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**Report for the Stage 3 in-depth review of emission
inventories submitted under the UNECE LRTAP
Convention and EU National Emissions Ceilings
Directive for:**

CROATIA

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INTRODUCTION

1. The mandate and overall objectives for the emission inventory review process under the LRTAP Convention is provided by the UNECE document '*Methods and Procedures for the Technical Review of Air Pollutant Emission Inventories reported under the Convention and its Protocols*'⁽¹⁾ – hereafter referred to as the 'Methods and Procedures' document.
2. This annual review, has concentrated on SO₂, NO_x, NMVOC, NH₃, plus PM₁₀ & PM_{2.5} for the time-series years 1990 – 2009 reflecting current priorities from the EMEP Steering Body and the Task Force on Emission Inventories and Projections (TFEIP). HMs and POPs have been reviewed to the extent possible.
3. This report covers the stage 3 centralised reviews of the UNECE LRTAP Convention and EU NEC Directive inventories of Croatia coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 27th June 2011 to 1st July 2011 in Copenhagen Denmark and was hosted by the European Environment Agency (EEA). The following team of nominated experts from the roster of experts performed the review: generalist – John van Aardenne (EEA), Energy – Julien Vincent (France), Industry – Peek Kees (the Netherlands), Solvents – Nadine Allemand (France), Agriculture +Nature – Jim Webb (UK), Waste – Nebojsa Redzic (Serbia).
4. Kristina Saarinen (Finland) was the lead reviewer. The review was coordinated by Katarina Marečková, (EMEP Centre on Emission Inventories and Projections - CEIP).

¹ Methods and Procedures for the Technical Review of Air Pollutant Emission Inventories reported under the Convention and its Protocols. Note by the Task Force on Emission Inventories and Projections. ECE/EB.AIR/GE.1/2007/16 <http://www.unece.org/env/documents/2007/eb/ge1/ece.eb.air.ge.1.2007.16.e.pdf>

PART A: KEY REVIEW FINDINGS

5. The inventory submitted by Croatia in 2011 is generally in line with the EMEP/EEA Inventory Guidebook and UNECE Reporting Guidelines. However, the ERT noted some areas of further improvements for which recommendations are provided in the relevant chapters below.

6. The ERT noted that recalculations have generally been carried out consistently through time-series. The ERT also noted that Croatia applies both default parameters and sometimes also country-specific methods which are consistent with the EMEP/EEA Inventory Guidebook.

INVENTORY SUBMISSION

7. In the 2011 submission, Croatia has reported a full time-series from 1990 to 2009 including LPS-data for the year 2009.

8. The 2011 CLRTAP Croatian inventory was submitted on time together with a detailed Informative Inventory Report.

9. Emissions are reported in NFR09 format at both national total and sector levels. The completeness of the inventory could, however, be further improved in the future according to recommendations made by the ERT for transport, industrial processes, solvents and agriculture sectors and for categories where emissions of Hg, PCDD/F, PAH-4, HCB, HCH and PCB are marked in the 2009 Croatian inventory submission with the notation key "NE".

10. The CLRTAP inventory submitted by Croatia is generally transparent and well organized. The inventory report (IIR) provides detailed and informative documentation.

KEY CATEGORIES

11. Key categories. Croatia has compiled and presented in its IIR a level Key Source Category Analysis for the following pollutants for the year 2009. SO_x, NO_x, NH₃, NMVOC, CO, TSP, PM₁₀, PM_{2.5}, Pb, Hg, Cd, PCDD/PCDF, PAH-4, HCB and PCB. All sectors have been included. The assessment of key source categories of individual pollutant follows the quantitative approach 1 described in the IPCC "Good Practice Guidance and Uncertainty Management" in National Greenhouse Gas Inventories.

12. The KC analysis is in line with that of the CEIP.

13. Croatia does not state in the IIR that the KCA is used in the prioritization of improvements for the inventory. The ERT recommends Croatia to use the KCA for prioritization improvements in the inventory.

QUALITY

Transparency

14. The ERT finds the IIR in general to be transparent, informative and well organized. For some sectors (i.e. Energy, Transport, Solvents and Agriculture) additional or more detailed information on activity data and emission factors is recommended to be added to the documentation in order to improve the transparency of the IIR.

15. The ERT encourages Croatia to further improve the transparency of the IIR with providing information on special national circumstances affecting the emission trends or inter annual variations in the energy mix.

16. The ERT commends Croatia for the clear description of the use of notation keys in the energy sector in the IIR and recommends this approach to be extended to the other sectors.

17. Although Croatia provided explanation for some of the sharp increases and decreases in the time-series, the ERT recommends Croatia to include a better description of the time-series in the next IIR.

18. During the review Croatia declared its willingness to improve its inventory in several issues and to carry out an inventory improvement plan. The ERT warmly welcomes this plan. Information has been provided in the IIR on improvements to earlier inventories based on the availability of improved activity data, which resulted in some recalculations.

19. The ERT recognises the level of effort undertaken by Croatia in providing an inventory with the level of documentation that enabled to conduct the review of the inventory.

