



**Report of the individual review of the annual submission  
of Croatia submitted in 2012**

**Note by the secretariat**

The report of the individual review of the annual submission of Croatia submitted in 2012 was published on 8 April 2013. For purposes of rule 10, paragraph 2, of the rules of procedure of the Compliance Committee (annex to decision 4/CMP.2, as amended by decision 4/CMP.4), the report is considered received by the secretariat on the same date. This report, FCCC/ARR/2012/HRV, contained in the annex to this note, is being forwarded to the Compliance Committee in accordance with section VI, paragraph 3, of the annex to decision 27/CMP.1.





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\* In the symbol for this document, 2012 refers to the year in which the inventory was submitted, and not to the year of publication.

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## I. Introduction and summary

1. This report covers the in-country review of the 2012 annual submission of Croatia, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 17 to 22 September 2012 in Zagreb, Croatia, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Mr. Newton Paciornik (Brazil); energy – Mr. Sergiy Skybyk (Ukraine); industrial processes – Ms. Elsa Hatanaka (Japan); agriculture – Mr. Simon Wear (New Zealand); land use, land-use change and forestry (LULUCF) – Ms. Penelope Reyenga (Australia); and waste – Mr. Qingxian Gao (China). Mr. Paciornik and Mr. Wear were the lead reviewers. The review was coordinated by Ms. Barbara Muik (UNFCCC secretariat).

2. In accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol” (decision 22/CMP.1), a draft version of this report was communicated to the Government of Croatia, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

3. In 2010, the main greenhouse gas (GHG) in Croatia was carbon dioxide (CO<sub>2</sub>), accounting for 74.1 per cent of total GHG emissions<sup>1</sup> expressed in CO<sub>2</sub> eq, followed by methane (CH<sub>4</sub>) (12.5 per cent) and nitrous oxide (N<sub>2</sub>O) (11.7 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>) collectively accounted for 1.7 per cent of the overall GHG emissions in the country. The energy sector accounted for 73.1 per cent of total GHG emissions, followed by the agriculture sector (11.4 per cent), the industrial processes sector (11.3 per cent), the waste sector (3.7 per cent) and the solvent and other products use sector (0.5 per cent). Total GHG emissions amounted to 28,722.23 Gg CO<sub>2</sub> eq and decreased by 9.4 per cent between the base year<sup>2</sup> and 2010. The emission trend follows the evolution of the economic activity in the country, with a decrease in emissions between 1990 and 1994 (emissions in 1994 were 29.3 per cent lower than in 1990) owing to the war in Croatia, and an increase in emissions towards 2007 (emissions in 2007 were 2.7 per cent higher than in 1990) following the subsequent economic recovery. In line with the economic crisis in Europe during 2008 and 2009, emissions decreased from 2007 to 2010 by 11.8 per cent.

4. Tables 1 and 2 show GHG emissions from Annex A sources, emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

5. Tables 3–5 provide information on the most important emissions and removals and accounting parameters that will be included in the compilation and accounting database.

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<sup>1</sup> In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO<sub>2</sub> eq excluding LULUCF, unless otherwise specified.

<sup>2</sup> “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 1  
**Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year<sup>a</sup> to 2010**

	Greenhouse gas	Base year <sup>a</sup>	Gg CO <sub>2</sub> eq							Change (%)
			1990	1995	2000	2005	2008	2009	2010	Base year –2010
Annex A sources	CO <sub>2</sub>	23 338.85	23 338.85	17 211.37	20 094.72	23 488.02	23 783.95	22 010.76	21 292.22	–8.8
	CH <sub>4</sub>	3 483.98	3 483.98	2 888.78	2 691.97	3 076.49	3 447.61	3 465.32	3 595.93	3.2
	N <sub>2</sub> O	3 946.42	3 946.42	3 054.07	3 285.10	3 485.68	3 505.39	3 257.69	3 348.97	–15.1
	HFCs	NO	NO	49.37	170.68	333.43	423.19	435.15	470.96	NA
	PFCs	936.56	936.56	NO	NO	NA, NO	NA, NO	0.20	0.03	–100.0
	SF <sub>6</sub>	10.95	10.95	11.66	12.18	13.66	13.71	14.11	14.11	28.8
KP-LULUCF	Article 3.3 <sup>b</sup>	CO <sub>2</sub>					98.57	84.76	81.45	
		CH <sub>4</sub>					IE, NE, NO	IE, NE, NO	IE, NE, NO	
		N <sub>2</sub> O					IE, NE, NO	IE, NE, NO	IE, NE, NO	
	Article 3.4 <sup>c</sup>	CO <sub>2</sub>	NA				–8 562.86	–8 164.64	–8 741.27	NA
		CH <sub>4</sub>	NA				80.53	40.05	27.65	NA
		N <sub>2</sub> O	NA				271.89	135.21	93.35	NA

*Abbreviations:* KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, IE = included elsewhere, NA = not applicable, NE = not estimated, NO = not occurring.

<sup>a</sup> “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

<sup>b</sup> Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

<sup>c</sup> Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

Table 2  
Greenhouse gas emissions by sector and activity, base year<sup>a</sup> to 2010

Sector	Gg CO <sub>2</sub> eq								Change (%)	
	Base year <sup>a</sup>	1990	1995	2000	2005	2008	2009	2010	Base year –2010	
Annex A	Energy	22 796.46	22 796.46	17 271.78	19 488.56	22 686.52	22 946.61	21 691.23	20 990.85	–7.9
	Industrial processes	3 810.82	3 810.82	2 035.65	2 871.37	3 288.44	3 580.28	2 977.80	3 239.29	–15.0
	Solvent and other product use	117.14	117.14	109.31	108.93	196.50	236.24	150.78	150.71	28.7
	Agriculture	4 380.72	4 380.72	3 054.84	3 130.16	3 477.70	3 478.12	3 365.58	3 265.09	–25.5
	Waste	611.63	611.63	743.67	655.64	748.13	932.59	997.84	1 076.29	76.0
	LULUCF	NA	–5 592.37	–6 664.01	–1 875.56	–7 662.64	–7 967.50	–7 752.76	–8 283.50	NA
<b>Total (with LULUCF)</b>	<b>NA</b>	<b>26 124.39</b>	<b>16 551.24</b>	<b>24 379.09</b>	<b>22 734.64</b>	<b>23 206.34</b>	<b>21 430.46</b>	<b>20 438.72</b>	<b>NA</b>	
<b>Total (without LULUCF)</b>	<b>31 716.77</b>	<b>31 716.77</b>	<b>23 215.25</b>	<b>26 254.65</b>	<b>30 397.28</b>	<b>31 173.84</b>	<b>29 183.22</b>	<b>28 722.23</b>	<b>–9.4</b>	
Other <sup>b</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KP-LULUCF	Article 3.3 <sup>c</sup>	Afforestation and reforestation					–142.86	–145.66	–141.43	
		Deforestation					241.43	230.41	222.87	
		<b>Total (3.3)</b>					<b>98.57</b>	<b>84.76</b>	<b>81.45</b>	
	Article 3.4 <sup>d</sup>	Forest management					–8 210.44	–7 989.37	–8 620.27	
		Cropland management	NA				NA	NA	NA	NA
		Grazing land management	NA				NA	NA	NA	NA
		Revegetation	NA				NA	NA	NA	NA
<b>Total (3.4)</b>	<b>NA</b>					<b>–8 210.44</b>	<b>–7 989.37</b>	<b>–8 620.27</b>	<b>NA</b>	

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

<sup>a</sup> “Base year” for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The “base year” for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol is 1990.

<sup>b</sup> Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

<sup>c</sup> Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation. Only the inventory years of the commitment period must be reported.

<sup>d</sup> Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation. For cropland management, grazing land management and revegetation, the base year and the inventory years of the commitment period must be reported.

Table 3  
**Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq  
for the year 2010, including the commitment period reserve**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Commitment period reserve</b>	142 985 025	133 900 653		133 900 653
<b>Annex A emissions for current inventory year</b>				
CO <sub>2</sub>	21 179 159	21 292 220		21 292 220
CH <sub>4</sub>	3 589 076	3 595 933		3 595 933
N <sub>2</sub> O	3 348 738	3 348 968		3 348 968
HFCs	465 911	470 964		470 964
PFCs	29			29
SF <sub>6</sub>	14 111			14 111
<b>Total Annex A sources</b>	<b>28 597 025</b>	<b>28 722 225</b>		<b>28 722 225</b>
<b>Activities under Article 3, paragraph 3, for current inventory year</b>				
3.3 Afforestation and reforestation on non-harvested land for current year of commitment period as reported	-141 426			-141 426
3.3 Afforestation and reforestation on harvested land for current year of commitment period as reported	NA, NO			NA, NO
3.3 Deforestation for current year of commitment period as reported	222 873			222 873
<b>Activities under Article 3, paragraph 4, for current inventory year<sup>c</sup></b>				
3.4 Forest management for current year of commitment period	-8 620 270			-8 620 270
3.4 Cropland management for current year of commitment period				
3.4 Cropland management for base year				
3.4 Grazing land management for current year of commitment period				
3.4 Grazing land management for base year				
3.4 Revegetation for current year of commitment period				
3.4 Revegetation in base year				

*Abbreviations:* NA = not applicable, NO = not occurring.

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 4  
**Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq  
for the year 2009**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Annex A emissions for 2009</b>				
CO <sub>2</sub>	21 891 695	22 010 757		22 010 757
CH <sub>4</sub>	3 464 282	3 465 315		3 465 315
N <sub>2</sub> O	3 257 444	3 257 686		3 257 686
HFCs	428 739	435 149		435 149
PFCs	204			204
SF <sub>6</sub>	14 111			14 111
<b>Total Annex A sources</b>	<b>29 056 476</b>	<b>29 183 222</b>		<b>29 183 222</b>
<b>Activities under Article 3, paragraph 3, for 2009</b>				
3.3 Afforestation and reforestation on non-harvested land for 2009 as reported	-145 656			-145 656
3.3 Afforestation and reforestation on harvested land for 2009 as reported	NA, NO			NA, NO
3.3 Deforestation for 2009 as reported	230 413			230 413
<b>Activities under Article 3, paragraph 4, for 2009<sup>c</sup></b>				
3.4 Forest management for 2009	-7 989 374			-7 989 374
3.4 Cropland management for 2009				
3.4 Cropland management for base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for base year				
3.4 Revegetation for 2009				
3.4 Revegetation in base year				

*Abbreviations:* NA = not applicable, NO = not occurring.

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 5  
**Information to be included in the compilation and accounting database in t CO<sub>2</sub> eq  
for the year 2008**

	<i>As reported</i>	<i>Revised estimates</i>	<i>Adjustment<sup>a</sup></i>	<i>Final<sup>b</sup></i>
<b>Annex A emissions for 2008</b>				
CO <sub>2</sub>	23 660 406	23 783 946		23 783 946
CH <sub>4</sub>	3 446 542	3 447 609		3 447 609
N <sub>2</sub> O	3 505 130	3 505 387		3 505 387
HFCs	423 185			423 185
PFCs	NA, NO			NA, NO
SF <sub>6</sub>	13 714			13 714
<b>Total Annex A sources</b>	<b>31 048 977</b>	<b>31 173 841</b>		<b>31 173 841</b>
<b>Activities under Article 3, paragraph 3, for 2008</b>				
3.3 Afforestation and reforestation on non-harvested land for 2008 as reported	-142 856			-142 856
3.3 Afforestation and reforestation on harvested land for 2008 as reported	NA, NO			NA, NO
3.3 Deforestation for 2008 as reported	241 428			241 428
<b>Activities under Article 3, paragraph 4, for 2008<sup>c</sup></b>				
3.4 Forest management for 2008	-8 210 440			-8 210 440
3.4 Cropland management for 2008				
3.4 Cropland management for base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for base year				
3.4 Revegetation for 2008				
3.4 Revegetation in base year				

*Abbreviations:* NA = not applicable, NO = not occurring.

<sup>a</sup> "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

<sup>b</sup> "Final" includes revised estimates, if any, and/or adjustments, if any.

<sup>c</sup> Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

## II. Technical assessment of the annual submission

### A. Overview

#### 1. Annual submission and other sources of information

6. The 2012 annual inventory submission was submitted on 13 April 2012 and resubmitted on 25 May 2012; it contains a complete set of common reporting format (CRF) tables for the period 1990–2010 and a national inventory report (NIR). Croatia also submitted information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 13 April 2012. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Croatia officially submitted revised emission estimates on 6 and 21 November 2012 in response to the list of potential problems and further questions raised by the expert review team (ERT) during the review (see paras. 41, 56, 74, 76 and 113 below), including information on KP-LULUCF. The figures contained in this report are those submitted by the Party on 21 November 2012.

8. The ERT also used the previous years' submissions during the review. In addition, the ERT used the standard independent assessment report (SIAR), parts I and II, to review information on the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and on the national registry.<sup>3</sup>

9. During the review, Croatia provided the ERT with additional information. The documents concerned are not part of the annual 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.

#### Completeness of inventory

10. The Croatian inventory covers all mandatory<sup>4</sup> categories for the period 1990–2010 and is complete in terms of years and geographical coverage.

11. Croatia has improved the completeness of its inventory by, for example, including new data collected from sugar manufacturers on CO<sub>2</sub> emissions from lime production (see para. 67 below) and including some new crops in the calculation of N<sub>2</sub>O emissions from

<sup>3</sup> The SIAR, parts I and II, is prepared by an independent assessor in line with decision 16/CP.10 (paras. 5(a), and 6(c) and (k)), under the auspices of the international transaction log (ITL) administrator using procedures agreed in the Registry System Administrators Forum. Part I is a completeness check of the submitted information relating to the accounting of Kyoto Protocol units (including the SEF tables and their comparison report) and to national registries. Part II contains a substantive assessment of the submitted information and identifies any potential problem regarding information on the accounting of Kyoto Protocol units and the national registry.

<sup>4</sup> Mandatory source and sink categories under the Kyoto Protocol are all source and sink categories for which the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) provide methodologies and/or emission factors to estimate GHG emissions and removals.

crop residues for the category agricultural soils (see para. 90 below). The ERT commends Croatia for these improvements.

