 100 per cent in the estimate for 2006, from 70.04 to 0 Gg CO_2.

Solvent and other product use – CO_2 and N_2O

92. Croatia estimates CO_2 emissions from solvent and other product use using its non-methane volatile organic compounds (NMVOC) inventory and a fixed assumed ratio of carbon to NMVOC of 0.8. As these sources make up only a small component of Croatia's emissions inventory, and because more important improvements to the inventory are required elsewhere, this approach is considered acceptable by the ERT. During the in-country review, Croatia informed the ERT about the basic assumptions behind the assumed ratio. The ERT recommends that Croatia include documentation on the assumptions made for this country-specific factor in the NIR of its next annual inventory submission. In its comments to the draft review report Croatia stated that this information has been included in the NIR of its 2009 submission.

93. Estimates of N_2O emissions from solvent and other product use are not reported in Croatia's inventory. During the in-country review the ERT recommended that Croatia collect relevant data and report these emissions. After the in-country review, Croatia informed the ERT that there is no possibility for the time being to collect the data required. The ERT recommends that Croatia make the necessary efforts to estimate N_2O emissions from this category in its next annual inventory submission. In its comments to the draft review report Croatia stated that this information has been included in the NIR of its 2009 submission.

7. Agriculture

Sector overview

94. In the base year (1990 for CO_2, CH_4 and N_2O and also for HFCs, PFCs and SF_6), the agriculture sector accounted for 4,328.40 Gg CO_2 eq, or 13.8 per cent, of the total GHG emissions. Emissions from the sector decreased by 20.9 per cent between 1990 and 2006. The key driver for the fall in emissions is the decrease in the cattle population since 1991.

95. In the base year, 57.6 per cent of the emissions came from agricultural soils, followed by 28.4 per cent from enteric fermentation and 14.0 per cent from manure management.

96. The improvements made by Croatia in the 2008 inventory submission reduced the uncertainty related to AD used for the estimates. It now uses only one data source for livestock population and mineral fertilizer use. Limited information related to AD is included in the NIR, and in some cases the

sources of this information are unclear. For example, the NIR does not provide information on which crops are included in estimates of direct soil emissions from crop residues and nitrogen (N)-fixing crops, or which dry matter fractions were used for each crop. The ERT recommends that Croatia include in the NIR of its next inventory submission clear and detailed information on AD (e.g. tables with time-series information on livestock population, mineral fertilizer use and crops cultivated in the country) and explanations for the trends and annual fluctuations in the data. In its comments to the draft review report Croatia stated that much of the required information has been included in the NIR of its 2009 submission.

97. Croatia uses tier 1 methods for all categories in the agriculture sector for the base year, even though the ERT identified available national information which would allow the use of a tier 2 method, including the base year. The ERT noted that additional efforts are needed to estimate the emissions in this sector more accurately, in particular by increasing the consideration of national circumstances.

98. In response to the potential problems identified by the ERT, after the in-country review Croatia submitted revised emission estimates for CH_4 emissions from 4.A enteric fermentation (see para. 100) and N_2O emissions from 4.D agricultural soils (see para. 105), and in addition provided revised estimates for CH_4 and N_2O emissions from 4.B manure management (see para. 106). These revisions have resulted in a 5.0 per cent decrease in the estimate of emissions for the agriculture sector in the base year, from 4,557.59 Gg CO_2 eq to 4,328.40 Gg CO_2 eq. The impact for 2006 was a decrease in the estimated emissions of 2.4 per cent, from 3,507.50 Gg CO_2 eq to 3,422.86 Gg CO_2 eq.

Key categories

Enteric fermentation – CH_4

99. In the 2008 submission, Croatia used a tier 1 method to estimate emissions from enteric fermentation from cattle. In the calculations the default CH_4 EFs for Eastern Europe (81 kg/head/year for dairy cattle and 56 kg/head/year for non-dairy cattle) provided in the Revised 1996 IPCC Guidelines were used. The default CH_4 EF for dairy cattle is calculated with an average of milk yield of 2,250 kg/head/year. During the in-country review the ERT found information on milk yield for Croatia from 1992 to 2007 from the Food and Agriculture Organization of the United Nations (FAO). The data show that the average milk yield in 1992 was 1,850 kg/head/year. For this reason, the use of the default EF from Eastern Europe for 1990 may lead to the emissions in the base year being overestimated. The ERT therefore recommended that Croatia apply a tier 2 method for dairy cattle, using country-specific information, if available, or FAO information for the parameters needed in the calculations. The ERT also considered that some of the additional information required for the tier 2 method could be based on expert judgement, if necessary. The ERT recommended that Croatia apply the tier 2 method for non-dairy cattle in the same way.

100. After the in-country review, following the recommendations of the ERT and taking into account updated data on its cattle population, Croatia revised its estimates of CH_4 emissions from enteric fermentation for dairy cattle and non-dairy cattle using the tier 2 method of the IPCC good practice guidance. The overall impact of these revisions was a decrease in the estimate of CH_4 emissions in the base year of 10.4 per cent, from 1,372.14 Gg CO_2 eq to 1,229.36 Gg CO_2 eq. The impact for 2006 was a decrease in the estimated emissions of 1.8 per cent, from 835.21 Gg CO_2 eq to 820.40 Gg CO_2 eq.