Completeness

20. The ERT acknowledges the effort Croatia has done to provide estimates of emissions for all sub-sectors and all pollutants reviewed. The inventory is complete for spatial and temporal coverage, and for the energy and transport sectors. For industrial processes, solvent and other product use, agriculture and waste sectors, the ERT has identified small missing sources, for which recommendations have been given under the relevant chapters of this review report.

21. For some source categories estimates for all pollutants are not provided (e.g. where Hg, PCDD/F, PAH-4, HCB, HCH and PCB are marked with the notation key NE) or emissions may in some cases be indicated as IE or NE for some years and categories.

22. The ERT encourages Croatia to always report PM_{2,5} whenever PM₁₀ are reported and also TSP in order that sectors and trends can be compared and the emission levels reviewed.

23. For some sectors, part of the activity data is not available (i.e. aviation fuels) or not split between sub-categories (e.g. transport).

Consistency, including recalculations and time-series

24. Croatia has recalculated its inventory for some sectors for different years from 1990 to 2008. The ERT commends Croatia for the information provided in the IIR regarding the recalculations and for its effort to complete its inventory with new sectors.

25. As a result of the recalculations, the Synthesis and Assessment Report for Croatia shows that some recalculations have a large impact on the emission trends compared to previous inventory submissions. There are notable changes particularly for SO₂ emissions in 2007 (22 per cent increase compared to previous inventory submission), PM_{2.5}, PM₁₀ and TSP emissions (especially for the period 1991 – 2004 with an increase of up to 160 per cent), CO (approximately 20 per cent increase for time-series), Pb (in some years an increase of 1000 per cent). For PCDD/F, HCB and HCH, the recalculations resulted in lower emissions compared to the earlier inventory submissions by Croatia.

Comparability

26. The ERT notes that the inventory of Croatia is comparable with those of other Parties thanks to the use of agreed reporting formats and methodologies defined in the EMEP/EEA Guidebook. The ERT encourages Croatia to continue with this approach to prepare the inventory.

CLRTAP/NECD comparability

27. The Party is not required to provide a NECD inventory in 2011.

Accuracy and uncertainties

28. The ERT notes that a general uncertainty analysis was not included in the current or previous inventory submissions. However, the ERT noticed that Croatia planned the "implementation of such an analysis for one of the next submissions". The ERT encourages Croatia to undertake an uncertainty analysis in order to help prioritizing the inventory improvements and provide an indication of the reliability of the inventory data.

Verification and quality assurance/quality control approaches

29. Croatia has provided a description of the overall quality assurance/quality control (QA/QC) plan including responsibilities and schedules for QA/QC checks and corrections. The ERT encourages Croatia to further improve the QC procedures to check the accuracy and comparability of statistics from year to year, as some inconsistencies in the activity trends resulted from the recalculations. The ERT encourages Croatia to assign an independent expert to perform this task for the next inventory.

30. The ERT noted that Croatia has performed general and source-specific QC activities, which are documented in the IIR. However, a system of QA (internal reviews and reviews by independent third parties) at the national level has not been established yet. The ERT encourages the Party to establish the QA part of the QA/QC system and also to implement sector-specific QA/QC procedures in the next submissions.

FOLLOW-UP TO PREVIOUS REVIEWS

31. The ERT commends Croatia for providing detailed responses to the questions identified in Stage 2 Review on outliers of implied emissions factors, trends and recalculation. Thanks to the documentation provided in the IIR and the responsiveness of Croatia, the ERT was able to review the inventory in detail and to provide a number of detailed recommendations.

AREAS FOR IMPROVEMENTS IDENTIFIED BY CROATIA

32. The ERT noted the intention of Croatia to improve its inventory on several issues such as:

- enhancement of the comparability between the NFR and CRF sectors 1A1b Refinery (SNAP 010300);
- data collection on abatement techniques installed in catalytic cracking (FCC) in the subcategory 1B2aiv; and
- emission factors update for the NFR 2A sub-sectors, in accordance with the EMEP/EEA Guidebook 2009.

DURING THE REVIEW CROATIA DECLARED ITS AMBITION TO IMPLEMENT AN INVENTORY IMPROVEMENT PLAN. THE ERT WARMLY WELCOMES THIS DEVELOPMENT AND ENCOURAGES THE PARTY TO PUT FURTHER EFFORT INTO INVENTORY IMPROVEMENT.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS-CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

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

- (a) to ensure that QA/QC procedures identify gaps and errors in activity data and time-series consistency, using for example automated procedures;
- (b) to include experts that are not directly involved in the emission inventory preparation in the QA/QC activities;
- (c) to include the missing emission estimates, as explained under the sectoral findings;
- (d) to take into account the import and export of products to improve the assessment of activity data levels;
- (e) to perform and present uncertainty analyses and use it as a tool to focus planned improvements to key categories;
- (f) to ensure that, when filling in the NFR09 tables, the data are entered in the correct columns and rows;
- (g) to systematically provide information for all sectors on activity data, emission factors with their units and the rationale for the choice of emissions and sources of data
- (h) to complete the estimation of not estimated (NE) sources;