12. In addition, Croatia has made significant improvements to the completeness of the inventory for the LULUCF sector by including estimates for the cropland, grassland and wetlands categories for the first time, and by improving the coverage of conversion subcategories and pools in the forest land and settlements categories. However the inventory for the LULUCF sector remains incomplete, with emissions and removals reported as not estimated (“NE”) for some categories and pools (see para. 96 below). The ERT recommends that Croatia provide estimates for these categories in its next annual submission, in order to improve completeness.

## **2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management**

### Overview

13. The ERT concluded that the national system continued to perform its required functions.

14. Croatia reported that changes in the national system have occurred since the previous annual submission and these changes are discussed in chapter II.G.3 of this report.

### Inventory planning

15. The NIR describes the national system for the preparation of the inventory. The Ministry of Environmental and Nature Protection (MENP) has overall responsibility for the national inventory, including the overall functioning of the national system, the approval of the inventory and the submission of the inventory to the UNFCCC secretariat. The Croatian Environmental Agency (CEA) has overall responsibility for organizing the GHG inventory preparation, including collecting activity data (AD), developing and implementing the quality assurance/quality control (QA/QC) plan, archiving the information used in the preparation of the GHG inventory, selecting the institution that prepares the inventory and reporting on any changes to the national system. CEA also oversees the administration of the national registry and the facilitation of the inventory reviews.

16. An authorized institution is selected by public tender to carry out the preparation of the inventory for a three-year period. For the 2012 annual submission, this task was performed by the Energy and Environmental Protection Institute (Ekoneg). Ekoneg is responsible for the emission and removal calculations, key category analysis, uncertainty analysis, reporting on Kyoto Protocol units and the preparation of the NIR. In the previous review report a concern was raised about the limited term (three years) of the authorized institution and how Croatia ensures the continuity of the inventory preparation and its quality. During the review, Croatia reaffirmed that the continuity is ensured by the process of selection of an institution to prepare the national inventory. One criterion for selection is experience in inventory preparation and knowledge of the Intergovernmental Panel on Climate Change (IPCC) guidelines and the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories” (hereinafter referred to as the UNFCCC reporting guidelines) and another that all data collected and used for the emission estimates are archived at CEA. In response to a question raised by the ERT during the review, Croatia stated that the public tender for the selection of the institution that will prepare the 2013 annual submission would occur only in November 2012, but that Ekoneg had already been contracted for the preparation of the CRF tables and the NIR for all sectors except the energy sector. The ERT considers that such a tight schedule for the selection of the

institution puts at risk the timeliness and quality of the annual submission. The ERT therefore encourages Croatia to improve the tender process schedule in order to enable the selection of the authorized institution well before the beginning of the work related to an annual submission, and reiterates the recommendation made in the previous review report that Croatia include the explanation of the process of selection of the authorized institution in the NIR of its next annual submission.

17. A national system committee is included in the approval process before the inventory is submitted to the UNFCCC secretariat. The members of the committee are nominated by the authorized ministries upon request by MENP and provide their opinion on parts of the inventory within the framework of their speciality.

18. There are other agencies and organizations also involved in the preparation of the inventory, mainly as data providers. These are listed in table 1.4-1 of the NIR.

#### Inventory preparation

##### *Key categories*

19. Croatia has reported tier 1 and tier 2 key category analyses, both level and trend assessment, as part of its 2012 annual submission. The tier 1 key category analysis performed by the Party and that performed by the secretariat<sup>5</sup> produced similar results. Croatia has included the LULUCF sector in its key category analysis and has also reported the analysis without the LULUCF sector. The ERT commends Croatia for this very comprehensive approach. The analysis was performed in accordance with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

20. In its NIR Croatia explained that the results of the key category analysis are used to establish the quality objectives in its annual QA/QC plan. However, Croatia did not detail how the key category analysis is used to prioritize the development and improvement of the inventory, including methodological choices. During the review, Croatia explained that the key category analysis is indeed used to drive the improvement of the inventory. The ERT recommends that Croatia include the explanations provided in the NIR of its next annual submission.

21. Croatia has identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for 2010, as provided in chapter 5.4.4 of the IPCC good practice guidance for LULUCF. The Party has explained in CRF table NIR-3 the reason for the identification of forest management as a key category. However, Croatia did not provide in the NIR a description of the KP-LULUCF key categories, together with the rationale for their identification as key. The ERT recommends that Croatia provide this information in the NIR of its next annual submission.

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<sup>5</sup> The secretariat identified, for each Party, the 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. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year or period. 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.

*Uncertainties*

22. Croatia has performed a quantitative tier 1 uncertainty analysis, both for the level and for the trend, using error propagation. The Party has also performed a tier 2 uncertainty analysis (Monte Carlo method) for the key categories, which accounted for 96.2 per cent of the total inventory emissions excluding LULUCF, for 2010. Both tier 1 and tier 2 analyses were conducted excluding and including the LULUCF sector. The ERT commends Croatia for performing this very comprehensive analysis. The ERT concludes that the uncertainty analysis has been performed in accordance with the IPCC good practice guidance. However, Croatia did not provide complete uncertainty values for the LULUCF sector (see para. 97 below) and the ERT recommends that the Party develop such values for its next annual submission.

23. The cumulative uncertainty of the total estimated GHG emissions excluding LULUCF for 2010 is 16.8 per cent and the trend uncertainty is 20.8 per cent, in accordance with the tier 1 method. According to the tier 2 Monte Carlo analysis, the uncertainty of the total estimated GHG emissions excluding LULUCF for 2010 is consistent with the tier 1 analysis in terms of both level (17.1 per cent) and trend (-17.6 per cent to +20.3 per cent). The uncertainty of the total estimated GHG emissions including LULUCF (tier 1) is 25.2 per cent for 2010. The ERT noted that the NIR presents different values for the latter result (25.177 in table A5.2-2, 25.3 on page 16 and 26 on page A5-26) and recommends that Croatia improve its QC in order to prevent such reporting errors in its future annual submissions.

24. The ERT noted that the value for the trend uncertainty according to the tier 1 method has increased substantially in relation to that reported in the previous annual submission (4.2 percentage points in the 2011 annual submission and 20.8 percentage points in the 2012 annual submission). The ERT identified that the reason for the difference is the adoption of new assumptions for the correlation between the values for the base year and those for the most recent year of the time series. The IPCC good practice guidance establishes as default in the tier 1 method that emission factors (EFs) are fully correlated between years, while AD are not correlated. For its 2012 annual submission, Croatia has assumed for many categories that the EFs are not correlated, including the energy EFs. These categories are listed in annex 5 to the NIR, but the rationale for the assumptions adopted is not presented. Moreover, it is not clear from the NIR whether the same assumptions on correlations have been used for both the tier 1 and tier 2 methods. The ERT recommends that Croatia provide more details on the correlation assumptions for each category, providing the justification for each choice, in its next annual submission.

25. The ERT identified a mistake in the calculation of the trend uncertainty using the tier 1 method (when calculating the contribution to the trend of AD or EFs using type B sensitivity, a factor of the square root of 2 is missing). The ERT recommends that Croatia improve its QC checks in order to prevent mistakes in the uncertainty calculations for its next annual submission.

26. As it does with the key category analysis, Croatia uses the uncertainty analysis when establishing the annual objectives in its QA/QC plan. However, Croatia has not detailed in the NIR how the results of the uncertainty analysis are used to prioritize the development and improvement of the inventory. The ERT reiterates the recommendation made in the previous review report that Croatia provide information in the NIR of its next annual submission on how it uses the results of the uncertainty analysis in the prioritization of future inventory improvements.

*Recalculations and time-series consistency*

27. Recalculations have been performed and reported in accordance with the IPCC good practice guidance. The ERT noted that recalculations reported by the Party of the time series 1990 to 2009 have been undertaken to take into account changes to and the refinement of methods in order to improve consistency with the IPCC good practice guidance, changes in available data and the correction of errors. The magnitude of the impact was an increase in estimated total GHG emissions for the base year (by 0.9 per cent) and an increase for 2009 (by 1.1 per cent). Taking into account the LULUCF sector, the impact was an increase in estimated total net GHG emissions for the base year (by 6.6 per cent) and an increase for 2009 (by 6.3 per cent). The rationale for these recalculations is provided in the NIR and in CRF table 8(b). The main changes were:

- (a) A decrease in estimated net CO<sub>2</sub> removals from the LULUCF sector, owing to recalculations in all categories (see para. 95 below);
- (b) An increase in estimated CO<sub>2</sub> emissions from road transportation, owing to the revision of AD and EFs in response to the list of potential problems and further questions raised by the ERT during the review week (see para. 56 below);
- (c) An increase in estimated fugitive CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from oil and natural gas in order to improve completeness in response to the list of potential problems and further questions raised by the ERT during the review week (see para. 41 below);
- (d) An increase in estimated N<sub>2</sub>O emissions from agricultural soils, owing to the inclusion of new sources of nitrogen (N) from sewage sludge and new crops (see para. 78 below);
- (e) An increase in estimated CO<sub>2</sub> emissions from solvent use coming from emissions of non-methane volatile organic compounds (NMVOCs) (see para. 64 below);
- (f) An increase in estimated CO<sub>2</sub> emissions from lime production, owing to new data provided by sugar producers (see para. 63 below).

28. The ERT noted a time-series inconsistency that resulted from recalculations of CH<sub>4</sub> emissions from enteric fermentation and manure management under the agriculture sector. For some subcategories the estimates for the period 2008–2010 have been recalculated following a recommendation made in the previous review report that the Party use EFs for developed countries. However, the estimates for the period 1990–2007 have not been revised and were still calculated using EFs for developing countries (see para. 83 below). The ERT reiterates the recommendation made in the previous review report that Croatia recalculate the entire time series using EFs for developed countries to ensure time-series consistency in its next annual submission.

*Verification and quality assurance/quality control approaches*

29. Croatia has provided information on its QA/QC procedures in the NIR. The Party has an overall QA/QC programme (the QA/QC plan in accordance with decision 19/CMP.1) in place, which includes the overall responsibilities and roles of the institutions involved in the inventory planning, preparation and management, a general timetable of activities, including data collection, inventory preparation, inventory submission, annual reviews and reporting on the national registry, and general and specific QA/QC procedures. Each year Croatia develops a QA/QC plan, which establishes the short-term (current year) and medium-term (1 to 3 years) quality objectives, including planned improvements to the inventory and the follow-up to previous review reports. During the review, Croatia provided copies of the QA/QC programme and annual QA/QC plan, available only in Croatian, and explained its contents to the ERT. The ERT reiterated the recommendation made in the previous review report that Croatia provide more information on its QC

procedures in the NIR of its next annual submission. Furthermore, the ERT noted that the annual QA/QC plan contains information on planned improvements and the follow-up to previous review reports, which are not reported transparently in the NIR (see para. 33 below). The ERT recommends that Croatia include the relevant information from the QA/QC plan related to planned improvements and the follow-up to previous review reports in the NIR of its next annual submission.

30. Croatia described the review conducted by the inventory committee prior to the submission of the inventory to the UNFCCC secretariat (see para. 17 above) as the sole QA procedure implemented at this point in time. The ERT noted that, regardless of the committee's composition, the efficiency of such a procedure as an expert peer review of the inventory in line with the IPCC good practice guidance is limited. The ERT encourages Croatia to include, in the QA/QC plan, provisions for the periodic review of selected key categories of the inventory by an independent institution.

#### *Transparency*

31. The transparency of the NIR has significantly increased since the previous annual submission, with clearer descriptions of the national system and its functions, the key category and uncertainty analyses, the QA/QC procedures and the methodologies, AD and EFs used for most categories. However, the ERT considers that the transparency of the QA/QC procedures could be improved by including in the NIR more details from the QA/QC programme and information on how the QC checks of the work done by the authorized institution are performed. The ERT encourages Croatia to add this information in its next annual submission. Furthermore, the transparency of the NIR could be improved so as to facilitate a full understanding of how the methodologies were applied, the origin of the AD and the rationale for the values of the EFs and parameters selected (see paras. 42, 46, 49, 60, 65, 74, 80, 81, 98 and 111 below). The ERT also encourages Croatia to follow the outline of the NIR contained in the UNFCCC reporting guidelines for the sectoral parts of the NIR.

#### Inventory management

32. Croatia has an archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. Croatia developed an inventory data sheet system for archiving, containing data and methodological information by category. An example of a data sheet is presented in the NIR. However, all calculation sheets, including those related to key category analysis and uncertainty analysis, are kept at Ekoneg. As the contract for the authorized institution is temporary (three years), a change in the authorized institution implies that this information would be lost. The ERT recommends that Croatia ensure that all information related to the inventory preparation is archived under the control of the national system in a permanent way in accordance with decision 19/CMP.1.

### **3. Follow-up to previous reviews**

33. The ERT noted that the information on how the recommendations made in previous review reports have been taken into account is not presented in a systematic and transparent manner in the NIR, thereby making it difficult for the reader and particularly for the ERT to verify which recommendations have already been addressed and what the time schedule is for the implementation of the remaining recommendations, listed as future improvements. During the review, while examining the QA/QC documents, the ERT identified that the

annual QA/QC plan contains a table with the recommendations of the previous ERT and the status of and plans to implement these recommendations. The ERT recommends that Croatia improve the documentation of the follow-up to the recommendations made in previous review reports, for instance by including a similar table in the NIR, listing all the recommendations and identifying which ones have already been resolved and the expected time schedule for the implementation of the remaining ones.

34. The previous review report (related to the 2011 annual submission) was published only after the due date of the 2012 annual submission. Hence, unless the recommendations contained therein were reiterations of previous recommendations, Croatia could not react appropriately to them. Nevertheless, the ERT identified that many reiterated recommendations had not yet been implemented.

35. Among the implemented improvements following previous recommendations, the ERT identified:

(a) The improvement of consistency between the CRF tables and the NIR in relation to the identification of key categories;

(b) The reallocation of emissions occurring from natural gas used as fuel in ammonia production from the industrial processes sector to the energy sector;

(c) The improvements in the consistency between the data from the Food and Agriculture Organization of the United Nations (FAO) for livestock population and the data reported in the CRF tables for agriculture.