Agricultural soils – N_2O

101. During the in-country review, the ERT noted that the EFs by fertilizer type that Croatia uses for reporting nitrogen oxides (NO_X) and ammonia (NH_3) emissions under the Convention on Long-Range Transboundary Air Pollution (LRTAP) are more detailed than the EFs for NO_X and NH_3 emissions that are used to estimate the direct and indirect N_2O emissions from synthetic fertilizer use for the whole time series. Therefore, the ERT recommended that Croatia use the available detailed EFs by fertilizer type for estimating these emissions, and that it also use country-specific data on fertilizer use for the estimates.

After the in-country review, Croatia followed these recommendations and provided revised estimates for direct and indirect N_2O emissions from synthetic fertilizer use. The impact of these revisions for the synthetic fertilizers subcategory was an increase in the estimate of N_2O emissions in the base year from 1.90 Gg to 1.99 Gg, and an increase in the 2006 estimate from 1.98 Gg to 2.06 Gg. The impact of these revisions for the indirect emissions subcategory was a decrease in the estimate of N_2O emissions in the base year from 3.08 Gg to 3.00 Gg and a decrease from 2.62 Gg to 2.55 Gg for 2006.

102. To estimate N_2O emissions from N-fixing crops and crop residue subcategories, Croatia used the default parameters from the Revised 1996 IPCC Guidelines, including the residue/crop product ratio ($Res_{BF}/Crop_{BF}$), to estimate the amount of crop residue returned to soil and the amount of nitrogen fixed by N-fixing crops for the base year and the whole time series. Updated default parameters are provided in the IPCC good practice guidance for the different types of crops considered by Croatia in its estimates. These default parameters are lower than the parameters used. During the in-country review, the ERT recommended that Croatia use the updated default parameters from the IPCC good practice guidance and provide disaggregated information on crops considered in its estimates. In addition, during the in-country review, the ERT identified an inconsistency in the base year information provided in the additional information table of CRF table 4.D between the $Frac_{BURN}$ value (10 per cent) for direct N_2O emissions from agricultural soils and the use of "NO" in CRF table 4.F for field burning of agricultural residues for all crops and recommended that Croatia clarify this inconsistency in reporting. After the in-country review, Croatia informed the ERT that field burning does not occur in the country, and changed the value of $Frac_{BURN}$ to 0 per cent.

103. After the in-country review, following the recommendations of the ERT mentioned in paragraph 102 above, Croatia revised its N_2O estimates for these two categories. The impact of these revisions for the N-fixing crops subcategory was an increase in the estimate of N_2O emissions in the base year from 0.10 Gg to 0.34 Gg and an increase from 0.21 Gg to 0.36 Gg for 2006. The impact of the revisions for the crop residue subcategory was a decrease in the estimate of N_2O emissions in the base year from 1.16 Gg to 0.40 Gg and a decrease from 1.04 Gg to 0.70 Gg for 2006.

104. The default EF (5 kg N_2O-N/ha/year) used to estimate direct N_2O emissions for organic soils (histosols) is taken from the Revised 1996 IPCC Guidelines. During the in-country review, the ERT recommended that Croatia use the updated default EF (8 kg N_2O-N/ha/year) provided in the IPCC good practice guidance. After the in-country review, following the recommendations of the ERT, Croatia revised its N_2O emission estimates for the cultivation of histosols subcategory, from 0.01 Gg to 0.02 Gg in the base year and from 0.01 Gg to 0.02 Gg in 2006.

105. The overall impact of the revisions indicated in paragraphs 101–104 above for the agricultural soils category was a decrease in the estimate of N_2O emissions in the base year of 3.2 per cent, from 2,575.50 Gg CO_2 eq to 2,491.86 Gg CO_2 eq. The impact for 2006 was a decrease of 2.7 per cent, from 2,278.98 Gg CO_2 eq to 2,217.46 Gg CO_2 eq.

Non-key categories

Manure management – CH_4 and N_2O

106. During the in-country review, the ERT noted that Croatia used an incorrect default CH_4 EF for horses (1.09 kg/head/year) for its estimates under this category for the complete time series, and recommended that Croatia use the correct default EF (1.1 kg/head/year). After the in-country review, Croatia followed this recommendation and revised its CH_4 estimates for the horses subcategory. In addition, Croatia revised its CH_4 and N_2O estimates for the manure management category to reflect the availability of updated and more detailed data on the cattle population for the period 1990–2006. The overall impact of these revisions for the manure management category was a decrease in the estimate of CH_4 and N_2O emissions in the base year of 0.5 per cent, from 609.95 Gg CO_2 eq to 607.18 Gg CO_2 eq. The impact for 2006 was a decrease by 2.1 per cent, from 393.30 Gg CO_2 eq to 385.00 Gg CO_2 eq.

8. Land use, land-use change and forestry

Sector overview

107. In 1990 the LULUCF sector was a net sink of 4,184.92 Gg CO_2 eq, offsetting 13.4 per cent of the total GHG emissions. In 2006 this sector remained a net sink, of 7,490.29 Gg CO_2 eq, offsetting 24.5 per cent of total GHG emissions. Removals from the sector increased by 79.0 per cent between 1990 and 2006.