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

SECTOR-SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY THE ERT

ENERGY

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2009 + (Protocol Years)		
NFRCode	CRF_NFRName	Reviewed	Not Reviewed	Recommendation Provided
1.A.1.a	public electricity and heat production	X		X
1.A.1.b	petroleum refining	X		X
1.A.1.c	Manufacture of solid fuels and other energy industries	X		X
1.A.2.a	iron and steel	IE (1A2fi)		
1.A.2.b	non-ferrous metals	IE (1A2fi)		
1.A.2.c	chemicals	IE (1A2fi)		
1.A.2.d	pulp, paper and print	IE (1A2fi)		
1.A.2.e	food processing, beverages and tobacco	IE (1A2fi)		
1.A.2.f.i	Stationary Combustion in Manufacturing Industries and Construction: Other (Please specify in your IIR)	X		X
1 A 3 e	Pipeline compressors ?	IE (1A2fi)		
1.A.4.a.i	commercial / institutional: stationary	IE (1A2fi)		
1.A.4.b.i	residential plants	X		X
1.A.4.c.i	Agriculture/forestry/fishing. stationary		X	
1.A.5.a	other, stationary (including military)		X	
1.A.5.b	other, mobile (including military, land based and recreational boats)?		X	
1.B.1.a	coal mining and handling		X	
1.B.1.b	solid fuel transformation		X	
1.B.1.c	other fugitive emissions from solid fuels)		X	
1 B 2 a i	Exploration, production, transport		X	
1 B 2 a iv	Refining / storage	X		X
1 B 2 a v	Distribution of oil products	X		X
1 B 2 b	Natural gas		X	
1 B 2 c	Venting and flaring		X	
1 B 3	Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2		X	

Note: Where a sector has been partially reviewed (e.g. some of the NFR codes please indicate which have and which have not in the respective columns.

General recommendations on cross-cutting issues.

Transparency:

33. The ERT commends Croatia for the description provided in the IIR on activity data and methods used. The annexes of the IIR provide a clear picture of the applied EFs and the national energy balance. However, the ERT recommends some further improvements to further increase the transparency of the energy sector inventory.

34. Emissions from all sub-sectors under NFR 1.A.2 are reported under the NFR code 1.A.2.f.i: Stationary combustion in manufacturing industries and construction: Other. Since energy consumptions are available at a disaggregated level, it would improve the transparency to report all sub-sectors under the relevant NFR codes.

35. The ERT encourages Croatia to include more details in the description of the correspondence between the energy balance and the NFR sectors, especially for industry sectors.

36. Most of the time-series inconsistencies were justified during the review week and usually resulted from energy mix variations between years. The ERT encourages Croatia to include these explanations in the IIR. However, some of the discrepancies were not resolved as they are due to wrong AD reported in tables "AnnexIV_Reporting_templates_300909_IIR2009_Croatia-XXXX.xls". The ERT strongly encourages Croatia to check its QA/QC procedures identify such errors.

37. The ERT commends Croatia for the clear description of the use of notation keys in the IIR.

Completeness:

38. The ERT considers the Energy sector to be complete and comprehensive. All important sources seem to be included in the energy sector inventory.

39. The notation key NE (Not Estimated) is only used for PCBs and HCBs for some of the energy sectors. The ERT encourages Croatia to complete the tables using EFs from the EMEP/EEA Guidebook.

Consistency including recalculation and time-series:

40. Croatia has recalculated its inventory for some energy sectors for different years between 1990 and 2008. The ERT commends Croatia for the information provided in the IIR regarding these recalculations and for its effort to complete its inventory with new sectors. Recalculations have significantly increased the time-series consistency.

41. However, the ERT encourages Croatia to complete the description of recalculations, explaining why some activity data were not taken into account in the previous inventory (e.g. due to corrections in the energy balance or problems with the QC procedures) and completing the information when the sulphur contents of fuels are corrected. This information is needed to assess whether the recalculations are justified or not.

Comparability:

42. The methodologies are consistent with those presented in the EMEP/EEA Guidebook. The ERT commends Croatia for a transparent description of methodologies in the IIR. No systematic over or under estimates were identified during the review.

43. Sufficient AD is collected to support the calculations. For the year 2009, energy consumption from LCPs represents about 1/3 of the total fuel consumption in the NFR sectors 1A1, 1A2 and 1A4. For sectors 1A1a and 1A2fi, plant specific EFs

for NO_x, SO₂, CO and PM₁₀ are used as reported in the EPR database². For EFs not reported in the EPR database, the EMEP/EEA Guidebook EFs are used. For heavy metals not available in the Guidebook, country-specific EFs from PARC, ATMO³ are used, or measurement results from the fuel characteristics are used to prepare country/plant specific emission factors.

44. Emissions from diffuse sources in NFR sectors 1A1, 1A2 and 1A4 are calculated with the EMEP/EEA Guidebook Tier 1 methodology. Tier 2 EFs are also used to calculate fugitive emissions.