36. The ERT noted that, in accordance with decision 15/CMP.1, annex, paragraph 4, each Party included in Annex I to the Convention shall describe in its annual inventory any steps taken to improve estimates in areas that were previously adjusted. Croatia has not provided information in the NIR in this regard. However, the ERT recognizes that the communication to the Party of the adjustment applied during the 2011 review took place after the due date of the 2012 annual submission. During the review, the Party submitted revised emission estimates for the category adjusted in the previous review (see para. 56 below). The ERT recommends that such information be included in the next annual submission and recalculations be performed as appropriate.

#### **4. Areas for further improvement identified by the expert review team**

37. During the review, the ERT identified several issues for improvement. These are listed in table 6 below.

38. Recommended improvements relating to specific categories are presented in the relevant sector chapters of this report and in table 6 below.

## **B. Energy**

### **1. Sector overview**

39. The energy sector is the main sector in the GHG inventory of Croatia. In 2010, emissions from the energy sector amounted to 20,990.85 Gg CO<sub>2</sub> eq, or 73.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 7.9 per cent. The key drivers for the fall in emissions are the decreases in emissions from manufacturing industries and construction (a decrease by 43.3 per cent since the base year) and energy industries (a decrease by 17.3 per cent since the base year). Within the sector, 28.9 per cent of the emissions were from transport, followed by 28.1 per cent from energy industries, 17.1 per cent from other sectors and 15.9 per cent from manufacturing industries and construction. Fugitive emissions from oil and natural gas accounted for 10.0 per cent.

Emissions from other and fugitive emissions from solid fuels were reported as not occurring (“NO”).

40. The Party has made recalculations for the energy sector between the 2011 and 2012 annual submissions following changes or refinements in methods and in order to rectify identified errors. The impact of these recalculations on the energy sector is an increase in the estimate of emissions for 2009 of 1.1 per cent. The main recalculations took place in the following categories:

(a) Public electricity and heat production, owing to reconciling differences between the two approaches used to calculate the emissions (bottom-up for large point sources and top-down for the rest of the category);

(b) Road transportation, in response to the list of potential problems and further questions raised by the ERT during the review week;

(c) Agriculture/forestry/fisheries, owing to correcting the net calorific value for diesel fuel for 2008;

(d) Fugitive emissions from oil and natural gas, in response to the list of potential problems and further questions raised by the ERT during the review week.

41. In the Party’s original 2012 annual submission, the CRF tables and the NIR were not complete. Croatia had not reported emissions for all subcategories of fugitive emissions from oil and natural gas for which the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC good practice guidance provide estimation methodologies. In response to the list of potential problems and further questions raised by the ERT during the review week, Croatia provided the missing emission estimates (see para. 59 below).

42. The inventory for this sector is generally transparent. However, the ERT noted that the transparency of the Croatian NIR could still be significantly improved. Croatia has not followed the recommendations of the UNFCCC reporting guidelines concerning the structure of the NIR for the energy sector. The ERT encourages the Party to provide in its next annual submission an NIR prepared in line with the UNFCCC reporting guidelines. Furthermore, the ERT strongly reiterates the recommendations made in previous review reports that the Party provide more information on AD and EFs and explanations of trends, especially for CO<sub>2</sub> and N<sub>2</sub>O emissions from road transportation, CO<sub>2</sub> emissions from civil aviation and CO<sub>2</sub> emissions from stationary fuel combustion in different categories. In this context, the ERT recommends that Croatia include in its next annual submission information on:

(a) Short-term and long-term trends, both in AD and emissions;

(b) The factors causing significant changes in implied emission factors (IEFs) (e.g. changes in the fuel mix and in the structure of the vehicle fleet);

(c) The sources of the EFs and AD used for the emission estimates;

(d) The basis on which expert judgment is made.

43. Croatia has reported in the NIR that it conducts category-specific QC checks for the category public electricity and heat production only. AD from the energy balance were compared with data provided by individual facilities. In response to questions raised by the ERT during the review, the Party confirmed that other category-specific tier 2 QC procedures were not conducted for the energy sector. However, the ERT noted that, in the 2011 NIR, the Party reported its short-term goal to enhance its use of category-specific QA/QC procedures, with the aim of improving the quality of the GHG inventory for the

energy sector. The ERT therefore encourages Croatia to conduct tier 2 QC checks for the key categories.

44. The ERT identified several issues that reduce the comparability of the sectoral emission estimates: fuel combustion emissions from natural gas transport are reported together with stationary combustion emissions; fugitive emissions from natural gas production, processing, transmission and distribution are reported together; oil and natural gas venting and flaring emissions are reported together as emissions from venting; military transport mobile combustion emissions are reported together with emissions from road transportation, navigation and civil aviation; and mobile combustion emissions from off-road vehicles and machinery are reported together with emissions from stationary combustion. The ERT recommends that Croatia follow the Revised 1996 IPCC Guidelines for reporting in its next annual submission and ensure, as far as possible, the separate reporting of categories. If the reallocation of emission estimates is not possible, the ERT recommends that the Party use the notation keys and provide clear explanations of where the relevant emissions are allocated.

45. According to the information provided in the NIR, Croatia is planning several inventory improvements, both methodological and in relation to the quality of existing data and EFs. However, the ERT noted that the list of short-term and long-term goals has not changed since the Party's 2010 annual submission. Also, most of the recommendations made in the previous review report (including recommendations concerning the category road transportation, which were discussed during the previous review) have not been implemented. The ERT strongly recommends that Croatia strengthen its efforts to implement recommendations made in previous review reports and that the Party report on its progress in implementing the necessary improvements in future annual submissions.

## 2. Reference and sectoral approaches

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

46. CO<sub>2</sub> emissions from fuel combustion were calculated using the reference approach and the sectoral approach. For 2010, the CO<sub>2</sub> emissions estimated using the reference approach are 2.3 per cent higher than those estimated using the sectoral approach. The differences for CO<sub>2</sub> emissions from gaseous fuels and solid fuels are 10.4 per cent and -5.2 per cent, respectively, for 2010. The explanation for the differences that the Party provided in the NIR is that CO<sub>2</sub> emissions from feedstocks and non-energy fuel use are included in the reference approach, but are not accounted for in the sectoral approach. Because of inconsistencies in the Party's reporting (including, for example, those identified in paras. 47, 48 and 50 below), the ERT considers that the accounting for feedstocks and non-energy use may not completely explain the differences between the two approaches and that the explanations in the NIR can be improved. In order to improve transparency and to strengthen the QC of the reference approach reporting, the ERT recommends that Croatia conduct more detailed analysis of factors that may result in discrepancies between the reference and the sectoral approaches and provide the numerical data obtained as a result of such analysis in its next NIR (e.g. to prove that the only identified reason for the differences between the two approaches is feedstocks and non-energy fuel use, Croatia may provide in the NIR alternative CO<sub>2</sub> emission estimates calculated using the reference approach excluding the emissions from feedstocks and non-energy fuel use that are not accounted for in the sectoral approach). The ERT reiterates the recommendations made in previous review reports that, in order to improve transparency, Croatia make efforts to reconcile the differences between the two approaches for future annual submissions and provide more explanation of the reasons for the differences between the two approaches.

47. The ERT identified that coke oven gas production is reported in CRF table 1.A(b) for the years 1990–1994. Since coke oven gas is a secondary fuel, the ERT recommends that Croatia exclude emissions from coke oven gas production from the emission estimates calculated using the reference approach.

48. The ERT reiterates the recommendations made in the previous review report that Croatia investigate the reasons for the discrepancies between the data reported in the CRF tables and the data submitted to the International Energy Agency (IEA) and provide information on the results of said investigation in the NIR of its next annual submission, including, for example: the reported values for the natural gas stock changes for 1993; the quantities of coal extracted from mines reported in CRF table 1.B.1 for the years prior to 2000; and the exports, and in some cases also imports, of crude oil reported in CRF table 1.A(b) for the years prior to 1997.

*International bunker fuels*

49. The Party has not provided in the NIR an explanation of how the data on international and domestic fuel consumption for navigation were derived. During the review, Croatia explained that fuel consumption data for the estimation of emissions from navigation were obtained directly from the national energy balance. As was clarified during the review, there is only one company in Croatia that handles international marine transport and reports information about fuel consumption for marine transport to the Energy Institute Hrvoje Požar. The Party obtains data on fuel consumption for navigation from that company and uses it as international marine bunker data. The fuel consumption for domestic navigation was calculated by subtracting these international marine bunker data from the data on total fuel consumption for sea and river transport from the energy balance. The ERT reiterates the recommendation made in the previous review report that Croatia improve the description of the approach used to derive the estimate of domestic fuel consumption in the NIR of its next annual submission.

50. The ERT identified discrepancies between CRF tables 1.C and 1.A(b) in the fuel consumption reported for jet kerosene (international aviation bunkers) for 1990–2006 and for gas/diesel oil (marine bunkers) for 2004. The Party explained that these differences were caused by errors in the fuel consumption reported in CRF table 1.A(b). The ERT recommends that Croatia correct these errors in the next annual submission.

*Feedstocks and non-energy use of fuels*

51. Croatia has reported information on non-energy use of fuels in CRF table 1.A(d). As noted in the previous review report, the present ERT again noted that the information in the CRF table is not fully consistent, since some emissions have been reported as “NO”. In addition, no detailed information has been provided in the NIR that could help the ERT to understand the allocation of emissions from feedstocks and non-energy use of fuels and to assess the approach used to split natural gas between that used as fuel and that used as feedstock for ammonia production (see para. 69 below). Therefore, the ERT reiterates the recommendation made in the previous review report that Croatia improve the transparency of its reporting on feedstocks and non-energy use of fuels in its next annual submission.

**3. Key categories**

Stationary combustion: solid, liquid and gaseous fuels – CO<sub>2</sub>

52. The ERT noted that Croatia has used only default carbon content values and oxidation factors for the emission estimates for stationary combustion, although CO<sub>2</sub> emissions from stationary combustion of solid, liquid and gaseous fuels are key categories. The ERT recommends that Croatia apply country-specific carbon content values and

oxidation factors to estimate emissions for the main fuel types. The ERT also noted that Croatia used plant-specific fuel consumption data for public electricity and heat production. The characteristics of power station fuels will often differ from fuels of the same type in use in other sectors, so the ERT encourages Croatia to use plant-specific carbon content values and oxidation factors for this category.

#### Road transportation: liquid fuels – CO<sub>2</sub>

53. In the previous review report an underestimation of emissions was identified and an adjustment for CO<sub>2</sub> emissions from gasoline used in road transportation was recommended for 2009. In the 2012 annual submission, Croatia has provided revised estimates of CO<sub>2</sub> emissions from gasoline consumption. However, the reason for the recalculations, provided in the NIR, was the use of a new version of the COPERT IV model (version 9.0 instead of version 7.1) for calculating emissions from road transportation, which does not resolve the potential underestimation of emissions. Hence, the recommendations made in the previous review report for this category (including the revision of adjusted estimates) have not been implemented.

54. During the review, the ERT confirmed that the CO<sub>2</sub> IEFs for road transportation emissions from gasoline and diesel fuel reported by the Party are based on calculations made using the COPERT model. The ERT recalled that the CO<sub>2</sub> EF depends on the type of fuel combusted and not on the technology of the vehicle (Revised 1996 IPCC Guidelines, European vehicles: tables 1-36 to 1-42). The use of the COPERT model results in lower estimates of CO<sub>2</sub> emissions (the IEFs are equal to 70.39 t CO<sub>2</sub>/TJ for gasoline and 73.05 t CO<sub>2</sub>/TJ for diesel fuel) than if the default IPCC values for Europe for 1990–2010 are used (after applying default oxidation factors, the EFs are equal to 72.27 t CO<sub>2</sub>/TJ for gasoline and 73.26 t CO<sub>2</sub>/TJ for diesel fuel), and thus the ERT considered the emissions from gasoline and diesel fuel used in road transportation to have been potentially underestimated.

55. During the review, Croatia confirmed that it does not use fuel consumption data from the energy statistics for the estimation of CO<sub>2</sub> emissions from road transportation, but instead uses AD calculated using the COPERT model. The ERT noted that, according to the IPCC good practice guidance, CO<sub>2</sub> emissions from road transportation are best calculated on the basis of the amount and type of fuel combusted in road transportation and its carbon content. As indicated in paragraph 2.3.1.1 of the IPCC good practice guidance, both distance-based AD (e.g. vehicle-kilometers travelled) and disaggregated fuel consumption may be considerably less certain than the overall fuel consumption. According to the IPCC good practice guidance, CO<sub>2</sub> emissions from road transportation should be calculated on the basis of fuel consumption statistics using the tier 1 (top-down) approach. The ERT considered that Croatia did not follow the IPCC good practice guidance and thus concluded that the emissions could have been underestimated.

56. In response to the list of potential problems and further questions raised by the ERT during the review week, Croatia provided revised CO<sub>2</sub> emission estimates for gasoline and diesel fuel used for road transportation for the entire time series, including the years for which adjustments were applied during the 2011 review, which were calculated using AD from the national energy balance and default EFs from the IPCC good practice guidance. The revision resulted in an increase of 34.96 Gg CO<sub>2</sub> eq, or 0.6 per cent, in the estimate of emissions from gasoline and diesel fuel consumption for road transportation for 2010. The ERT agrees with the revised estimates and recommends that Croatia transparently document the methodology used for the calculations in its next annual submission.

#### Coal mining and handling – CH<sub>4</sub>

57. Croatia has reported coal mining and handling emissions for 1990–1999 using the tier 1 approach and for 2000–2010 as “NO”. The ERT noted that the data on coal

production reported to IEA are half those reported in the CRF tables. Croatia confirmed that an error had occurred in the CRF tables and that the IEA data are correct. Also, during the review, it was confirmed that Croatia used data on saleable coal production from the energy balance for the estimation of fugitive emissions from coal mining and handling. However, according to the IPCC good practice guidance, if data on raw coal production are available, these should be used for the estimation of fugitive emissions, because the amount of coal production may have an influence on the emissions. Where AD relate to saleable coal, some effort should be made to determine the amount of production that is washed. Moreover, the ERT identified a discrepancy between the results of the emission calculations and the values reported in CRF table 1.B.1. The ERT recommends that Croatia revise the calculation of fugitive emissions from coal mining and handling to be in line with the IPCC good practice guidance, provide the sources of the EFs used in the next NIR and improve the QA/QC procedures in order to avoid errors in the calculation and reporting of emissions.