108. In the 2008 inventory submission, the CO_2 emissions and removals from the sector were recalculated for 1990 owing to the availability of revised estimates of AD for forest area and the annual net carbon increment. The estimate of net CO_2 removals for the LULUCF sector in 1990 that was reported in the 2007 submission, 6,281.22 Gg CO_2 eq, has been reduced to 4,184.93 Gg CO_2 eq in the 2008 submission (a 33.4 per cent decrease). The NIR does not provide adequate information on the reasons for the reported changes in AD and changes in the methods for estimating the AD on forest area. The ERT recommends that Croatia provide rationale and explanations for the new AD in the NIR of its next annual inventory submission.

109. Regarding completeness, CO_2 emissions and removals are reported by Croatia only for the forest land remaining forest land category. The ERT strongly recommends that Croatia also estimate and report emissions and removals for land converted to forest land in its next annual inventory submission, since afforestation is reported to have occurred in Croatia during 1990. Emissions and removals of CO_2 in cropland, grassland, wetland, settlements and other land categories are reported as "NE" and "NO", and CO_2 and non-CO_2 emissions from wildfires under cropland, grassland and wetlands are reported as "NE". The ERT recommends that Croatia estimate and report GHG emissions and removals for all land categories in its next annual inventory submission. To enhance the completeness and transparency of the NIR of its next annual inventory submission, the ERT further recommends that Croatia provide information on land-use pattern data, including area under different land-use categories during the inventory year, along with a land-use change matrix that incorporates the areas subject to change from one land category to another since 1990. The ERT encourages Croatia to provide explanations and clarifications in the documentation boxes of the CRF tables, as this is good practice.

110. The NIR states that QA/QC procedures have been adopted for the GHG estimates of the sector for all years of the time series, including 1990. However, the QC procedures for AD are not described. The ERT recommends that Croatia adopt QC procedures for AD collection procedures and include descriptions of these procedures in the NIR of its next annual inventory submission.

111. The ERT commends Croatia for modifying the NIR, CRF tables and estimates of GHGs for the LULUCF sector in response to recommendations of the previous review report, in particular the use of default values from the IPCC good practice guidance for LULUCF instead of those from the Revised 1996 IPCC Guidelines, the reporting of CO_2 emissions from biomass burning and the inclusion of a definition of forests in the NIR. These changes were incorporated in the 2007 submission and remain in the 2008 submission.

112. Uncertainty estimates are provided in the NIR; however, no further explanations for the methods used to arrive at these estimates are provided. The ERT recommends that Croatia rectify this and provide a description of methods adopted for estimating the uncertainty values for the LULUCF sector in its next annual inventory submission.

Key categories

Forest land remaining forest land – CO_2

113. Even though forest land remaining forest land is a key category, the carbon stock changes for this category are estimated using tier 1 methods. For the estimates, country-specific data on the average annual increment in net carbon are used, whereas all other EFs or parameters are taken from the IPCC good practice guidance for LULUCF. The ERT recommends that Croatia adopt a higher tier method for its estimates in forest land remaining forest land, since it is a key category. The CRF table 5.A reports changes in carbon stocks only for the living biomass carbon pool. The ERT recommends that Croatia also report changes in dead organic matter and soil carbon stocks. Similarly, areas with degraded forest vegetation are not included in the inventory calculations; the ERT recommends inclusion of carbon gains and losses for these lands also. As explained by the Croatian experts during the in-country review, if these degraded forest vegetation lands satisfy the definition of forest, they should be reported under the category forest land. The ERT recommends that Croatia make all the necessary efforts to implement these improvements for this category in its next annual inventory submission.

114. The rationale for dividing Croatia's forest into 50 per cent coniferous and 50 per cent deciduous forest is not clearly explained in the NIR, even though detailed stratification according to forest type is available in the country, as explained to the ERT during the review. The calculation of changes in carbon stocks is not reported in a disaggregated manner for coniferous and deciduous forests in CRF table 5.A, even though the biomass carbon increment is different. The ERT recommends that Croatia use the country-specific or nationally derived stratification forest area for the inventory estimates and that Croatia improve the documentation in the NIR and the CRF tables accordingly.

115. The area subject to wildfires is reported as 3,805 ha in CRF table 5(V). Biomass burning is reported for forest land remaining forest land using the tier 1 approach. The ERT recommends that Croatia report the source of data on the amount of available fuelwood for burning in the NIR of its next annual inventory submission.

9. Waste

Sector overview

116. In the base year (1990 for CO_2, CH_4 and N_2O and also for HFCs, PFCs and SF_6), emissions from the waste sector amounted to 578.72 Gg CO_2 eq, contributing 1.8 per cent to total GHG emissions. The total emissions from this sector decreased by 20.4 per cent between the base year and 2006. The following categories were reported in the base year and 2006: solid waste disposal on land, domestic wastewater handling, human sewage and waste incineration. Wastewater handling is the major category in the waste sector, contributing 61.8 per cent of the sector emissions in the base year. In 2006, solid waste disposal on land produced most of the emissions in the sector (59.8 per cent).