45. The ERT encourages Croatia to replace Tier 1 methods with Tier 2 methods, especially for industrial sectors (NFR 1A2fi), to take into account the technical specifications encountered in the country and to better estimate emissions from combustion in these processes.

46. The ERT also encourages Croatia to improve the energy consumption split between fuel categories since fuels are not always reported in the proper category. This seems, for example, to be the case for refinery gas, petroleum coke and LPG which should be reported under liquid fuels. Moreover, coke oven gas should be reported under solid fuels. Croatia informed the ERT during the review week that this would be corrected for the next submission.

47. The ERT encourages Croatia to always report PM_{2,5} whenever PM₁₀ are reported, and also TSP in order to compare sectors and trends and review emission levels.

Accuracy and uncertainties:

48. Croatia has not yet undertaken an uncertainty analysis but the ERT noted that Croatia will include it in the next submissions. The ERT encourages Croatia to undertake an uncertainty analysis for the Energy Sector as soon as possible in order to help prioritizing improvements and to provide an indication of the reliability of the inventory data.

49. The ERT noted that Croatia carries out some routine QA/QC checks to ensure data integrity, correctness and completeness and to identify errors and omissions. A system of review procedures conducted by staff members not directly involved in the inventory compilation/development process is also carried out in the energy sector. The ERT encourages Croatia to further improve QC procedures for the Energy sector. Indeed, there seems to be some gaps, inconsistencies in the IEF time-series and activity omissions, because some recalculations were carried out due to corrections in activity data levels.

Improvement:

50. The ERT commends Croatia for its improvements in the energy sectors. The ERT notes the Croatian intention to improve the comparability between the NFR and

² EPR = Environmental Pollution Register

³ Emission factors manual PARC ATMOS – Emission factors for air pollutants (1992) – TNO Environmental and Energy Research

CRF sectors 1A1b Refinery (SNAP 010300) and to collect data on abatement techniques installed in catalytic cracking (FCC) in the NFR sub-sector 1B2aiv. The ERT encourages Croatia to implement the planned improvements and to continue the QC activities in order to avoid gaps and improve time-series inconsistencies.

Sub-Sector Specific Recommendations.

Category issue 1: 1A1a Public electricity and heat production - NO_x, SO_x, TSP, PM₁₀, Hg

51. The ERT identified a problem on IEFs reported in 1990 and from 1993 to 1995, as these seem to be very low. This originates from very high gaseous fuel consumptions which are inconsistent (about 10 times higher than for the other years). Croatia provided the ERT with the correct AD which are consistent through the time-series. Croatia promised to correct these values in the next submission. The ERT encourages Croatia to double-check the activity levels for each fuel and each activity.

Category issue 2: 1A1b Petroleum refining - SO_x

52. The ERT noticed that the SO_x IEF is multiplied by a factor 3 from 2003 onwards. The inventory team justified this during the review week by the correlation between the SO_x IEF and the residual fuel consumption. For transparency reasons, the ERT recommends Croatia to explain these evolutions in the IIR.

Category issue 3: 1A1b Petroleum refining - Cd

53. The ERT noticed that no Cd emissions were reported for 1990. Croatia confirmed to the ERT during the review week that this gap should be corrected in the next submission. The ERT strongly recommends Croatia to put automatic QC procedures in place to detect such gaps.

Category issue 4: 1A1b Petroleum refining – PM₁₀, PM_{2,5}, Cd

54. The ERT noticed that IEFs for PM₁₀, PM_{2,5} and Cd vary strongly from one year to another. The inventory team confirmed during the review week that those variations are due to consumption of residual fuel. For transparency reasons, the ERT recommends Croatia to introduce these justifications in the IIR.

Category issue 5: 1A1c Manufacture of solid fuels and other energy industries – all pollutants

55. The ERT noted that the notation key NA is used for SO_x and PM emissions. If only natural gas is consumed, low emissions could still be calculated according to the latest version of the EMEP/EEA Guidebook. The ERT encourages Croatia to complete the NFR tables with the help of the latest version of the EMEP/EEA Guidebook (see chapter 1.A.1, p. 110 of 124 for PM and appendix C, p. 79 of 124 for sulphur content in fuels).

Category issue 6: 1A2fi Stationary combustion in manufacturing industries and construction: Other – NO_x, TSP

56. The ERT noticed a decrease in the NO_x IEF of about 30% in 1993 and of about 60% in 2005 compared to other years. The same evolution is observed for

TSP. This is due to incorrect AD values introduced in the NFR Excel sheets (copy/paste from the year 1990). The ERT strongly recommends Croatia to check the QA/QC procedures to identify such errors.

Category issue 7: 1A4bi Residential: Stationary plants – NMVOC, Cd

57. The ERT noticed that biomass and solid fuel consumptions are the highest in 1990, 1994 and 1995. Therefore, it could be expected that the IEFs are about the same for these 3 years. However, in the inventory, IEFs for these 2 pollutants are the highest of the whole time-series in 1990 and the lowest in 1994 and 1995. This is due to incorrect AD values introduced in the NFR Excel sheets (copy/paste from the year 1990). The ERT strongly recommends Croatia to check the QA/QC procedures to identify such errors.