#### Fugitive emissions: oil and natural gas – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O<sup>6</sup>

58. For its original 2012 annual submission, Croatia used the method from the Revised 1996 IPCC Guidelines to estimate fugitive CH<sub>4</sub> emissions from oil and natural gas systems, which provides EFs that correlate with throughput and allow the estimation of emissions only in an aggregated manner. The ERT noted that, according to the IPCC good practice guidance, fugitive emissions from gas transmission and distribution systems do not correlate well with throughput and are better related to lengths of pipeline. The ERT noted the recommendation made in the 2010 review report that Croatia estimate emissions for each stage of oil and gas operations (production, unloading, processing, underground storage, transportation and distribution). The ERT therefore reiterates the recommendation that Croatia estimate emissions for this category for each stage of oil and gas operations using a higher-tier method, or, if that is not applicable, use disaggregated EFs following the corresponding methods in the IPCC good practice guidance to improve the comparability of its reporting.

59. Croatia did not report emission estimates for all subcategories of fugitive emissions from oil and natural gas, for which the Revised 1996 IPCC Guidelines and the IPCC good practice guidance provide estimation methodologies, in its original 2012 annual submission. These include: CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from oil exploration (1.B.2.a.i); CO<sub>2</sub> emissions from oil production (1.B.2.a.ii); CO<sub>2</sub> emissions from oil transport (1.B.2.a.iii); CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from natural gas exploration (1.B.2.b.i); CO<sub>2</sub> emissions from natural gas production (1.B.2.b.ii); CO<sub>2</sub> emissions from natural gas transmission (1.B.2.b.iii); CO<sub>2</sub> emissions from oil venting(1.B.2.c); CO<sub>2</sub> and N<sub>2</sub>O emissions from oil flaring(1.B.2.c); and CO<sub>2</sub> and N<sub>2</sub>O emissions from natural gas flaring (1.B.2.c). Emissions for most of these subcategories were reported as “NO” in CRF table 1.B.2. However, during the review, Croatia confirmed that such emissions do occur in the country. In response to the list of potential problems and further questions raised by the ERT during the review, Croatia provided revised emission estimates for the entire time series, calculated using the methodologies and default EFs from the IPCC good practice guidance, resulting in an increase of 75.74 Gg CO<sub>2</sub> eq, or 3.8 per cent, in the estimate of fugitive emissions from oil and natural gas for 2010. The ERT agrees with the revised estimates and recommends that Croatia transparently document the AD and methodology used for the calculations in its next annual submission.

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<sup>6</sup> Not all emissions related to all gases under this category are key categories, particularly N<sub>2</sub>O emissions. However, since the calculation procedures for issues related to this category are discussed as whole, the individual gases are not assessed in separate sections.

60. The ERT commends Croatia for the use of a country-specific approach for calculating CO<sub>2</sub> emissions from natural gas scrubbing which takes into account national circumstances (the high CO<sub>2</sub> content of the natural gas produced). To improve the transparency of the reporting and to ensure that all sources of fugitive CO<sub>2</sub> emissions from natural gas processing activities are considered, the ERT recommends that Croatia provide, in the next annual submission, a more detailed explanation of the approach used for the estimation of emissions from natural gas scrubbing and provide numerical data on the amount of natural gas processed and the natural gas composition before and after processing.

#### 4. Non-key categories

##### Other (mobile): liquid fuels – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

61. The Revised 1996 IPCC Guidelines require Parties to report mobile emissions from military fuel use in the category other (mobile). The ERT noted that Croatia reported such emissions as “NO”. During the review, the Party confirmed that mobile emissions from military fuel use were reported together with emissions from road transportation, civil aviation and navigation, because military fuel consumption is not presented separately in the national energy balance. To improve the transparency of the reporting and to ensure that all fuel consumption is covered and emissions from military transport are included in the estimates, the ERT encourages Croatia to provide in the next NIR a balance for gasoline, diesel, fuel oil and jet kerosene. The ERT also encourages Croatia to make efforts to split military mobile and other mobile fuel consumption and to report the former in a separate subcategory. If this is not possible, the ERT recommends that Croatia use the correct notation key for the reporting of emissions from military mobile fuel combustion and provide a clear explanation of where these emissions are allocated, in its next annual submission.

### C. Industrial processes and solvent and other product use

#### 1. Sector overview

62. In 2010, emissions from the industrial processes sector amounted to 3,239.29 Gg CO<sub>2</sub> eq, or 11.3 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 150.71 Gg CO<sub>2</sub> eq, or 0.5 per cent of total GHG emissions. Since 1990, emissions have decreased by 15.0 per cent in the industrial processes sector and increased by 28.7 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector is the decrease of emissions from metal industry (by 97.7 per cent since the base year), owing to production being halted of pig iron in 1991, ferroalloys in 2003 and aluminium in 1991, although there is also an increasing emission trend in the category consumption of halocarbons and SF<sub>6</sub> (by 4,328.5 per cent since the base year). Emissions from this sector decreased from 1990 to 1995, owing to the decline in industrial activities caused by the war in Croatia, followed by an increase from 1996 to 2007. Emissions decreased from 2008 to 2009 (by 16.8 per cent), which is explained by the decrease in economic activity due to the economic crisis in Europe and the consequent decrease in emissions from cement, lime, ammonia and steel production. However, emissions started to increase again in 2010 (by 8.8 per cent compared with in 2009). Within the industrial processes sector, 43.5 per cent of the emissions were from mineral products, followed by 40.6 per cent from chemical industry, 15.0 per cent from consumption of halocarbons and SF<sub>6</sub> and 0.8 per cent from metal industry. Emissions from production of halocarbons and SF<sub>6</sub> were reported as “NO”.

63. The Party has made recalculations for the industrial processes sector between the 2011 and 2012 annual submissions following changes in AD and in order to rectify identified errors. The impact of these recalculations on the industrial processes sector is an increase in the estimate of emissions for 2009 of 0.5 per cent. The main recalculations took place in the following categories:

(a) Mineral products, owing to the correction of the input data for cement production and the inclusion of new AD for lime production (provided by sugar producers), limestone and dolomite use and soda ash use;

(b) Chemical industry, owing to the update of the EFs for carbon black and ethylene production.

64. The Party has made recalculations for the solvent and other product use sector between the 2011 and 2012 annual submissions following changes in AD. The impact of these recalculations on the solvent and other product use sector is an increase in the estimate of emissions for 2009 of 15.0 per cent. The main recalculations took place in the category chemical products manufacturing or processing.

65. The inventory for these sectors is generally transparent. The ERT noted that the transparency of Croatia's national inventory would be further enhanced by including in the NIR more of the input data used in the background calculations and more accurate, clear and consistent descriptions, in addition to improving the descriptions and reporting of AD in the CRF tables. The ERT specifically recommends that the time-series data for the amount of ferroalloys production be included in the NIR, in addition to the data currently provided on reducing agents, to provide better background information to explain the changes in the IEF. The ERT also recommends that the Party improve the descriptions in the NIR to make them more consistent throughout the report (e.g. clarify that there is no production of fluorinated gases, HFCs, PFCs and SF<sub>6</sub> in Croatia) and clearer (e.g. explain that the AD coverage for electrical equipment is complete because data from HEP Proizvodnja (the national power generation company) cover electricity production for the whole territory of Croatia, not just for the cities of Zagreb, Osijek and Sisak). The ERT noted that the CRF sectoral background table (table 2(I).A-G) often do not include a description of what AD were used and recommends that the Party add such description to all categories in this sector for the purpose of enhancing transparency. In addition, the ERT noted that for cement production the current AD reported in the CRF tables are pre-adjusted by the cement kiln dust factor, and therefore recommends that the current AD be replaced by non-adjusted values, for the purpose of enhancing comparability across Parties.

66. Regarding completeness, in the previous review report it was noted that Croatia had reported CO<sub>2</sub> emissions from glass production as "NE", but the Party reported in the 2012 NIR that emissions from the use of carbonate materials in glass production were included in the emission estimates for the categories limestone and dolomite use and soda ash use. Croatia confirmed during the review that this was an error and that the notation key "NE" will be changed to included elsewhere ("IE") for this subcategory. The ERT recommends that the notation key is corrected in the next annual submission.

67. The ERT commends Croatia for improving the consistency between the CRF tables and the NIR, following the recommendation made in the previous review report regarding discrepancies observed in the identification of key categories. The ERT also commends Croatia for including new data collected from sugar manufacturers on CO<sub>2</sub> emissions from lime production, to further enhance the completeness of the inventory, and recommends that Croatia continue to refine the AD for all categories in this sector, by conducting more thorough checks against international statistics, general economic trends and domestic regulation changes, such as bans on the use of certain equipment, that may affect trends.

## 2. Key categories

### Ammonia production – CO<sub>2</sub>

68. CO<sub>2</sub> emissions from ammonia production were estimated following the Revised 1996 IPCC Guidelines, on the basis of natural gas consumption, and applying a country-specific EF derived from measurements of natural gas composition. Data on the consumption and composition of natural gas used as feedstock were collected from a survey of ammonia manufacturers (Petrokemija Fertilizer Company Kutina) and cross-checked against ammonia production data from annual industrial reports published by the Croatian Central Bureau of Statistics (CBS), Department of Manufacturing and Mining.

69. The ERT noted that the CO<sub>2</sub> IEF for ammonia production (1.1 t CO<sub>2</sub>/t) is lower than the IPCC default EF of 1.5–1.6 t CO<sub>2</sub>/t and is among the lowest compared with those of the other Parties that report these emissions. The ERT therefore recommends that, in its next NIR, Croatia provide more general information about the survey that it conducted among the ammonia manufacturers that provided the data, but also more specifically with regard to the approach used to split natural gas between that used as fuel and that used as feedstock.

70. The ERT also noted that there are descriptions in the industrial processes chapter of the NIR of the method used for estimating emissions from consumption of natural gas as fuel, and therefore recommends that Croatia make a clear distinction in both the CRF tables and the NIR between the energy and industrial processes sectors with regard to fuel and feedstock issues.

### Consumption of halocarbons and SE<sub>6</sub> – HFCs and PFCs<sup>7</sup>

71. The actual HFC emissions from refrigeration and air-conditioning equipment in Croatia were estimated using the tier 2 method and default EFs from the Revised 1996 IPCC Guidelines. Potential HFC and PFC emissions were calculated on the basis of the Revised 1996 IPCC Guidelines, and the potential PFC emissions act as a substitute for the actual emissions. The NIR explains that potential emissions of PFCs were added to the total actual emissions of HFCs. However, as confirmed by Croatia during the review, this is a reporting error in the NIR, because in the CRF tables the potential emissions of PFCs have been reported separately and not included in the total HFC emissions from refrigeration and air-conditioning equipment. The ERT recommends that this error in the NIR be corrected in the next annual submission.

72. Croatia has reported HFC emissions from refrigeration and air-conditioning equipment for 1995 onwards, using data compiled by MENP. Emissions from manufacturing and disposal for this subcategory are reported as “NO”. The ERT noted that Croatia explains in its NIR that decommissioning and disposal have not occurred so far because all equipment is still functioning and in use. The Party explained during the review that the country started using HFCs later than many other countries, because it is an Article 5 Party under the Montreal Protocol, and that equipment using hydro chlorofluorocarbons is still in use. The ERT acknowledges Croatia’s situation; however, it noted that, according to the Revised 1996 IPCC Guidelines, the default lifetime for refrigeration and air-conditioning equipment is 12 to 15 years, and 10 to 15 years according to the IPCC good practice guidance, each depending on the device. The current explanation in the NIR indicates that the use of this equipment started in 1995, leading the ERT to assume that it is

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<sup>7</sup> Not all emissions related to all gases and subcategories under this category are key categories, particularly PFC emissions from refrigeration and air-conditioning equipment, HFC emissions from foam blowing and HFC and PFC emissions for all other subcategories. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases and subcategories are not assessed in separate sections.

likely that decommissioning and disposal of equipment using HFCs will soon occur. The ERT therefore encourages Croatia to conduct a new survey in the near future on the status of disposal of refrigeration and air-conditioning equipment in the country and include the findings in the NIR.

73. Croatia reported potential HFC emissions from foam blowing for 2006 to 2010. However, it did not report actual emissions for these years. Since actual HFC emissions were reported for other subcategories in the category consumption of halocarbons and SF<sub>6</sub>, the potential emissions reported from foam blowing were not included in the national totals for HFCs. The ERT noted that a methodology is provided in the Revised 1996 IPCC Guidelines (section 2.17.3 (tier 1) and section 2.17.4 (tier 2)) to estimate HFC emissions for this subcategory, and that total HFC emissions had potentially been underestimated.

74. In response to the list of potential problems and further questions raised by the ERT during the review week, Croatia provided revised emission estimates for 2006 to 2010, including the currently estimated potential HFC emissions to act as a substitute for actual HFC emissions from foam blowing. The impact of the revision is an increase in the estimate for 2010 of 5.05 Gg CO<sub>2</sub> eq. The ERT agrees with the revised estimates and recommends that Croatia transparently document the methodology used for the calculations in its next NIR. However, the ERT noted that, although the estimates are correctly reflected in the sectoral total, there is a lack of data in the CRF sectoral background table. The ERT therefore recommends that Croatia complete this table, as appropriate, in its next annual submission. Also, the ERT encourages Croatia to continue in its efforts to collect data to estimate actual HFC emissions from foam blowing.

### **3. Non-key categories**

#### Soda ash use – CO<sub>2</sub>

75. Croatia estimated CO<sub>2</sub> emissions from soda ash use occurring in the manufacturing of glass, ceramics, soap and detergents using bottom-up collected AD from annual industrial reports published by CBS, Department of Manufacturing and Mining, and surveys of manufacturers. However, the total amount of soda ash used by Croatia for the estimation of CO<sub>2</sub> emissions from soda ash use is lower by 9,135 t (3.79 Gg CO<sub>2</sub> eq) than the value of the total soda ash available in Croatia for 2010, as obtained from the United Nations Commodity Trade Statistics Database (Comtrade) (imports minus exports, for disodium carbonate). Croatia could not explain the discrepancy (i.e. where this remaining soda ash was used), which indicates that AD may not have been accounted for, thus suggesting a potential underestimation of emissions.