117. Owing to improvements in data collection, CO_2 emissions from waste incineration and CH_4 emissions from domestic and commercial wastewater are both reported for the whole time series in the 2008 submission, whereas in the 2007 submission the emissions in the base year from these two categories were not reported. Emissions from industrial wastewater handling and sludge treatment were not estimated for the whole time series in either submission. The ERT recommends that Croatia make all the necessary efforts to report emission estimates for these categories in its next annual inventory submission.

118. In 2006 and 2007, regulations on waste management were adopted in Croatia. As a result, data collection has been improved and CH_4 emissions from solid waste disposal sites (SWDS) were recalculated for the years 2001–2006. These recalculations did not impact the estimate of base-year emissions.

119. The use of notation keys in the CRF tables is complete and consistent with the information in the NIR. Uncertainty estimation is consistent with the tier 1 method of the IPCC good practice guidance.

120. In response to the potential problems identified by the ERT, after the in-country review, Croatia submitted revised estimates for CH_4 emissions from 6.B.1 industrial wastewater (see para. 125).

Key categories

Solid waste disposal on land – CH_4

121. CH_4 emissions from SWDS is the only key category (both level and trend) in the waste sector identified in the 2008 inventory submission. In the base year, emissions of CH_4 from SWDS amounted to 221.21 Gg CO_2 eq. CH_4 emissions from this category accounted for 0.7 per cent of total GHG emissions in the base year and 1.4 per cent in 2006, and increased by 88.4 per cent during this period. The estimate covers managed and unmanaged (deep and shallow) SWDS.

122. Croatia uses the tier 2 method to estimate methane emission from SWDS, with country-specific AD and default values of EFs. Owing to results of a survey of SWDS characteristics, the proportion in the total of SWDS types used in the country was changed for the period 2001–2006 in both the 2007 and 2008 submissions. The methane correction factors (MCF) in the base year and 2006 are 0.606 and 0.856, respectively. This change over time is due to shifting of waste management practices from a wide use of unmanaged SWDS to wide use of managed SWDS. The quantity of waste collected in the base year and 2006 is taken from different data sources, and for the missing years interpolation is used. The ERT recommends that Croatia make the necessary efforts to collect AD for the missing years of the time series and explain how the consistency in emission estimates is ensured in the NIR of its next annual inventory submission. In its comments to the draft review report Croatia stated that some corrections to the emission estimates are included in its 2009 inventory submission.

123. Gas recovery did not occur in SWDS in the base year, but is reported for 2005 and 2006. Owing to an incorrect calculation, the amount recovered was overestimated. The ERT recommends that Croatia make the correction and revise its estimates in its next annual inventory submission, since this leads to underestimation of CH_4 emissions in 2005 and 2006. The mistake does not affect the base year emissions. In its comments to the draft review report Croatia stated that some corrections to the emission estimates are included in its 2009 inventory submission.

Non-key categories

Wastewater handling – CH_4 and N_2O

124. Emissions from wastewater handling are estimated using the tier 1 method and default values given in the Revised 1996 IPCC Guidelines. In the absence of AD, values from available years have been extrapolated to other years of the time series (see para. 126).

125. CH_4 and N_2O emissions from industrial wastewater are not reported for the whole time series. During the in-country review, the ERT recommended that Croatia use data from the Statistical Yearbook of the Republic of Croatia and follow the decision tree of the IPCC good practice guidance to estimate the CH_4 emissions from major industrial wastewater handling activities and implement estimates using IPCC default values and expert judgement according to this guidance. After the in-country review, Croatia provided estimates for the CH_4 emissions from industrial wastewater for manufacture of food products and beverages, manufacture of textiles, manufacture of pulp, paper and paper products and manufacture of chemicals and chemical products, in line with the recommendations of the ERT. The overall impact of the estimates for this category was an increase in the estimate of CH_4 emissions in the base year of 101.3 per cent, from 177.55 Gg CO_2 eq to 357.42 Gg CO_2 eq. The impact for 2006 was an increase of 60.3 per cent, from 174.39 Gg CO_2 eq to 279.63 Gg CO_2 eq.

126. Emissions of N_2O from human sewage in 2005 and 2006 were lower than in previous years. Croatia used protein intake values (PIVs) from FAO for 1992–2003 to estimate these emissions and extrapolating the PIVs for 2002 and 2003 estimated emissions for 2004–2006. This led to a declining trend for the last three years of the time series. The ERT recommends that Croatia, in its next annual inventory submission, estimate the PIVs for 2004–2006 and beyond by extrapolating the values for the whole time series from 1992 to 2003 if no updated data are available. The estimate of the emissions in the base year is based on extrapolation of the data for the years 1992–1994, producing a reasonable estimate for the base year.

Waste incineration – CO_2

127. CO_2 emissions from this category have been stable since the base year. The whole time series has been estimated for the first time in the 2008 submission, using improved information from questionnaires conducted by CEA. The estimates use the IPCC default values and interpolation of clinical waste generation rates to obtain the amount of waste incinerated.

C. Calculation of the assigned amount

128. Croatia's base year is 1990 and the Party has also chosen 1990 as its base year for HFCs, PFCs and SF_6. Croatia's quantified emission reduction commitment is 95 per cent as included in Annex B to the Kyoto Protocol.