Category issue 8: 1B2aiv Refining / storage - NO_x

58. The ERT noticed that the NO_x IEF doubles from 2000 onwards. The justification provided during the review week does not explain these variations. For transparency reasons, the ERT recommends Croatia to justify these kinds of evolutions in the IIR.

Category issue 9: 1B2av Distribution of oil products - NMVOC

59. The ERT noticed a relatively stable NMVOC IEF from 1990 to 2009 with a decrease of about 25% in 1992. Croatia answered during the review week that the overall decline of economic activities and energy consumption in the period 1991-1994 are mainly the consequence of the war in Croatia. For transparency reasons, the ERT recommends Croatia to provide such justification in the IIR.

TRANSPORT

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2006 + (Protocol Years)		
NFRCode	CRF_NFRName	Reviewed	Not Reviewed	Recommendation Provided
1.A.3.a.i.(i)	international aviation (LTO)	x		x
1.A.3.a.i.(ii)	international aviation (cruise)		x	x
1.A.3.a.ii.(i)	civil aviation (domestic, LTO)	x		x
1.A.3.a.ii.(ii)	civil aviation (domestic, cruise)		x	x
1.A.3.b.i	road transport, passenger cars	x		
1.A.3.b.ii	road transport, light duty vehicles	x		
1.A.3.b.iii	road transport, heavy duty vehicles	x		
1.A.3.b.iv	road transport, mopeds & motorcycles	x		
1.A.3.b.v	road transport, gasoline evaporation	x		
1.A.3.b.vi	road transport, automobile tyre and brake wear	x		
1.A.3.b.vii	road transport, automobile road abrasion	x		
1.A.3.c	railways	x		x
1.A.3.d.i (ii)	international inland navigation		x	
1.A.3.d.ii	national navigation	x		x
1.A.4.b.ii	household and gardening (mobile)	x		
1.A.4.c	agriculture / forestry / fishing	x		
1.A.4.c.ii	off-road vehicles and other machinery	x		
1.A.4.c.iii	national fishing		x	
1.A.5.b	other, mobile (including military, land based and recreational boats)		x	
1 A 3 d i (i)	International maritime navigation		x	
1 A 3	Transport (fuel used)			

Note: Where a sector has been partially reviewed (e.g. some of the NFR codes please indicate which have and which have not in the respective columns.

General recommendations on cross-cutting issues.

Transparency:

60. Croatia provided a detailed and generally transparent emission inventory for the transport sector. Nonetheless, estimates are not provided at the most detailed level for all mobile combustion sectors.

61. The information related to the methodology and emission factors in the IIR is not sufficient. The ERT encourages the Party to include more detailed information in its next IIR, in order to improve the transparency of the inventory.

62. Information on fuel consumption for road transport is rather detailed; while information on the other sub-sectors of NFR 1A3, as well as for all other sub-sectors including mobile sources is not provided on appropriate detailed level. The ERT encourages Croatia to provide not only trend charts on activity data but also the actual activity data for all sub-sectors in order to understand the calculations.

63. The use of notation keys is explained properly in the NFR table “Additional Info” as well as in the IIR. The ERT commends this, asking the Party to solve the minor formal mistakes within the tables provided in the IIR (Table 1.8-2 Explanation to the notation key IE).

64. The use of the notation key IE (included elsewhere) is explained properly in the NFR table “Additional Info” as well as in the IIR. Nevertheless, the ERT encourages the Party to put further effort in reporting these sectors emissions separately (e.g. all sub-sectors of NFR 1.A.3.a, in the next submissions).

65. The use of the notation key C (“confidential”) is explained properly in NFR table “Additional Info” as well as in the IIR, providing information on where the related emissions have been allocated.

66. Under NFR 1.A.5.b Other, Mobile (including military, land-based and recreational boats), emissions from mobile military sources are included, and reported entirely as confidential (C). The ERT accepts this approach; nevertheless, it asks the Party to present separately the related data as soon as national circumstances allow.

Completeness:

67. The ERT considers the mobile combustion sector to be variable in terms of completeness, comprehensiveness and level of detail in the methodology descriptions.

Consistency including recalculation and time-series:

68. Croatia has recalculated its inventory for all important sectors including mobile sources, providing sound information on the reasons for these recalculations. The ERT encourages the Party to provide more detailed information including tables showing: i) data from the current and the past submission as well as the absolute and relative changes for each sub-sector where recalculations were carried out, and ii) the overall impact of recalculations on national totals.

69. The results of stage 2 review showed several sharp increases and decreases in the emissions time-series provided for these sectors for the year 2005. Croatia explained that these data were incorrect, due to an exchange of rows in the NFR tables. The ERT thanks for the explanation and looks forward to see this data being corrected in the Party’s next annual submission.

Comparability:

70. The methods used for calculation of transport sector emissions are consistent with the EMEP/EEA Guidebook.

71. In its IIR, Croatia provides basic information on the methods used, including the origin of AD and EFs. The ERT warmly recommends the Party to provide more detailed information on a (sub-)sector level. While information provided for NFR 1A3b is good, nearly no information is provided for the other main sectors such as NFR 1A3a or 1A3c.