76. In response to the list of potential problems and further questions raised by the ERT during the review week, Croatia provided revised emission estimates for the entire time series, which were based on import and export data obtained from CBS, Department of Foreign Trade, and are consistent with the data from United Nations Comtrade. The impact of the revision is an increase in the estimate of emissions from soda ash use for 2010 of 3.79 Gg CO<sub>2</sub> eq, or 19.0 per cent. The ERT agrees with the revised estimates and recommends that Croatia transparently document the AD used for the calculations in the NIR of its next annual submission.

## **D. Agriculture**

### **1. Sector overview**

77. In 2010, emissions from the agriculture sector amounted to 3,265.09 Gg CO<sub>2</sub> eq, or 11.4 per cent of total GHG emissions. Since 1990, emissions have decreased by 25.5

per cent. The key driver for the fall in emissions is a decrease in the livestock population, leading to a decrease in emissions for all categories, as follows: enteric fermentation by 34.9 per cent since 1990, manure management by 39.3 per cent since 1990 and agricultural soils by 17.5 per cent since 1990. Within the sector, 63.9 per cent of the emissions were from agricultural soils, followed by 24.8 per cent from enteric fermentation and 11.4 per cent from manure management.

78. Croatia has made recalculations for the agriculture sector between the 2011 and 2012 annual submissions in response to the 2011 annual review report and following changes in AD and EFs. The impact of these recalculations on the agriculture sector is an increase in the estimate of emissions for 2009 of 1.5 per cent. The main recalculations took place in the following categories:

- (a) Enteric fermentation, owing to changes in the AD for the populations of sheep, horse, mules and asses and the milk yield of dairy cattle;
- (b) Manure management, owing to changes in the AD for the populations of sheep, horses, mules and asses;
- (c) Agricultural soils, owing to revisions of the N excretion values resulting from changes in the AD for livestock populations and the use of synthetic fertilizers, the addition of sewage sludge and the addition of estimates of N<sub>2</sub>O emissions from new cropping activities.

79. The inventory for the agriculture sector is complete with respect to the coverage of categories, gases and years, and has generally been reported in a transparent manner. Sources of AD and EFs, the methodological issues and the emissions trends do need to be more clearly explained in the NIR. The uncertainties, recalculations, QA/QC procedures and planned improvements have also been reported in the NIR at the category level. The ERT noted that the transparency of Croatia's reporting could be improved; corresponding recommendations are presented in paragraphs 80–82 below.

80. The NIR lacks information on how the AD for the agriculture sector are sourced. In response to questions raised by the ERT during the review, Croatia provided information on the data sources. Data on livestock populations are sourced from CBS. The data for between 1990 and 2003 are based on cadastral surveys. In 2004 there was an agricultural census, with smaller-sample surveys conducted in 2007 and 2010. The next sample survey is planned for 2013. Smaller surveys were conducted in other years. The scope of the data covers agricultural production by smallholdings, households and animal waste management systems. The animal population statistics report stocks as at 1 December every year. Croatia informed the ERT that the data collection complies with Eurostat requirements, including QA/QC for European Union (EU) agricultural statistics and completion of Eurostat data tables. Slaughterhouse statistics provide data on carcass weights; livestock registries provide data on live animal weights and animal births, deaths and trades. Milk fat and protein percentages for dairy milk are based on laboratory testing. The ERT recommends that Croatia provide more information in the NIR, such as the sources of AD and the information provided to the ERT during the review, in its next annual submission.

81. The previous and present ERTs identified room for the further improvement of transparency, recommending that Croatia include, in its next annual submission, the following: information on the annual average N excretion rates (N<sub>ex</sub>) for livestock and the fractions of N<sub>ex</sub> that are managed for each animal waste management system for each animal type and the source of information for these data; the reasons for the choice of parameters for different sources (e.g. numbers of goats and mules and asses, and crop production levels of cowpeas, lentils, peas and vetches); an explanation of how time-series consistency is ensured; information on how each of the four sources of information (page 165 of the NIR) were used to establish the dry matter content of crop residues, specifically

linking the four sources of information to the specific activity; information on the residue to crop product mass ratio; information on the N content of N-fixing crops and an explanation of which data sources are used for the same parameters for non-N-fixing crops; information on the drivers of and explanations for trends (e.g. during the review Croatia explained how farm earnings have driven fertilizer use); an explanation of how and where the references in the reference section are used in the NIR; and the logical basis for expert judgement, such as in relation to the area of organic soils. During the review, Croatia provided the ERT with information related to all of the aforementioned issues, and the ERT reiterates the recommendation made in the previous review report that the Party include this information in the NIR of its next annual submission, together with the relevant data.

82. Information on the choice of uncertainty values is reported in the NIR, but not for all categories (e.g. in particular the logical basis supporting the expert judgement used to determine the uncertainty of the AD is missing). In response to questions raised by the ERT during the review, the Party provided the relevant information. The expert judgement used to determine the uncertainty of the AD is based on observing annual variations in AD and variations due to the periodic revisions to the AD. The ERT recommends that Croatia include this information in the NIR of its next annual submission. The ERT also recommends that Croatia follow the UNFCCC reporting guidelines and include in the NIR information on QA/QC and planned improvements in subsections, and include subsection headings for rice cultivation, burning of crop residues and prescribed burning of savannas with explanations as to why the activities are not occurring.

83. The emission estimates reported in the inventory are accurate for 2008 to 2010 and have been estimated generally in line with the provisions of the IPCC good practice guidance. The previous ERT noted some inconsistencies in the time series of some EFs. In particular, for the estimation of emissions from enteric fermentation for sheep and swine and from manure management for sheep, goats, horses, mules and asses, swine and poultry, Croatia used IPCC default EFs for developing countries for the period 1990–2007 and IPCC default EFs for developed countries for the period 2008–2010. In response to questions raised by the ERT during the review, the Party stated that the use of the EFs for developed countries are appropriate for the conditions in Croatia from 2008 onwards because Croatia has made efforts to improve the productivity of livestock since 2008.

84. During the review, Croatia provided the ERT with information on the number of sheep and pigs, live animal weights and wool production. The ERT assessed the sheep and swine productivity from 2000 to 2011 from the information provided and determined that there were no observed step changes in livestock performance to justify the commensurate step changes in the EFs from 2008. Croatia explained that a project proposal for the development of country-specific EFs is under development and will ensure time-series consistency. Approval for the project has been granted and it is expected to start at the end of 2012. The ERT considers that a tier 2 method is the appropriate method for Croatia to use to relate EFs to animal productivity, and noted that Croatia has sufficient data on animal performance to develop a tier 2 model. The ERT considers that the consistency of the time series and comparability with other Parties have not been ensured in the inventory, and therefore recommends that Croatia improve the time-series consistency and comparability with other Parties in the next annual submission in accordance with the IPCC good practice guidance and use the EFs for developed countries for the entire time series. For future annual submissions, the ERT recommends that Croatia develop tier 2 methods where data and methods are available.

85. The Croatian Ministry of Agriculture coordinates the statistical returns to FAO using agricultural data reported by CBS. The ERT found no differences in the livestock numbers for cattle, sheep, goats, horses and swine between the data in the CRF tables and the data reported by FAO. Revisions have been made to the population of mules and asses in the

2012 CRF tables. However, the revisions had not been reflected by FAO at the time of the review.

86. Data for crop production (tonnes), both N-fixing and non-N-fixing crops, have been reported in the NIR but not in the CRF tables. The ERT noted that the CRF tables are the appropriate place in the annual submission to report all AD. The ERT recommends that Croatia complete CRF table 4.F with information on crop production, even in the case that no field burning of agricultural residues occurs, as these data are used to calculate N<sub>2</sub>O emissions from agricultural soils.

## 2. Key categories

### Enteric fermentation – CH<sub>4</sub>

87. The ERT noted that, in the tier 2 calculations of emissions from enteric fermentation, Croatia used default values for cattle live weights and also for milk fat percentages. However, Croatia does have country-specific data on animal live weights and milk fat percentages, as noted previously (see para. 80 above). The ERT recommends that Croatia use country-specific data for these factors where country-specific values exist.

### Manure management – CH<sub>4</sub> and N<sub>2</sub>O

88. Croatia used a tier 1 method together with IPCC default EFs to estimate CH<sub>4</sub> emissions from manure management for cattle, sheep, goats, horses, mules and asses, swine and poultry. The ERT recommends that the Party develop tier 2 estimates using country-specific EFs for the most significant animal types, namely cattle (based on the gross energy intake associated with the relevant EF used for enteric fermentation) and swine. The ERT noted that a tier 2 method is the appropriate method for Croatia to use if EFs are to be related to livestock productivity.

89. The Party used the default method presented in the IPCC good practice guidance, together with country-specific and default AD and EFs, to estimate N<sub>2</sub>O emissions from livestock manure management. The ERT recommends that Croatia develop country-specific values for the annual average Nex/head of species and for the fraction of total annual Nex for each livestock species that is managed for every manure management system and report these values and information sources in the NIR of its next annual submission.

### Agricultural soils – N<sub>2</sub>O

90. In response to the list of potential problems and further questions raised by the previous ERT, Croatia included some new crops in the calculation of N<sub>2</sub>O emissions from crop residues (in particular cabbage, garlic, onion, rye, sorghum and watermelons), using the country-specific values of other reporting Parties for the dry matter fraction, the residue/crop product ratio and the N fraction in cases where these values are not available in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance. The revision resulted in an increase in the estimate of total N<sub>2</sub>O emissions from agricultural soils for 2009 of less than 0.1 per cent. The ERT commends Croatia for including estimates of emissions from crops for which there is no methodology in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance. The ERT recommends that Croatia report all crop data under crop production in CRF table 4.F in its next annual submission.

91. Croatia estimated emissions of N<sub>2</sub>O from the application of sewage sludge to agricultural land for the first time for its 2012 annual submission. Croatia explained that it was not possible to obtain data for sludge for 1990–1994. The ERT recommends that Croatia consider options such as trend extrapolation or a surrogate method (i.e. using

drivers) to estimate AD and emissions for 1990–1994. These methods are explained in section 7.3.1 of the IPCC good practice guidance.

92. The previous ERT found the amount of N in fertilizers to be higher according to the FAO statistical data than according to the data reported in the CRF tables for 2009. In addition, it noted that there are differences between the data on N in fertilizers reported by FAO and the data reported in the CRF tables. The FAO fertilizer data for 2006 to 2009 seem to be highly variable and these years appear to be outliers. The FAO data state that Croatia used 66,830 t N in fertilizers in 2010, whereas the value reported in CRF table 4.D is 99,445.25 t N. The FAO fertilizer data are based on modelled estimates using United Nations trade data. During the review, Croatia explained that there are three companies that supply fertilizer within Croatia and company sales records together with information on N content are used to estimate the total N applied. The ERT considers that this approach will tend to provide an overestimate of the N applied to soils, compared with data from farm surveys. In response to questions raised by the ERT during the review, Croatia stated that it has been working with Eurostat and FAO to reconcile and explain the differences between the FAO and CRF data for the N in fertilizers. The ERT recommends that Croatia continue its efforts with FAO and either reconcile or document the reasons for the differences in the values of N reported by FAO and used in the CRF tables.

93. Croatia collects statistics on the proportions of animal waste management practices. Nex rates for each manure management system are based on the Revised 1996 IPCC Guidelines. The ERT recommends that Croatia use the country-specific data which are available on waste management systems for the Nex rates for each manure management system.

## **E. Land use, land-use change and forestry**

### **1. Sector overview**

94. In 2010, net removals from the LULUCF sector amounted to 8,283.50 Gg CO<sub>2</sub> eq. Since 1990, net removals have increased by 48.1 per cent. The key driver for the rise in removals is the increase in removals from forest land remaining forest land following the re-establishment of forest management in areas affected by the war in Croatia. Within the sector, 8,754.43 Gg of net removals were from forest land, followed by 258.23 Gg from grassland and 12.93 Gg from cropland. There were net emissions of 712.82 Gg from settlements, while net emissions from wetlands accounted for 29.26 Gg.

95. The Party has made recalculations for the LULUCF sector between the 2011 and 2012 annual submissions in response to recommendations made in previous review reports, owing to changes in AD and in order to rectify identified errors. The impact of these recalculations on the LULUCF sector is a decrease in the estimate of net removals for 2009 of 11.0 per cent. Recalculations took place in all categories. The main recalculations were due to the inclusion of previously unreported categories (see para. 96 below).

96. Croatia has made significant improvements to the completeness of the inventory for the LULUCF sector, including estimates for the cropland, grassland and wetlands categories for the first time and improving the coverage of the conversion subcategories and pools in the forest land and settlement categories. However, the inventory for the LULUCF sector remains incomplete. Emissions and removals were not estimated for the following: maquia and scrub (Mediterranean shrubland biome also referred to as ‘out of yield’ forests in the NIR) in forest land remaining forest land; other land converted to forest land; conversion of maquia and scrub, private and ‘other state’ forest land to other categories; and the application of lime on cropland. The ERT reiterates the recommendations made in

previous review reports that Croatia provide, in its next annual submission, estimates for all land-use categories and pools in line with IPCC good practice guidance for LULUCF.

97. In relation to the completeness of its reporting, the Party has also not provided annual land-use change matrix tables and has only provided uncertainty estimates for forest land remaining forest land and land converted to settlements. In addition, the reporting of land areas in the CRF tables was incomplete, because the sum of the areas reported in the CRF tables is not equal to the total area of Croatia. Land areas for the following categories were not included: 'out of yield' forest land; other land converted to forest land; annual cropland remaining annual cropland; and the settlements, wetlands and other land remaining categories. The ERT reiterates the recommendation made in previous review reports that Croatia provide complete land-use change matrices for all years since 1990. In addition, the ERT recommends that Croatia include land areas for all land-use categories in the CRF tables and provide complete uncertainty estimates in the next annual submission.