129. Based on Croatia's base year emissions (32,527.325 Gg CO_2 eq) and its Kyoto Protocol quantified emission reduction commitment (95 per cent), in its initial report the Party originally calculated its assigned amount to be 171,129,792 t CO_2 eq. In the calculation of its assigned amount, Croatia has added 3.5 million t CO_2 eq to its base year level following decision 7/CP.12. This decision states that Croatia shall be allowed to add this amount 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 for implementation of its commitments under Article 4, paragraph 2, of the Convention. The ERT considers that the addition of 3.5 million t CO_2 eq to the base year level for the calculation of Croatia's assigned amount is not in accordance with Article 3, paragraphs 7 and 8, of the Kyoto Protocol and the modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol (decision 13/CMP.1).

130. In response to issues related to the inventory identified during the in-country review and in accordance with the recommendations of the ERT, Croatia submitted revised estimates of its base year emissions (31,321.790 Gg CO_2 eq), which resulted in a revised calculation of the assigned amount. Based on the revised base year emissions, its Kyoto Protocol target and decision 7/CP.12, Croatia calculates its assigned amount to be 165,403,503 t CO_2 eq. The ERT disagrees with this figure because, as noted in paragraph 129 above, the addition of 3.5 million t CO_2 eq to the base year is not in accordance with Article 3, paragraphs 7 and 8, of the Kyoto Protocol and the modalities for the accounting of assigned amounts under Article 7, paragraph 4 of the Kyoto Protocol. The ERT calculates Croatia's assigned amount to be 148,778,503 t CO_2 eq, based on the revised base year emissions and the Party's Kyoto Protocol target.

D. Calculation of the commitment period reserve

131. In its initial report, based on its total GHG emissions for the reviewed 2004 inventory included in the 2006 submission – 29,431.859 Gg CO_2 eq – Croatia originally calculated its commitment period reserve to be 147,159,297 t CO_2 eq. The ERT disagreed with this figure, because the calculation of the required level of the commitment period reserve was not in accordance with paragraph 6 of the annex to decision 11/CMP.1, taking into account that the most recently reviewed inventory is the 2006 inventory included in the 2008 submission, which originally amounted to 30,833.982 Gg CO_2 eq. This value caused the calculation of the commitment period reserve to be based on the assigned amount calculation

and not on the most recently reviewed inventory (the 2006 revised inventory estimate amounts to 30,573.312 Gg CO_2 eq).

132. The revised estimate of Croatia's base year emissions and revised calculation of the assigned amount, submitted in response to issues related to the inventory identified during the in-country review, resulted in a revised calculation of the commitment period reserve. Using the revised calculation of the assigned amount (based on the base year revised inventory estimate of 31,321.790 Gg CO_2 eq) and decision 7/CP.12, Croatia calculates its commitment period reserve to be 148,863,153 t CO_2 eq. The ERT disagrees with this figure because, as discussed above, the addition of 3.5 million t CO_2 eq to the base year level for the calculation of Croatia's assigned amount is not in accordance with Article 3, paragraphs 7 and 8, of the Kyoto Protocol and the modalities for the accounting of assigned amounts under Article 7, paragraph 4 of the Kyoto Protocol and consequently the calculation of the commitment period reserve is not in accordance with paragraph 6 of the annex to decision 11/CMP.1. The ERT calculates Croatia's commitment period reserve to be 133,900,653 tonnes CO_2 eq, based on its calculation of the assigned amount.

E. National registry

133. Croatia has provided most of the information on the national registry system required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1). The information provided is transparent and in accordance with the requirements of these reporting guidelines.

134. Table 5 summarizes the information on the mandatory reporting elements on the national registry system, as stipulated by decision 15/CMP.1, which describes how its national system performs functions defined in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1.

Table 5. Summary of information on the national registry system

Reporting element	Provided in the initial report	Comments
Registry administrator		
Name and contact information	Yes	
Cooperation with other Parties in a consolidated system		
Names of other Parties with which Croatia cooperates, or clarification that no such cooperation exists	Yes	Croatia does not cooperate with other Parties in maintaining a consolidated system of national registries
Database structure and capacity of the national registry		
Description of the database structure	Yes	
Description of the capacity of the national registry	Yes	
Conformity with data exchange standards (DES)		
Description of how the national registry conforms to the technical DES between registry systems	Yes	Covered in the independent assessment report (IAR)[a]
Procedures for minimizing and handling of discrepancies		
Description of the procedures employed in the national registry to minimize discrepancies in the transaction of Kyoto Protocol units	Yes	
Description of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transaction	Yes	
Prevention of unauthorized manipulations and operator error		
An overview of security measures employed in the national registry to prevent unauthorized manipulations and to prevent operator error	Yes	Covered in the IAR
An overview of how these measures are kept up to date	No	Covered in the IAR
User interface of the national registry		
A list of the information publicly accessible by means of the user interface to the national registry	Yes	Covered in the IAR
The Internet address of the interface to Croatia's national registry	Yes	http://www.azo.hr/ghgregistry
Integrity of data storage and recovery		
A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster	Yes	Covered in the IAR
Test results		
The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems	No	Test results covered in the IAR

[a] Pursuant to decision 16/CP.10, the administrator of the international transaction log (ITL), once registry systems become operational, is requested to facilitate an interactive exercise, including with experts from Parties to the Kyoto Protocol not included in Annex I to the Convention, demonstrating the functioning of the ITL with other registry systems. The results of this exercise will be included in an independent assessment report (IAR). They will also be included in the annual report of the ITL administrator to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol. The IAR for Croatia was forwarded to the expert review team on 30 April 2009.