Accuracy and uncertainties:

72. So far no uncertainty analysis has been carried out for the Transport sector . The ERT welcomes Croatia's efforts to improve its inventory particularly where data are supposed to be of high uncertainty. The ERT encourages Croatia to undertake an uncertainty analysis for the mobile combustion sector in order to help the prioritization of inventory improvement and to provide an indication of the reliability of the inventory data.

Improvement:

73. No planned improvements are mentioned for reporting emissions from transport and other mobile sources. Nevertheless, during the review the Party declared its willingness to improve its inventory in several issues and that;it is planned to carry out an improvement plan. The ERT warmly welcomes this plan, encouraging the Party to put further effort into inventory improvement.

Sub-Sector Specific Recommendations.

Category issue 1: 1.A.2.f.ii / 1.A.3.a.ii - All Pollutants

74. The results of stage 2 review showed several sharp increases and decreases within the emissions time-series provided for these sectors for the year 2005. The Party acknowledged that there were errors in the data due to an exchange of row during filling out the NFR tables. The ERT encourages Croatia to correct the values in the next annual submission.

Category issue 2: 1.A.3.a - All Pollutants

75. During the review the ERT noted that Croatia reports emissions from both domestic and international Cruise (NFR 1A3a ii (ii) & i (ii)) as IE in the corresponding sub-sector for LTO (NFR 1A3a ii (i) & i (i)), since there is no data available from national statistics for the disaggregation. Croatia declared that it is planning to improve the inventory in this respect with some AD still missing in order to obtain the trend from 1990 onwards. The ERT warmly welcomes these efforts and encourages the Party to further investigate and complete possible data gaps.

Category issue 3: 1.A.3.c, 1.A.3.d.ii (i) – PM_{2.5}, PM₁₀

76. During the review the ERT noted that only values for TSP are reported in the NFR tables, while PM_{2.5} and PM₁₀ are reported as NA. Croatia stated that this deficiency will be corrected in the next report. The ERT welcomes the Party's willingness to improve its inventory's completeness and correctness.

Category issue 5: 1.A.4.a.ii – All Pollutants

77. During the review the ERT noted that all emissions from NFR 1A4a ii are reported as NA. Croatia stated that this notation key was chosen because of the lack of better information on the kind of mobile machinery that should be included in this sector. The Party furthermore agreed that it might be more appropriate to use the notation key IE instead of NA. Here, the Party considered that statistical AD needed for reporting emissions from this sector might be included in the AD used for NFR 1A3b ii, as it includes private vehicles as well as commercial and institutional LTV vehicles. The ERT stated that emissions from commercial and institutional LTV

vehicles are not to be reported under NFR 1A4aⁱⁱ, but under 1A3bⁱⁱ. Instead, (small) mobile sources to be reported under NFR 1A4aⁱⁱ include, for example, lawn mowers. Here, the ERT acknowledges the fact that data collection might be laborious.

Category issue 5: 1.A.4.b.ii, c.ii – All Pollutants

78. The results of stage 2 review showed several significant decreases within the emissions time-series provided for these sectors for the years 1992 and 1993. Croatia stated that these trends resulted from the war in the former Yugoslavia. The ERT encourages the Party to provide such information within its IIR as it has a strong impact on the emission trends.

Category issue 6: 1.A.3.b.ii, c.ii – All Pollutants

79. The ERT noted that in the “Additional Info” table, for NFR 1A3b sub-sectors 1A3bⁱⁱ to iv (named incorrectly) the use of IE (in 1A3bⁱ) is explained for PCDD/F and PAH-4 emissions. Assuming that this might have happened by mistake, since there are separate values provided within the data table, the ERT encourages Croatia to correct these data for the next submission.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		NO _x , SO _x , NH ₃ , CO, NMVOC, TSP, PM ₁₀ , PM _{2.5} , Pb, Cd, Hg, PCDD/F, PAH-4, HCH, HCB and PCB		
Years		1990 – 2009 + (Protocol Years)		
NFRCode	CRF_NFRName	Reviewed	Not Reviewed	Recommendation Provided
2.A.1	cement production	X		X
2.A.2	lime production	X		X
2.A.3	limestone and dolomite use		NO	
2.A.4	soda ash production and use		NO	
2.A.5	asphalt roofing	X		X
2.A.6	road paving with asphalt	X		X
2.A.7.a	Quarrying and mining of minerals other than coal	X		X
2.A.7.b	Construction and demolition	X		X
2.A.7.c	Storage, handling and transport of mineral products		NA	
2.A.7.d	Other Mineral products (Please specify the sources included/excluded in the notes column to the right)	X		X
2.B.1	ammonia production	X		X
2.B.2	nitric acid production	X		X
2.B.3	adipic acid production		NO	
2.B.4	carbide production		NO	
2.B.5.a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	X		X
2.B.5.b	Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)		NA	
2.C.1	iron and steel production	X		
2.C.2	ferroalloys production		NO	
2.C.3	aluminium production		NO	
2.C.5.a	Copper Production		NO	
2.C.5.b	Lead Production		NO	
2.C.5.c	Nickel Production		NO	
2.C.5.d	Zinc Production		NO	
2.C.5.e	Other metal production (Please specify the sources included/excluded in the notes column to the right)		NO	
2.C.5.f	Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)		NO	
2.D.1	pulp and paper	X		X
2.D.2	food and drink	X		X

2.D.3	Wood processing	X		X
2.E	production of POPs		NA	
2.F	consumption of HM and POPs (e.g. Electrical and scientific equipment)	X		
2.G	Other production, consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded in the notes column to the right)		NO	
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes please indicate which have and which have not in the respective columns.				