98. The inventory for this sector is generally transparent, but the ERT noted that the transparency of the NIR could be improved, as there was insufficient information provided to explain the forest types covered in each of the forest subdivisions used for the reporting, and to explain the forest management plans that underlie much of the data collection. Additional information is also required to explain the reason for the changes in the coverage of and corrections to the CBS data, the basis for expert judgements and the source of reference materials (e.g. default parameter tables and soil data). The transparency of the estimates of emissions and removals reported in the CRF tables could also be improved, by reporting emissions from organic cropland soils separately from emissions from mineral soils, by reporting litter separately from soils in the conversion categories and by using, where possible, consistent forest subdivisions for the reporting between and within the Convention categories and Kyoto Protocol activities. The ERT recommends that Croatia improve the transparency of its reporting in the NIR and the CRF tables in its next annual submission, in particular with regard to the issues identified above.

99. The ERT identified a number of issues with the information provided in the CRF tables, including: incorrect use of the notation keys; inadequate explanations of "IE" and "NE"; and the inclusion of unnecessary subdivisions. For example, other land converted to forest land has been incorrectly reported as "NO" rather than "NE", while other forest land transition categories have been reported as "NO", and cropland includes subcategories reported as "IE". The ERT recommends that Croatia review the use of the notation keys and other information contained in the CRF tables and improve the future QC of the CRF tables. During the review, the Party explained that some tier 2 QC checks were undertaken to compare the country-specific soil data with the data of other countries. The ERT recommends that Croatia report on these QC checks and the results in the NIR of its next annual submission.

100. The Party has detailed in the NIR the areas where it plans to make improvements to the inventory for the LULUCF sector to address issues raised in previous review reports. Given the large number of improvements identified for the LULUCF sector, the ERT encourages Croatia to provide more detailed information, in its next annual submission, on the priorities and likely timing of implementation for these improvements.

## 2. Key categories

### Forest land remaining forest land – CO<sub>2</sub>

101. The reporting on this category is incomplete because estimates are only available for the following: high forests, cultures, plantations and coppices. Carbon stock changes in other forest types (including maquia and scrub) have not been estimated. The ERT reiterates the recommendation made in previous review reports that the Party report

emissions and removals for all forest types and carbon pools for forest land remaining forest land in its next annual submission.

102. During the review, the Party explained that maquia and scrub are not harvested for timber but are covered by forest management plans to ensure that they are sustainably managed. The ERT understands that these forests are subject to wildfires but that the associated CO<sub>2</sub> emissions and removals have not been estimated. In response to questions raised during the review, Croatia explained that it does not have data on carbon stock changes as these forests are left to regenerate naturally, unlike other forest types, where changes are captured through subsequent wood removal. The ERT recommends that Croatia determine the area of wildfires on maquia and scrub and estimate emissions and removals from the loss and subsequent regrowth of biomass and dead organic matter (DOM).

103. Croatia estimated the carbon stock changes in living biomass using default IPCC parameters, while carbon stock changes in the DOM and soil pools are assumed not to occur, applying the tier 1 method. Forest land remaining forest land is a key category, so the ERT reiterates the recommendation made in the previous review report that Croatia work towards implementing country-specific data (this could include using data from countries with similar vegetation and conditions) and estimate carbon stock changes for all pools. For the next annual submission, the ERT recommends that, as part of its QA/QC activities, as a minimum the Party test the validity of the IPCC default parameters against those of countries with similar conditions and country-specific data.

104. The method for estimating the increment for 'other state' and private forests is not transparent. On reviewing the calculation spreadsheets, the ERT noted that there appear to be inconsistencies between the methods for calculating annual growing stocks and annual increments and in the approach used to estimate post-2006 data for the different forest types. In response to questions raised during the review, Croatia informed the ERT of other issues that it has not yet addressed, including that felling data have not yet been included and that recent shifts in the lands between forest categories have resulted in negative increments. The ERT recommends that Croatia review and, if necessary, revise the methods used to estimate the increments, to ensure that biomass is neither over- nor underestimated.

105. The ERT noted that the Croatian National Forest Inventory (CRONFI) is still under official consideration and is not yet available for use for the national inventory. The ERT reiterates the recommendation made in the previous review report that Croatia make efforts to advance the consideration of the CRONFI, as it may provide data which could improve the completeness of the inventory.

#### Land converted to forest land – CO<sub>2</sub>

106. In its NIR, Croatia has reported a significant increase in the area of other land converted to forest land (increasing from 2 kha in 1990 to 251 kha in 2010). The ERT noted that, as the data sources used to determine the land area representation have different resolutions and classification systems, the other land category is used as a balancing term to ensure that the total land area of Croatia is reported. This approach makes it difficult to determine whether this change in land use is real or is an anomaly of the data. The ERT also noted that the Party had identified that the cadastral-based forest area data for 2006 are inaccurate and therefore determined the forest area using a mix of orthophotos, satellite images and the CORINE land-cover database. The ERT further noted that the forest area reported for 1996, however, remains based on cadastral data. The ERT recommends that Croatia undertake an investigation to verify whether the conversion from other land to forest land is a real land-use change or an anomaly of the data.

107. Croatia did not estimate the emissions and removals associated with the conversion of other land to forest land. During the review, the Party explained that an analysis is being undertaken of whether these changes occur on managed or unmanaged land, whether they are natural or human-induced and the exact year of the change. The ERT recommends that the Party estimate emissions and removals from these land conversions if they are occurring on managed land, and, if occurring on unmanaged land, these land areas should be explicitly reported in the CRF tables, in order to be consistent with the IPCC good practice guidance for LULUCF.

### 3. Non-key categories

#### Land converted to settlements – CO<sub>2</sub>

108. In response to questions raised by the ERT during the review, the Party explained that the potential conversion of maquia and scrub, 'other state' and private forest (pre-2006) to settlements is not known. As the area of settlements is determined from the CORINE land-cover database, with a correction (based on allocations in Austria and Luxembourg) to ensure that roads and railways, which are not captured in the CORINE database, are estimated, the actual area and changes in the area of settlements is unknown. The ERT recommends that Croatia collect data to determine whether these forest land types are being converted to settlements (or other land uses) and report the associated emissions and removals. In addition, the ERT encourages Croatia to develop a good-quality base map for 1990 from which to assess land-use changes.

## F. Waste

### 1. Sector overview

109. In 2010, emissions from the waste sector amounted to 1,076.29 Gg CO<sub>2</sub> eq, or 3.7 per cent of total GHG emissions. Since 1990, emissions have increased by 76.0 per cent. The key driver for the rise in emissions is the increase in emissions from solid waste disposal on land, which have risen by 214.6 per cent since 1990. However, emissions from wastewater handling have decreased by 15.2 per cent since 1990 and emissions from waste incineration have remained relatively stable. Within the sector, 70.9 per cent of the emissions were from solid waste disposal on land, followed by 29.1 per cent from wastewater handling and less than 0.1 per cent from waste incineration.

110. The Party has made recalculations for the waste sector between the 2011 and 2012 annual submissions following changes in AD. The impact of these recalculations on the waste sector is an increase in the estimate of emissions for 2009 of 0.1 per cent. The main recalculations took place in the category solid waste disposal on land, owing to an update of AD.

111. The inventory for the waste sector is complete with respect to the coverage of categories, gases and years and is generally transparent. The ERT noted that sources of AD and EFs, methodologies and the emission trends need to be more clearly explained in the NIR to improve transparency. The notation key "NE" was used to report subcategories for which methodologies are provided in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance, such as: CH<sub>4</sub> emissions from sludge (industrial wastewater and domestic and commercial wastewater) and CH<sub>4</sub> and N<sub>2</sub>O emissions from waste incineration. During the review, the Party provided further information on these categories, which resolved the issue of the potential underestimations (see paras. 118–120 below). In addition, Croatia reported as "NE" CO<sub>2</sub> emissions from managed waste disposal on land, for which no IPCC estimation method exists. The ERT encourages Croatia to explore whether CO<sub>2</sub>

emissions from managed waste disposal on land occur in the country and, if not, to change the notation key used from “NE” to “NA”.

112. The ERT identified inconsistencies between the NIR and the CRF tables. Examples include the following: the contribution of the waste sector to total GHG emissions (NIR executive summary page XXV) was reported as 9.7 per cent, whereas the correct value is 3.7 per cent; and there were no emissions of CO<sub>2</sub> from the waste sector reported in table ES 3-3, but there were 0.10 Gg CO<sub>2</sub> emissions from waste incineration reported in the CRF tables for 2010. The ERT recommends that Croatia ensure that its QA/QC procedures are properly implemented to avoid such errors in its next annual submission.

## 2. Key categories

### Solid waste disposal on land – CH<sub>4</sub>

113. The tier 2 first order decay methodology, as described in the IPCC good practice guidance, was used by Croatia to calculate CH<sub>4</sub> emissions for this category. The waste treatment was divided into three solid waste disposal site types – managed, unmanaged deep and unmanaged shallow – according to expert judgement. On the basis of these assumptions, the methane correction factor (MCF) was calculated as a share-weighted average of the three waste treatment types. This value was reported in table 8.2-2 of the NIR (page 247). During the review, the ERT identified an error in this calculation. The ERT and Croatia concluded that the MCF for 2010 was incorrect and should be 0.943 instead of 0.883, causing an underestimation of CH<sub>4</sub> emissions from solid waste disposal on land for 2010. In response to the list of potential problems and further questions raised by the ERT during the review week, Croatia checked the original data and provided a revised estimate of CH<sub>4</sub> emissions from solid waste disposal on land, using the correct MCF value (0.943), for 2010. The ERT agrees with this estimate. The impact of this revision is an increase in the estimate for 2010 of 5.62 Gg CO<sub>2</sub> eq, equivalent to 0.7 per cent of the emissions for this category.

114. The ERT noted that the transparency of the NIR could be improved for this category, for example: the first order decay methodology was used, but the initial year has not been reported; the calculation of the MCF is based on the waste treatment types in Croatia and uses expert judgement for the waste management classification, but the NIR does not provide the basis of the expert judgement; the text on page 245 of the NIR states that the fraction of degradable organic carbon (DOC) in municipal solid waste was estimated to be 0.17 for the period 1990–2004 and 0.16 for the period 2005–2010, but the assumptions considered when deriving these different values from the ranges in table 8.2-1 of the NIR have not been presented; and the method and main assumptions used for calculating the MCF for the different periods have not been clearly described in the NIR and the source of the MCF for the period 1995–1989 has not been provided. The ERT recommends that Croatia improve the transparency of the NIR by reporting the relevant background information, including the sources of EFs and AD, in the next annual submission.

115. The total amount of municipal solid waste generated and disposed in the historical period from 1955 to 1990 is based on country-specific waste generation rates, but the details of treatment measures (managed or unmanaged) were not included in NIR. The ERT encourages Croatia to conduct research in order to develop country-specific parameters for the first order decay method to increase the accuracy of the emission estimates for this category and to improve the reporting of the assumptions based on expert judgements.

### Wastewater handling – CH<sub>4</sub>

116. The IPCC tier 1 methodology was used for calculating CH<sub>4</sub> emissions from wastewater handling. The ERT noted that some basic background information is missing

from the NIR. This includes an explanation of how the fraction of wastewater treated was obtained, the basis for the MCF adopted and how AD were extrapolated. The ERT recommends that Croatia improve transparency regarding the sources of AD and the selection of EFs in the next annual submission.

117. The NIR reported that “Methane emissions from industrial wastewater have been calculated using the methodology proposed by the Revised 1996 IPCC Guidelines, by multiplying the total industrial output with degradable organic component (kg COD/m<sup>3</sup> wastewater), wastewater produced (m<sup>3</sup>/t product) and fraction of DOC removed as sludge”. During the review, the ERT checked the calculation sheet and found that Croatia did not correctly apply the methodology proposed by the Revised 1996 IPCC Guidelines (waste: equation 9). Croatia used the total amount of wastewater produced by industry instead of the amount of product produced by year (in t) in the calculation. Hence, the calculation should not have included the parameter “amount of wastewater produced by t product”, and by including this parameter Croatia might have overestimated the emissions. The ERT recommends that Croatia recalculate CH<sub>4</sub> emissions from industrial wastewater and document the method, data sources and assumptions used in the next annual submission.

118. In CRF table 6.B, CH<sub>4</sub> emissions from industrial wastewater sludge and domestic and commercial wastewater sludge have been reported as “NE”. During the review, Croatia confirmed to the ERT that there is no DOC removed as sludge from industrial wastewater treatment or from domestic and commercial wastewater treatment in Croatia. The ERT recommends that Croatia change the notation key used from “NE” to “NO” in its next annual submission.

### 3. Non-key categories

#### Waste incineration – CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

119. In CRF table 6.C, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from the incineration of sewage sludge have been reported as “NE”. During the review, Croatia confirmed that there is no sewage sludge incinerated in Croatia. The ERT recommends that Croatia correct the notation keys used from “NE” to “NO”.

120. CH<sub>4</sub> and N<sub>2</sub>O emissions from waste incineration (hazardous waste) have been reported as “NE” in CRF table 6.C. While there is no methodology provided for estimating CH<sub>4</sub> emissions, the IPCC good practice guidance provides a methodology for estimating N<sub>2</sub>O emissions from waste incineration and default N<sub>2</sub>O EFs for the incineration of waste (rotating treatment plants) for hazardous waste from industry (table 5.7: N<sub>2</sub>O EF for rotating 210–240 kg N<sub>2</sub>O/Gg waste (dry)). Croatia did estimate CO<sub>2</sub> emissions from the incineration of hazardous waste and reported in CRF table 6.C that in 2010 0.03 Gg hazardous waste was incinerated. During the review, the Party confirmed that the rotating technique is used for waste incineration in Croatia. Considering that the activity exists and that a default EF is provided, the ERT concluded that N<sub>2</sub>O emissions from waste incineration should be estimated. In response to the list of potential problems and further questions raised by the ERT during the review, Croatia stated that rotation treatment plants are used only for cement clinker production, for which emissions are reported under the energy sector, and that information on other types of incineration technology for hazardous waste is not available from the Environmental Pollution Register database. The ERT recommends that Croatia research and identify the technologies applied in the incineration of hazardous waste and provide this information in the next annual submission.