135. During the in-country review, the ERT was provided with additional and updated information on the national registry of Croatia. The ERT was informed that the national registry is supported by the European Community registry software (CR), which has capabilities to serve as a registry both under the Kyoto Protocol and under the European Union emissions trading scheme. Croatia also informed the ERT that capacity-building activities for enabling effective implementation of the registry software are in place and that practical user guidelines will be produced during 2009. The ERT recommends that Croatia provide this information, in particular regarding implementation and development of the registry system in its next annual inventory submission. In its comments to the draft review report Croatia informed the ERT that the practical user guidance for the registry administrator and account holders in the registry is available in Croatian and English. In addition, an additional document has been prepared for the registry administrator containing testing exercises for the disaster recovery plan.

136. For technical administration of the registry, CEA cooperates with the professional hosting company "B.net Croatia, Ltd.", which is responsible for hosting the registry servers and maintaining the server availability and security at the main location as well as at the back-up location. Information on the registry is publicly available at <http://www.azo.hr/ghgregistry>.

137. The ERT was informed about the procedures and security measures to minimize discrepancies, terminate transactions, correct problems, and minimize operator error. These procedures and measures include a back-up server that is geographically separated from the main server and archiving data from the main database server onto a database on the back-up server on every redo log switching (archived logs on a standby database, a Data Guard). A full back-up of data is made weekly and incremental backup is made on a daily basis; all backups are transferred to a safeguarded location on the registry premises and saved on tapes kept in a vault.

138. The ERT acknowledged the effort made by Croatia to put in place these procedures and security measures. The ERT gained the overall impression that Croatia attached adequate importance, and allocated adequate resources, including human resources, to the development, operation and maintenance of the registry.

139. The national registry was not operational at the time of the in-country review owing to the required software still being adapted to Croatian circumstances. During the in-country review, the ERT was informed that the internal operational test of the registry for network connection was expected to be completed on 12 December 2008. The initialization process was expected to be completed by 28 February 2009 and the registry to be fully operational by the second week of March 2009. The ERT recommended that Croatia expedite the implementation schedule. After the in-country review, Croatia informed the ERT that all tests, including the initialization test, as well as documentation required for the national registry, were completed on 15 April 2009.

140. The ERT took note of the results of the technical assessment of the national registry, including the results of standardized testing, as reported in the independent assessment report that was forwarded to the ERT by the administrator of the ITL, pursuant to decision 16/CP.10, on 30 April 2009.

141. The ERT reiterated the main findings of this report, including that the registry has fulfilled sufficient its obligations regarding conformity with the data exchange standards. These obligations include having adequate transaction procedures; adequate security measures to prevent and resolve unauthorized manipulations; and adequate measures for data storage and registry recovery. The report identified the following minor limitations in the state of registry readiness: no evidence was provided on a disaster recovery test plan; limited evidence was provided on a time validation plan; little evidence was provided for version change management; little evidence was provided to demonstrate that tests were conducted and documented; little evidence was provided on how Croatia deals with incidents; and little evidence was provided on how change management is performed. The ERT recommends that Croatia

address these limitations prior to the registry commencing live operations and report on these issues in its next annual inventory submission. In its comments to the draft review report Croatia stated that it has made a plan to rectify the identified problems and that all required information will be provided to the ITL service desk in September 2009.

142. Based on the results of the technical assessment, as reported in the independent assessment report, the ERT concluded that Croatia's national registry is sufficiently compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1, noting that registries do not have obligations regarding operational performance or public availability of information prior to the operational phase.

F. Land use, land-use change and forestry parameters and election of activities

143. Table 6 shows Croatia's choice of parameters for forest definition as well as elections for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in accordance with decision 16/CMP.1.

Table 6. Selection of land use, land-use change and forestry parameters

Parameters for forest definition		
Minimum tree cover	10%	
Minimum land area	0.1 ha	
Minimum tree height	2 m	
Elections for Article 3, paragraphs 3 and 4, activities		
Article 3, paragraph 3, activities	**Election**	**Accounting period**
Afforestation and reforestation	Mandatory	Commitment period
Deforestation	Mandatory	Commitment period
Article 3, paragraph 4, activities		
Forest management	Elected	Commitment period
Cropland management	Not elected	Not applicable
Grazing land management	Not elected	Not applicable
Revegetation	Not elected	Not applicable

144. The elected parameter values for the definition of forest are within the ranges prescribed in paragraph 1(a) of the annex to decision 16/CMP.1. However, the ERT noted that the definition differs from that used in the Party's reporting to FAO (where the minimum land area is 0.5 ha and the minimum tree height is 5 metres). Croatia explained that the choice of different parameters for the forest definition than those used in reporting to FAO is responding to the need to remain consistent with national legislation.