General recommendations on cross-cutting issues

Transparency:

80. The industrial processes inventory is generally transparent and well organised. The ERT noted that the necessary items are included in all paragraphs of the Industrial Processes chapter or in the annexes (emission factors) of the IIR. The ERT commends the Party for this.

81. The ERT noted that in the NFR table, the notation key "NO" has been used several times in the activity cell and "NA" in a number of pollutant cells with the same NFR-code. The ERT recommends Croatia to use the notation key "NA" where the source exists but relevant emissions are considered not to occur and "NO" where sources do not occur.

82. The emission factors used in the calculations are either default or plant specific emission factors. The country-specific emission factors are based on well-documented research. Plant specific emission factors are used for the following sources:

- 2 A 1 Cement Production;
- 2 A 7 d Glass manufacture (the mineral wool);
- 2 B 1 Ammonia;
- 2 B 2 Nitric acid
- 2 B 5 a Other inorganic chemical industries (sulphuric acid, NPK fertilizers and urea):

83. A short explanation of sharp increase/decrease or other changes in the emissions time-series of the sub-sectors of the Industrial Processes sector is presented in the Emission trends' chapter of the IIR. However, in the Industrial Processes sector's chapter, explanations of sharp increase/decrease or other changes in the emission time-series of the following key sources are missing: NFR 2.A.1 Cement production, NFR 2.A.6 Road paving with Asphalt, and NFR 2.D.2 Food and Drink. The ERT recommends the Party to include at least explanations of sharp increase/decrease or other changes in the emission time-series of the key sources in the Industrial Processes sector's chapter of the IIR.

Completeness:

84. The ERT considers the industrial processes sector to be almost complete for the main sources and comprehensive with good levels of detail in the methodology

descriptions. Additional details and specific recommendations are given in the sector's section.

85. Furthermore, the ERT noted that, except for one mistake, no NEs have been used for the industrial processes sector's inventory.

Consistency including recalculation and time-series:

86. The ERT noticed that Croatia has performed recalculations for the Industrial Processes sector. The ERT found discrepancies between the 2010 and 2011 TSP, PM10 and PM2,5 emissions time-series for various emission sources, and noted that Croatia did not document these inconsistencies in the IIR. The ERT encourages Croatia to document any changes in the time-series in the future IIRs.

87. Both the time-series of activity data and the EFs are consistent.

Comparability:

88. Croatia has reported emissions from the Industrial Processes inventory in accordance with the reporting requirements and in the requested NFR format. However, the ERT noted that Croatia not always used the available EFs from the EMEP/EEA Emission Inventory Guidebook, 2009 for NFR 2A sub-sectors and NFR 2D1, Pulp and paper. In order to avoid under and/or overestimations, the ERT recommends Croatia to use the available EFs from the EMEP/EEA Guidebook version 2009 or verified country/plant specific EFs in the future (see also chapter Improvement).

Accuracy and uncertainties:

89. The ERT noted that Croatia has performed general and source specific QC activities, which are documented in the IIR. In contrast, the system of QA (internal reviews and reviews by independent third parties) at the national level has not been established yet. The ERT encourages the Party to establish the QA part of the QA/QC system and also to implement sector-specific QA/QC procedures for the Industrial Processes Sector in next submissions.

90. So far, no uncertainty analysis has been carried out. The ERT encourages Croatia to perform sector specific uncertainty analyses for the Industrial Processes Sector in next submissions.

Improvement:

91. The ERT notes that an update of the emission factors for the 2A sub-sectors, in accordance with the new EMEP / EEA Guidebook 2009, is planned as part of one of the next inventories, and compliments Croatia for this improvement.

Sub-Sector Specific Recommendations:

Category issue 1: 2A 1 Cement Production

92. For the period 1990-2004, the NFR 2A1 for NOx emissions was reported by using the notation key NA. Since 2005 the NFR included significant NOx emissions.

During the review Croatia provided the following explanation: Since 2005 direct pollutant emissions have been obtained from the Environmental Pollution Register (EPR)⁴ where the NO_x emissions are separately reported for fuel combustion (energy) and for the cement production process. For the period 1990-2004 detailed data are not available; hence, NO_x emissions from cement production (fuel combustion NO_x emission and process NO_x emission) and therefore the emissions were calculated and reported in the Energy sector 1.A.2.f.i. The ERT recommends Croatia to include this kind of explanations in next submissions.