**G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol**

**1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol**

Overview

121. Croatia has submitted estimates for afforestation, reforestation and deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol and for the elected activity forest management under Article 3, paragraph 4, of the Kyoto Protocol for 2008, 2009 and 2010. The Party has chosen to account for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol at the end of the first commitment period. The estimates are generally in line with the requirements outlined in decision 15/CMP.1, annex, paragraphs 5–9. In relation to the requirements of decision 15/CMP.1, annex, paragraph 6(b), the ERT recommends that Croatia include in the NIR the maps reported in the previous annual submission and provided during the review week, which show the geographical location of the boundaries of the areas that encompass the land units.

122. For ‘state forests’, the ERT assessed that the information on afforestation and deforestation for these forests meets the requirements of the IPCC good practice guidance for LULUCF for the identification (decision 16/CMP.1, annex, paragraph 20) and reporting of the geographical location of the boundaries encompassing the units of land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol (decision 15/CMP.1, annex, paragraph 6(b)). Afforestation information for the ‘state forests’ is collected from Forest Management Area Plans, which collect data on a 0.05 ha grid. Deforestation of ‘state forests’ is strictly controlled under the Croatian Forestry Act and these lands must be formally excluded from the national forest management areas.

123. For the other forest categories (‘other state’, private (pre-2006) and maquia and scrub) information on afforestation and reforestation and deforestation is currently not available. This makes the identification and traceability of such lands a potential problem (decision 16/CMP.1, annex, paragraphs 19 and 20) and could result in a possible underestimation of emissions and removals from land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol. The ERT noted that, for these other forest categories, Croatia must identify and report emissions and removals from afforestation and reforestation, and deforestation lands by its 2014 annual submission. In addition, Croatia needs to ensure that it is able to trace afforested and deforested lands and ensure that it is able to determine the harvesting or future deforestation of afforested lands by its 2014 annual submission.<sup>8</sup>

124. During the review week, Croatia did not provide information on how it will ensure the identification and traceability of afforestation and deforestation lands. In response to the list of potential problems and further questions raised by the ERT during the review week, Croatia provided the following information: (a) in relation to the identification of deforestation on other forest lands, Croatia will provide a conservative estimate in its 2013 annual submission, calculated using a statistical approach based on an extrapolation of trends in known deforestation activities and major infrastructure works and taking into consideration the protection status of the other forest lands; and (b) in relation to afforestation and reforestation, Croatia explained that information on these activities is potentially available in the forest management plans of the other forest lands, but because these plans are not centralized it currently does not have the capacity to collect and extract

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<sup>8</sup> As Croatia opted to account for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol at the end of the first commitment period, the 2014 annual submission is the latest point in time for the Party to provide complete estimates for these activities.

data from the plans. To address the identification and traceability issues for afforestation and reforestation, Croatia indicated to the ERT that it proposes to undertake an assessment of a representative sample of forest management plans (for all forest categories) over time to assess the reason for changes in forest area (directly human-induced or not) and the year of land-use change. The results of this statistically representative sample will be extrapolated to the whole country. In addition to filling the data gap for other forest lands, the analysis will also enable Croatia to allocate the areas identified as other land converted to forest land to the appropriate KP-LULUCF reporting activity. The ERT strongly recommends that these planned improvements and the additional information provided be detailed in the NIR of the next annual submission.

125. The Party has made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions in response to previous annual review reports, owing to changes in AD and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

- (a) Afforestation and reforestation: estimated removals increased by 0.7 per cent;
- (b) Deforestation: estimated emissions increased by 209.2 per cent;
- (c) Forest management: estimated removals decreased by 7.6 per cent.

#### Activities under Article 3, paragraph 3, of the Kyoto Protocol

##### *Afforestation and reforestation – CO<sub>2</sub>*

126. In response to recommendations made in the previous review report, the Party has improved the coverage of pools (i.e. soils and litter) and the justification that omitted pools (i.e. DOM) are not a net source of emissions. Data on afforestation for ‘other state’ forests, private forests (pre-2006) and maquia and scrub are currently not available. The ERT strongly recommends that Croatia estimate afforestation for all land areas, using the methods proposed by the Party (see para. 124 above), as soon as practicable, but no later than by the 2014 annual submission.

##### *Deforestation – CO<sub>2</sub>*

127. The Party has improved the completeness of its deforestation estimates for ‘state’ forests, with carbon stock changes for all pools now reported. Carbon stock changes in litter are included in the soil estimates and DOM is included in the biomass estimates. Data on the deforestation of ‘other state’ forests, private forests (pre-2006) and maquia and scrub are currently not available, which may indicate that emissions from this KP-LULUCF activity have been underestimated. The ERT strongly recommends that AD be developed for the other forest types as proposed by Croatia (see para. 124 above) and that estimates of emissions and removals be reported in the next annual submission.

#### Activities under Article 3, paragraph 4, of the Kyoto Protocol

##### *Forest management – CO<sub>2</sub>*

128. There are inconsistencies in the area of forest management reported in the land-transition matrix tables (NIR-2) and KP-LULUCF table 5(KP-1)B.1. In the land-transition matrix tables (NIR-2) the areas of forest management and other at the beginning of the current inventory year do not match the area at the end of the previous year. In addition, the forest management areas reported in the land-transition matrices do not match those reported for forest management in KP-LULUCF table 5(KP-1)B.1 or for the forest land remaining forest land category under the Convention. In response to the list of potential problems and further questions raised by the ERT during the review week, Croatia clarified

that the forest management land area includes the areas of other land converted to forest land which are not yet confirmed as afforestation and reforestation land and are excluded from the Convention reporting tables. The ERT strongly recommends that Croatia review and correct the KP-LULUCF land-transition matrices and the areas reported for forest management. The ERT also recommends that Croatia provide explanations for the difference in the reported forest areas between forest management and forest land remaining forest land in the NIR.

129. As outlined previously in relation to forest land remaining forest land (see para. 101 above), carbon stock changes for the other forest types have not been estimated under forest management. The ERT strongly reiterates the recommendation made in the previous review report that Croatia estimate emissions and removals for all managed forest types for its next annual submission.

## **2. Information on Kyoto Protocol units**

### Standard electronic format and reports from the national registry

130. Croatia has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the SIAR on the SEF tables and the SEF comparison report.<sup>9</sup> The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR.

131. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies. The ERT noted that Croatia has not reported any transfer, acquisition, retirement or cancellation of Kyoto Protocol units in the SEF tables, because the issuance of the assigned amount units following the establishment of the assignment amount only occurred in February 2012, and the Party's registry will only be fully operative in January 2013, which is in accordance with decision 14/CMP.1, annex, paragraph 3.

### National registry

132. The ERT took note of the SIAR and its finding that the reported information on the national registry is complete and has been submitted in accordance with the annex to decision 15/CMP.1. The ERT further noted from the SIAR and its finding that the national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with decisions 16/CP.10 and 12/CMP.1. The national registry also has adequate security, data safeguard and disaster recovery measures in place and its operational performance is adequate. Although the SIAR recognized that the national registry has fulfilled all requirements regarding the public

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<sup>9</sup> The SEF comparison report is prepared by the ITL administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

availability of information in accordance with decision 13/CMP.1, annex, chapter II.E, the ERT, in line with the SIAR, recommends that Croatia make the required information publicly available as soon as its registry has performed a Kyoto Protocol unit transaction.

133. The ERT noted that Croatia has taken actions to implement the recommendations made in the previous review report in relation to the availability of complete public information, reporting in the NIR the reasons for not yet reporting all the information in accordance with decision 13/CMP.1, annex, paragraphs 45–48.

#### Calculation of the commitment period reserve

134. Croatia has reported its commitment period reserve in its 2012 annual submission. The Party reported in chapter 12 of the NIR its commitment period reserve to be 142,985,025.08 t CO<sub>2</sub> eq, based on the national emissions in its inventory for 2010 in its 2012 annual submission (28,597.03 Gg CO<sub>2</sub> eq). The ERT disagrees with this figure, noting that it is not in line with decision 11/CMP.1, annex, paragraph 6, because the value reported is higher than 90 per cent of the Party's assigned amount calculated pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol. During the review, Croatia informed the ERT that the correct value for its commitment period reserve is 133,900,653 t CO<sub>2</sub> eq, based on the assigned amount (148,778,503 t CO<sub>2</sub> eq). The ERT agrees with this figure. The ERT recommends that Croatia report its commitment period reserve correctly in its next annual submission.

### **3. Changes to the national system**

135. Croatia reported that there have been changes in its national system since the previous annual submission. The Party described the change of regulations in its NIR. The new regulations include a revision of the Regulation on Greenhouse Gas Emissions Monitoring in the Republic of Croatia in order to align it with the requirements of the EU, and a new Air Protection Act, enacted in November 2011, that further strengthens the obligation for the collection of AD by competent sectoral authorities. However, Croatia did not detail how the changes will affect the functions and roles of the institutions involved and the inventory planning and management.

136. During the review, Croatia provided the ERT with a copy of the new Air Protection Act and further explained how it will affect the inventory preparation. The Act legally establishes that the state administration bodies and other public bodies competent in activities pertaining to environmental protection, the economy, agriculture, forestry, water management, sea, transport and official statistics shall deliver data on GHG emissions and removals by 30 June each year for the previous calendar year, and establishes that these bodies shall participate in the inventory preparation and review. The ERT commends Croatia for this improvement in the national system but recommends that the Party report in its next annual submission any changes in its national system, detailing how the changes affect the general and specific functions of the national system, including roles and responsibilities, in accordance with decision 15/CMP.1, annex, chapter I.F. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

### **4. Changes to the national registry**

137. Croatia reported that there are no changes in its national registry since the previous annual submission. The ERT concluded that the Party's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol.

## **5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol**

138. Croatia did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its 2012 annual submission. However, the ERT identified that the information reported in the NIR is exactly the same as that reported in the previous annual submission. The ERT acknowledges that reporting all information increases transparency; however, it recommends that the Party, in its next annual submission, report also any changes in the information provided under Article 3, paragraph 14, in accordance with decision 15/CMP.1, annex, chapter I.H.

139. The reported information is generally complete and transparent and includes information on policy elements for the mitigation of climate change in order to fulfil the Party's commitments under Article 3, paragraph 1, of the Kyoto Protocol, and information on the 33 measures included in the Air Quality Protection and Improvement Plan of the Republic of Croatia. The ERT reiterates the encouragement made in the previous review reports for the Party to improve the completeness and transparency of this information by reporting on how it gives priority, in implementing its commitments under Article 3, paragraph 14, to the actions listed in decision 15/CMP.1, annex, paragraph 24.

## **III. Conclusions and recommendations**

### **A. Conclusions**

140. Croatia made its annual submission on 13 April 2012 and resubmitted it on 25 May 2012. The annual submission contains the GHG inventory (comprising the CRF tables and an NIR) and supplementary information under Article 7, paragraph 1, of the Kyoto Protocol (information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, Kyoto Protocol units, changes to the national system and the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol). This is in line with decision 15/CMP.1.

141. The ERT concludes that the inventory submission of Croatia has been prepared and reported in accordance with the UNFCCC reporting guidelines. The inventory submission is complete and the Party has submitted a complete set of CRF tables for the years 1990–2010 and an NIR; these are complete in terms of geographical coverage, years and sectors, as well as generally complete in terms of categories and gases. However, despite a significant improvement, the inventory for the LULUCF sector remains incomplete, with emission estimates missing for several categories and pools (see para. 96 above).

142. The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1.

143. The Party's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, higher-tier methodologies for key categories should be adopted, together with the use of country-specific EFs, particularly for estimating emissions from stationary combustion (see para. 52 above), emissions from the agriculture sector (see paras. 84, 87, 88, 89 and 93 above) and emissions and removals from the LULUCF sector (see para. 103 above).

144. The Party has made recalculations for the inventory between the 2011 and 2012 annual submissions following changes in AD and EFs, in order to rectify identified errors and owing to methodological changes. The impact of these recalculations on the national

totals is an increase in the estimate of emissions for 2009 of 1.1 per cent, not including the LULUCF sector, and an increase in the estimate of net emissions for 2009 of 6.3 per cent, including the LULUCF sector. The main recalculations took place in the following categories/sectors:

- (a) CO<sub>2</sub> removals from the LULUCF sector, owing to recalculations in all categories (see para. 95 above);
- (b) CO<sub>2</sub> emissions from road transportation, owing to the revision of AD and EFs in response to the list of potential problems and further questions raised by the ERT during the review week (see para. 56 above);
- (c) CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O fugitive emissions from oil and natural gas, to increase the completeness of the reporting in response to the list of potential problems and further questions raised by the ERT during the review week (see para. 41 above);
- (d) N<sub>2</sub>O emissions from agricultural soils, owing to the inclusion of new sources of N from sewage sludge and new crops (see para. 78 above);
- (e) CO<sub>2</sub> emissions from solvent use coming from NMVOC emissions (see para. 64 above);
- (f) CO<sub>2</sub> emissions from lime production, owing to new data provided by sugar producers (see para. 63 above).

145. Croatia has reported information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for 2008, 2009 and 2010, which is generally in line with the requirements outlined in decision 15/CMP.1, annex, paragraphs 5–9. However, information on the geographical location of the boundaries of the areas that encompass the land units (decision 15/CMP.1, annex, paragraph 6(b)) has not been provided in the NIR (see para. 122 above). Information on afforestation and reforestation and deforestation is not available for all forest categories (see paras. 123 and 124 above). This makes the identification and traceability of such lands a problem, which must be solved no later than by the Party's 2014 annual submission. Hence, the requirements of decision 16/CMP.1, annex, paragraphs 19 and 20, have not been fulfilled.

146. The Party has made recalculations for the KP-LULUCF activities between the 2011 and 2012 annual submissions in response to previous annual review reports, owing to changes in AD and in order to rectify identified errors. The impact of these recalculations on each KP-LULUCF activity for 2009 is as follows:

- (a) Afforestation and reforestation: estimated removals increased by 0.7 per cent;
- (b) Deforestation: estimated emissions increased by 209.2 per cent;
- (c) Forest management: estimated removals decreased by 7.6 per cent.