145. The elected forest definition is only partly consistent with the Croatian Forestry Act. This Act defines forests based only on one parameter, namely, a minimum land area of 0.1 ha with trees. This definition does not include the minimum tree cover and tree height parameters. Therefore the ERT recommends that Croatia provide additional information in its next annual inventory submission on the differences between the parameters that have historically been used in its reporting to FAO and those chosen by Croatia for reporting activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

146. Croatia did not provide information in its initial report on how its national system will identify the land areas associated with the activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

After the in-country review, in response to the request made by the ERT, Croatia explained that its national system for identification of land areas associated with the activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol will use information on state forests collected by the state-owned company Croatian Forests and the National Forest Inventory, which was due to be finished at the end of 2008. In addition, remote sensing data will be used as supplemental information. The ERT has concerns that this plan, under the national system, may not be sufficient to provide estimates that meet the requirements for reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and recommends that Croatia as a priority strengthen its efforts in this regard before mandatory reporting on these activities begins, and that it report on these efforts in its next annual inventory submission.

III. Conclusions and recommendations

A. Conclusions

147. In its initial report, Croatia submitted all the information in accordance with the relevant provisions of paragraphs 5, 6, 7 and 8 of the annex to decision 13/CMP.1, chapter I of the annex to decision 15/CMP.1, and the relevant decisions of the CMP. Additional information on all elements was provided to the ERT during and following the in-country review.

148. The ERT concludes that the national system in Croatia is generally prepared in accordance with the requirements of the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1) and reported in accordance with the guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol (decision 15/CMP.1). The description of the national system in the initial report shows that much effort to develop the national system and to improve AD collection and inventory estimates has been made in recent years.

149. Croatia has provided its GHG inventory data for the base year (1990 for CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) and the years 1990–2006, including a full set of the CRF tables required containing data on all relevant gases, and an NIR. The Croatian inventory is largely consistent with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The CRF tables and the NIR are nearly complete with regard to the geographical coverage, years, sectors, categories and gases. However, during the in-country review the ERT identified some categories where methods or EFs used were not fully in accordance with the IPCC good practice guidance, which might lead to overestimation of emissions in the base year or underestimation of emissions in the most recent years. The ERT recommended that Croatia revise its estimates for these categories. After the in-country review, Croatia provided revised estimates and/or additional documentation, including improved estimation methods, AD and/or enhanced transparency for a number of categories for the entire time series and particularly for the base year and 2006.

150. The ERT notes that Croatia provided timely and thorough responses to its questions concerning potential problems, following the recommendations of the ERT and in line with the relevant reporting guidelines, in particular the IPCC good practice guidance and relevant CMP decisions. The ERT did not recommend the application of adjustments in any inventory category of Croatia's GHG inventory. In response to the inventory issues identified during the in-country review, Croatia revised its estimate of base year emissions from 32,527,325 t CO_2 eq to 31,321,790 t CO_2 eq.

151. In the calculation of its assigned amount, Croatia has added 3.5 million t CO_2 eq to its base year following decision 7/CP.12. The ERT considers that the addition of 3.5 million t CO_2 eq to the base year for the calculation of Croatia's assigned amount is not in accordance with Article 3, paragraphs 7 and 8, of the Kyoto Protocol and the modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol (decision 13/CMP.1). The ERT calculates Croatia's assigned amount to be 148,778,503 t CO_2 eq, based on the revised base year emissions and Croatia's Kyoto Protocol target.

152. To calculate its commitment period reserve, Croatia used its calculation of the assigned amount which includes the 3.5 million t CO_2 eq added to its base year following decision 7/CP.12. The ERT disagrees with this figure because the calculation of the assigned amount is not in accordance with Article 3, paragraphs 7 and 8, of the Kyoto Protocol and the modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol, and, consequently, the calculation of the commitment period reserve is not in accordance with paragraph 6 of the annex to decision 11/CMP.1. The ERT calculates Croatia's commitment period reserve to be 133,900,653 t CO_2 eq.

153. Croatia identified all the required information on parameters and elections for LULUCF under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in its initial report. Croatia's chosen parameters to define forest are: 10 per cent for minimum tree cover, 0.1 ha for minimum land area and 2 metres for minimum tree height. These parameters are within the ranges established under decision 16/CMP.1. Croatia has elected forest management under Article 3, paragraph 4, of the Kyoto Protocol and has chosen the entire commitment period as the accounting period for all activities under Article 3, paragraphs 3 and 4.

154. Croatia has provided practically all the information on the national registry system required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1). During the in-country review, the ERT was provided with additional and updated information on the national registry. The information provided is transparent and in accordance with these guidelines. At the time of the in-country review, the registry was still not operational. After the in-country review, the initialization process was completed on 15 April 2009. Based on the results of the technical assessment, as reported in the independent assessment report, the ERT concluded that Croatia's national registry is sufficiently compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1.

B. Recommendations

155. In the course of the review, the ERT formulated a number of recommendations relating to the completeness, consistency, accuracy and transparency of Croatia's information presented in its initial report. Most of the recommendations were implemented or resolved during the review process, including those potential problems that could have led to an overestimation of emissions in the base year. The key remaining recommendations[6] are that Croatia should:

(a) Strengthen the capacity and resources of the inventory team and provide additional support for the sectoral experts compiling the inventory (such as support on cross-cutting issues, ensuring availability of backup staff and increasing interaction across sectors);

(b) Use increasingly higher tier methodologies for key categories, while enhancing collaboration with expert and research organizations, as well as universities;

(c) Describe country-specific methods in more detail in the NIR, including rationale for choices of methods, EFs and parameters;

(d) Improve transparency of the inventory estimates by describing reasons for annual fluctuations and trends of emissions in the NIR;

(e) Include estimates of emissions and removals from all categories in the LULUCF sector;

(f) Improve and update the uncertainty estimates and key category analyses, and take into account the results when prioritizing improvements to the inventory;

(g) Develop the QA/QC plan to include more sector-specific considerations and strengthen its implementation;

[6] For a complete list of recommendations, the relevant sections of this report should be consulted.