147. Croatia has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1.

148. The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1.

149. The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the CMP.

150. Croatia has reported information under decision 15/CMP.1, annex, chapter I.H, "Minimization of adverse impacts in accordance with Article 3, paragraph 14", as part of its

2012 annual submission. Although Croatia did not highlight it in the NIR, the ERT noted that the information is exactly the same as that reported in the previous annual submission. The reported information is generally complete and transparent (see para 139 above).

## B. Recommendations

151. The ERT identifies issues for improvement as listed in table 6 below.

Table 6  
Recommendations identified by the expert review team

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>	
General	Completeness	Provide estimates for all LULUCF categories and pools.	12 and 95	
	Key category analysis	Include explanations in the NIR of how the key category analysis is used to drive the improvement of the inventory.	20	
	Key category analysis – KP-LULUCF	Provide in the NIR a description of the KP-LULUCF key categories, together with the rationale for their identification as key.	21	
	Uncertainty	Develop a full set of uncertainty values for the LULUCF sector.	22	
	Uncertainty/ QA/QC	Improve quality checks, in order to prevent the presentation of different uncertainty values in different sections of the NIR.	23	
	Uncertainty		Provide more details on and justify the correlation assumptions used for each category in the uncertainty calculations.	24
			Improve the QC checks in order to prevent mistakes in the uncertainty calculations.	25
			Provide information in the NIR on how the Party uses the results of the uncertainty analysis in the prioritization of future inventory improvements.	26
	Time-series consistency	Recalculate the entire time series for CH <sub>4</sub> emissions from enteric fermentation and manure management using EFs for developed countries to maintain the time-series consistency.	28	
	QA/QC and follow-up to previous reviews	Include more information on the QC procedures and the relevant information from the QA/QC plan related to planned improvements and follow-up to previous review reports in the NIR.	29 and 33	
Archiving	Ensure that all information related to the inventory preparation is archived under the full control of the national system in a permanent way.	32		
Adjustments	Include in the NIR a description of the steps taken to improve estimates in areas that were previously adjusted.	36		
Energy	Fugitive emissions	Transparently document the AD and methodology used for the calculation of revised estimates.	41	
	Transparency	Provide more information on AD and EFs and explanations of trends, especially for CO <sub>2</sub> and N <sub>2</sub> O emissions from road	42	

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		transportation, CO <sub>2</sub> emissions from civil aviation and CO <sub>2</sub> emissions from stationary fuel combustion in different categories.	
	Comparability	Follow the Revised 1996 IPCC Guidelines for the reporting in the next annual submission and ensure, as far as possible, the separate reporting of categories, or, if this is not possible, use the correct notation keys and provide clear explanations of where the relevant emissions are allocated.	44
	Follow-up	Strengthen efforts to implement the recommendations made in the previous review report.	45
	Reference approach	Conduct more detailed analysis of factors that may result in discrepancies between the reference and the sectoral approaches and provide the numerical data obtained as a result of such analysis; and make efforts to reconcile the differences between the two approaches for future annual submissions, or provide more explanation of the reasons for the differences between the two approaches.	46
		Exclude emissions from coke oven gas production from the emission estimates calculated using the reference approach.	47
		Investigate the reasons for the discrepancies between the data reported in the CRF tables and the IEA data (e.g. natural gas stock changes for 1993; coal extracted from mines for the years prior to 2000; and exports and imports of crude oil for the years prior to 1997) and provide information on the results in the NIR.	48
	Bunker fuels	Improve the description of the approach used to derive the fuel consumption for domestic navigation.	49
		Correct the reporting errors in the CRF tables in relation to fuel consumption in bunkers.	50
	Feedstocks and non-energy fuel use	Provide information on the allocation of feedstocks and non-energy use of fuels in order to improve the transparency of the reporting on feedstocks and non-energy use of fuels.	51
	Stationary combustion	Apply country-specific carbon content values and oxidation factors to estimate emissions for the main fuel types.	52
	Road transportation	Document the methodology used for the recalculations that were conducted during the review.	56
	Fugitive emissions	Revise the calculations of fugitive emissions from coal mining and handling, provide sources for EFs used and improve QA/QC procedures.	57
		Estimate emissions for each stage of oil and gas operations using a higher-tier method, or, if that is not applicable, use disaggregated EFs following the corresponding methods in the IPCC good practice guidance.	58
		Provide a more detailed explanation of the approach used for the estimation of emissions from natural gas scrubbing and numerical data on the amount of natural gas processed and the natural gas	60

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		composition before and after processing.	
	Mobile fuel combustion (military)	Use the correct notation key for the reporting of mobile fuel combustion (military) and provide a clear explanation of where the emissions are allocated.	61
Industrial processes	Transparency	<p>Include the time-series data for the amount of ferroalloys production, in addition to the currently provided data on reducing agents, to provide better background information to explain the changes in the IEF.</p> <p>Improve the descriptions in the NIR to make them more consistent (e.g. clarify that there is no production of fluorinated gases in Croatia) and clearer (e.g. explain that the AD coverage for electrical equipment is complete).</p> <p>Add descriptions in the CRF background tables of AD for all categories.</p> <p>Report non-adjusted AD for cement production instead of AD pre-adjusted by the cement kiln dust factor.</p>	65
	Glass production	Correct the notation key used.	65
	QA/QC	Continue to refine the AD for all categories in the industrial processes sector, by conducting more thorough checks against international statistics, general economic trends and domestic regulation changes, such as bans on the use of certain equipment, that may affect emission trends.	67
	Ammonia production	Provide more general information about the survey of the ammonia manufacturers that provided the data, but also more specifically with regard to the approach used to split natural gas between that used as fuel and that used as feedstock.	69
		Clearly distinguish in both the CRF tables and the NIR between the energy and industrial processes sectors with regard to fuel and feedstock issues.	70
	Consumption of halocarbons and SF <sub>6</sub>	Correct the description in the NIR of the aggregation of potential emissions of PFCs.	71
		Document transparently the methodology used to estimate emissions from foam blowing and complete the CRF sectoral background table for the foam blowing emissions.	74
	Soda ash use	Document transparently in the next NIR the AD used for the calculations.	76
Agriculture	Transparency	Provide more information in the NIR, particularly on the sources of AD.	80
		Include in the NIR: information on the annual average Nex rates for livestock and the fractions of Nex that are managed for each animal waste management system for each animal type and the source of these data; the reasons for the choice of parameters for different sources; an explanation of how time-series consistency is ensured;	81

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
		information on how each of the four sources of information (page 165 of the NIR) were used to establish the dry matter content of crop residues, specifically linking the four sources of information to the specific activity; information on the residue to crop product mass ratio; information on the N content of N-fixing crops; and an explanation of which data sources are used for the same parameters for non-N-fixing crops; information on the drivers for and explanations of trends; information on how and where references in the reference section are used in the NIR; and the logical basis for expert judgement, such as in relation to the area of organic soils.	
	Uncertainty	Provide information on the logical basis supporting the expert judgement used to determine the uncertainty of the AD. Include information on QA/QC and planned improvements in subsections with headings for rice cultivation, burning of crop residues and prescribed burning of savannahs, with explanations as to why the activities are not occurring.	82
	Time-series consistency and comparability	Improve the time-series consistency and comparability with other Parties and use the developed country EFs for the entire time series for livestock data; and for future annual submissions, develop tier 2 methods, where data and methods are available.	84
	Field burning of agricultural residues	Complete CRF table 4.F with information on crop production, residue crop ratios, dry matter fractions and the crop fraction burned on fields.	86
	Enteric fermentation	Use country-specific data for cattle live weights and milk fat percentages, where country-specific values exist.	87
	Manure management	Develop tier 2 estimates using country-specific EFs for the most significant animal types, namely cattle (based on the gross energy intake associated with the relevant EF used for enteric fermentation) and swine.	88
		Develop country-specific values for the annual average Nex/head of species and for the fraction of total annual Nex for each livestock species that is managed for every manure management system, and report these values and information sources in the NIR.	89
	Agricultural soils	Report data on crop production in CRF table 4.F.	90
		Consider options such as trend extrapolation or a surrogate method to estimate AD for and emissions from the application of sewerage sludge to agricultural land for 1990–1994.	91
		Continue efforts with FAO and either reconcile or document the reasons for the differences in the values of N reported by FAO and used in the CRF tables.	92
		Use the country-specific data which are available on waste management systems for the Nex rates for each manure management system.	93

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
LULUCF	Completeness	Provide complete estimates for all land-use categories and pools in line with IPCC good practice guidance for LULUCF.	96
		Provide complete land-use change matrices for all years since 1990, and include land areas for all land-use categories in the CRF tables and provide complete uncertainty estimates.	97
	Transparency	Improve the transparency of the reporting, in particular to explain the forest types covered, and explain the reason for the changes in the coverage of and corrections to the CBS data, the basis for expert judgements and the source of reference materials.	98
	QA/QC	Review the use of the notation keys and other information contained in the CRF tables and improve the QC of the CRF tables; and report the QC checks undertaken to compare the country-specific soil data with data of other countries.	99
	Forest land remaining forest land	Report emissions and removals for all forest types and carbon pools.	101
		Determine the area of wildfires on maquia and scrub and estimate emissions and removals from the loss and subsequent regrowth of biomass and dead organic matter.	102
		Work towards implementing country-specific data and estimate carbon stock changes for all pools; and also (as a minimum) test the validity of the IPCC defaults against the values of countries with similar conditions and country-specific data.	103
		Review and, if necessary, revise the methods used to estimate the increment for 'other state' and private forests in order to ensure that biomass is neither over- nor underestimated.	104
		Make efforts to advance the consideration of the Croatian National Forest Inventory.	105
	Land converted to forest land	Undertake an investigation to verify whether the conversion from other land to forest land is a real land-use change or a data anomaly.	106
		Estimate emissions and removals associated with the conversion of other land to forest land, if occurring on managed lands, and, if occurring on unmanaged lands, these land areas should be explicitly reported in the CRF tables, in order to be consistent with the IPCC good practice guidance for LULUCF.	107
	Land converted to settlements	Develop methods for determining whether maquia and scrub, 'other state' and private forest (pre-2006) are being converted to settlements (or other land uses) and report the associated emissions and removals.	108
Waste	QA/QC	Ensure that the QA/QC procedures are properly implemented to avoid inconsistencies between the NIR and the CRF tables.	112
	Solid waste disposal on land	Improve transparency by reporting the relevant background information, including the sources of EFs and AD.	114

<i>Sector</i>	<i>Category</i>	<i>Recommendation</i>	<i>Paragraph reference</i>
	Wastewater handling	Improve transparency regarding sources of AD and the selection of EFs.	116
		Recalculate CH <sub>4</sub> emissions from industrial wastewater, correcting the error in the current estimates.	117
		Correct the notation key used for emissions from wastewater sludge.	118
	Waste incineration	Correct the notation key used for incineration of sewage sludge.	119
		Research and identify the technologies applied in the incineration of hazardous waste.	120
KP-LULUCF		Include in the NIR maps showing the geographical location of the boundaries of the areas that encompass the land units.	121
		Implement the planned improvements in relation to afforestation, reforestation and deforestation and provide the additional information provided during the review in the NIR.	124
	Afforestation and reforestation	Estimate afforestation for all land areas, using the methods proposed by Croatia during the review.	126
	Deforestation	Develop AD on the deforestation of 'other state' forests, private forests (pre-2006) and maquia and scrub and estimate emissions and removals.	127
	Forest management	Review and correct the KP-LULUCF land-transition matrices and the areas reported for forest management; and provide explanations for the difference in the forest areas reported between forest management and forest land remaining forest land.	128
		Estimate emissions and removals for all managed forest types.	129
National registry		Make the required information publicly available, as soon the national registry has performed a Kyoto Protocol unit transaction.	132
Commitment period reserve		Report correctly the commitment period reserve.	134
Changes in the national system		Report in the next annual submission any changes in the national system, detailing how the changes affect the general and specific functions of the national system, including roles and responsibilities.	136
Article 3, paragraph 14		Report any changes in the information provided under Article 3, paragraph 14, of the Kyoto Protocol.	138

#### IV. Questions of implementation

152. No questions of implementation were identified by the ERT during the review.

## Annex I

### Documents and information used during the review

#### A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

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

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”. FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

“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>.

“Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol”. Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

“Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol”. Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

“Guidelines for review under Article 8 of the Kyoto Protocol”. Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Croatia 2012. Available at <http://unfccc.int/resource/docs/2012/asr/hrv.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2012. Available at <http://unfccc.int/resource/webdocs/sai/2012.pdf>.

FCCC/ARR/2011/HRV. Report of the individual review of the annual submission of Croatia submitted in 2011. Available at <http://unfccc.int/resource/docs/2012/arr/hrv.pdf>.

UNFCCC. *Standard independent assessment report*, parts I and II. Available at [http://unfccc.int/kyoto\\_protocol/registry\\_systems/independent\\_assessment\\_reports/items/4061.php](http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php).

**B. Additional information provided by the Party**

Responses to questions during the review were received from Ms. Visnja Grgasovic (Ministry of Environmental and Nature Protection), including additional material on the methodologies and assumptions used. The following document<sup>1</sup> was also provided by Croatia:

Croatian Geological Survey. 2012. *Expert Mission on the fulfilment of the commitments under the UNFCCC and the Kyoto Protocol considering the GHG emissions by sources and removals by sinks from LULUCF activities – Part 2*. Zagreb.

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<sup>1</sup> Reproduced as received from the Party.

## Annex II

### Acronyms and abbreviations

AD	activity data
CH <sub>4</sub>	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
CRF	common reporting format
DOM	dead organic matter
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs and SF <sub>6</sub> without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
kg	kilogram (1 kg = 1,000 grams)
LULUCF	land use, land-use change and forestry
m <sup>3</sup>	cubic metre
MCF	methane correction factor
N <sub>2</sub> O	nitrous oxide
N	nitrogen
NA	not applicable
NE	not estimated
Nex	nitrogen excretion
NIR	national inventory report
NMVOCS	non-methane volatile organic compounds
NO	not occurring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF <sub>6</sub>	sulphur hexafluoride
SIAR	standard independent assessment report
UNFCCC	United Nations Framework Convention on Climate Change