(h) Enhance the process for recalculations and prioritization of inventory improvements.

156. Recommendations relating to specific categories are presented in the relevant sector sections of this report.

C. Questions of implementation

157. In the calculation of its assigned amount, Croatia has added 3.5 million t CO_2 eq to its base year (1990) level following decision 7/CP.12, which states that Croatia shall be allowed to add this amount 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 for implementation of its commitments under Article 4. paragraph 2, of the Convention. The ERT considers that the addition of 3.5 million t CO_2 eq to the base year level for the calculation of Croatia's assigned amount is not in accordance with Article 3, paragraphs 7 and 8, of the Kyoto Protocol and the modalities for the accounting of assigned amounts under Article 7, paragraph 4, of the Kyoto Protocol (decision 13/CMP.1). The ERT considers that the calculation of Croatia's assigned amount is an unresolved problem and therefore lists it as a question of implementation.

158. Furthermore, the ERT considers that the revised calculation of Croatia's commitment period reserve, based on the revised calculation of its assigned amount following decision 7/CP.12, is not in accordance with paragraph 6 of the annex to decision 11/CMP.1. The ERT considers that the calculation of Croatia's commitment period reserve is an unresolved problem and lists it also as a question of implementation.

159. The ERT would like to stress that its consideration of the issues related to the above questions of implementation was based on the provisions for a technical assessment set out in the Article 8 review guidelines (annex to decision 22/CMP.1), and that it is not in a position to address issues that fall outside its mandate.

Annex I

Documents and information used during the review

A. Reference documents

IPCC. 2000. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

IPCC. 2003. *Good Practice Guidance for Land Use, Land-use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

IPCC/OECD/IEA. 1997. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Volumes 1–3. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

UNFCCC. "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories (following incorporation of the provisions of decision 13/CP.9)". FCCC/SBSTA/2004/8. Available at <http://unfccc.int/resource/docs/2004/sbsta/08.pdf>.

UNFCCC. "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

UNFCCC. "Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". FCCC/KP/CMP/2005/8/Add.3. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

UNFCCC. "Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". FCCC/KP/CMP/2005/8/Add.2. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

UNFCCC. "Guidelines for review under Article 8 of the Kyoto Protocol". FCCC/KP/CMP/2005/8/Add.3. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

UNFCCC. Annual status report of the greenhouse gas inventory of Croatia. FCCC/ASR/2008//HRV. Available at <http://unfccc.int/resource/docs/2008/asr/hrv.pdf>.

UNFCCC. Synthesis and assessment report on the greenhouse gas inventories submitted in 2008. Available at <http://unfccc.int/resource/webdocs/sai/2008.pdf>.

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

UNFCCC secretariat. Independent assessment report of the national registry of Croatia. Reg_IAR_HRV_2009_1. Available at <http://unfccc.int/resource/docs/2009/iar/hrk01.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) and Mr. Davor Vesligaj (Ekonerg) including additional material on the methodology and assumptions used. The following documents were also provided by the Party:

Reports under the UNDP/GEF regional project "Capacity Building for Improving the Quality of GHG Inventories (Europe and CIS Region)":

- Final report;
- Manual of Procedures for Agriculture, Fugitive sources, Industrial Processes and Solvent Use, and LUCF;
- Awareness raising campaign;
- Description on inventory Archives;
- Improvement of Road Transport;
- Improvement – CH_4 calculation from waste.

QA/QC plan for preparation of the 2008 and 2009 inventory submissions.

Regulation on greenhouse gas emissions monitoring in the Republic of Croatia (Official Gazette, No. 2/07).

Statistical Report, 2005, Milked Cows and Production of Milk, Zagreb, Croatia.

Statistical Year Book 1992, Central Bureau of Statistics, Zagreb, Croatia. (Obtained by the ERT).

Annex II

Acronyms and abbreviations

AD	activity data
CaO	calcium oxide
CH_4	methane
CEA	Croatian Environmental Agency
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CRF	common reporting format
EF	emission factor
ERT	expert review team
FAO	Food and Agriculture Organization of the United Nations
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
ITL	International Transaction Log
LULUCF	land use, land-use change and forestry
MgO	magnesium oxide
NA	not applicable
NE	not estimated
NH_3	ammonia
NO	not occurring
N_2O	nitrous oxide
NIR	national inventory report
NMVOC	non-methane volatile organic compounds
NO_x	nitrogen oxides
PFCs	perfluorocarbons
PIV	protein intake values
QA/QC	quality assurance/quality control
SF_6	sulphur hexafluoride
SO_2	sulphur dioxide
SWPB	side-worked pre-baked
UNFCCC	United Nations Framework Convention on Climate Change

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