Category issue 2: 2D2. Food and drink

93. On page 144 of the IIR it is stated that “For all activities in the sub-sector 2D1 production of pulp and paper and 2D2 Food and drinks, recommended emission factors are used from the EMEP / CORINAIR Atmospheric emission inventory Guidebook - Second Edition (1999). For the sector 2D2 a default emission factors based on products: food were used”, and on page 145 it is stated that “A NMVOC factor for white bread proposed for Europe in EMEP-EEA Guidebook 2009 were used, and whole trend of NMVOC emission from bread production were recalculated”. During the review Croatia informed the ERT that there is a mistake in the description of the methodology. For the sector 2D2 default emission factors from the EMEP/EEA Guidebook 2009 have been used and the text will be corrected accordingly. An overview of all EFs (incl. references), used for the calculation of NMVOC emissions from 2D2 Food and drinks is provided by the Party.

Category issue 3: 2D2. Food and drinks

94. In the IIR a table with the total production of 2D2 Food and Drink is included. However, detailed information on the production of wine, spirits, beer and bread, coffee roasting, meat, fish etc. frying / curing, sugar production, animal feed, margarine and solid fats and final cakes, biscuits and breakfast cereals is missing. During the review Croatia provided the ERT with the missing activity data. The ERT commends the Party for this.

⁴ EPR – Environmental Pollution Register: a set of data of sources, type, amount, manner and place of discharge, transfer and disposal of pollutants and waste into the environment based on the Regulations on the Environmental Pollution Register

SOLVENTS

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2006 + (Protocol Years)		
NFRCode	CRF_NFRName	Not		
		Reviewed	Reviewed	Recommendation Provided
3.A.1	Decorative coating application	x		x
3.A.2	Industrial coating application	x		x
3.A.3	Other coating application (Please specify the sources included/excluded in the notes column to the right)	x		x
3.B.1	Degreasing	x		x
3.B.2	Dry cleaning	x		x
3.C	Chemical products,	x		x
3.D.1	Printing	x		x
3.D.2	Domestic solvent use including fungicides	x		x
3.D.3	Other product use	x		x
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes please indicate which have and which have not in the respective columns.				

General recommendations on cross-cutting issues

Transparency:

95. The IIR is generally transparent and well organised although some additional improvements for details have been recommended below. The ERT recommends Croatia to systematically provide information on activity data, emission factors with their units, rationals for the choice of the emission factors and sources of data.

96. The notation key IE is used for NFR 3A1 and 3A2 with the explanation that these sources are included under NFR 3A3. The ERT encourages Croatia to check Table 1.8.2 where IE is reported for NFR 2A1 instead of 3A1, which is probably a mistake.

97. In its reply to the questions raised by the ERT, Croatia provided information on sharp increases/decreases. Since this information is very useful for the understanding of trends, the ERT recommends including it in the IIR.

98. No confidentiality issues were raised by Croatia in the industrial processes sector.

Completeness:

99. The ERT considers the solvent sector to be almost complete. However, the following improvements are recommended: Croatia uses Tier 1 methodologies to calculate NMVOC emissions from most solvent use categories considered under the NFR 3. In addition, some activities are missing, such as:

- a) NFR 3C: SNAP 060311 adhesive, magnetic tapes, films and photograph
- b) NFR 3D1: Printing activities: the emissions inventory is limited to rotogravure, heat set web offset and flexography. Other printing activities are missing such as screen printing and cold set web offset.
- c) NFR 3D2: Preservation of wood,
- d) NFR 3D3: Fat edible and non edible oil extraction, domestic use of pharmaceutical products.

100. The ERT recommends Croatia to verify if these activities do or do not exist in the country. If yes, the ERT encourages Croatia to estimate their emissions using the EMEP/EEA Guidebook.

Consistency including recalculation and time-series:

101. Croatia provided information on some limited recalculations in the IIR for NFR3A, NFR 3B2, SNAP 060306 in NFR3c, NFR3d1, NFR 3D2 and SNAP 060405 in NFR 3D3. The ERT commends Croatia for this.

102. The ERT noted that no information on sharp increases/decreases of the time-series is provided in the IIR. The ERT recommends that Croatia further develops the explanations provided to the ERT during the review and includes them in the IIR.

Comparability:

103. Most emission factors used in the solvent sector inventory are derived from the EMEP/CORINAIR Guidebook, version 1999 or older. The ERT recommends Croatia to update the emission factors with the latest version of the EMEP/EEA Guidebook in order to improve the comparability of the inventory with other countries.

Accuracy and uncertainties:

104. In the current state of development of the solvent sector emission inventory, the inventory is accurate. However, it would be necessary to use more accurate methodologies (Tier 2 and Tier 3), especially for key sources, in order to take into account the progress in the decrease of solvent content of products (paints, inks, glues) and regulations implemented in Croatia on VOC emissions, for existing activities.

105. The ERT recommends Croatia to include in the QA/QC activities, the check of accuracy of the statistics used and their comparability from year to year, since there are some inconsistencies in the activity level trends in Croatia's inventory. The ERT encourages Croatia to take into account import and export data to improve the definition of the activity levels.

106. According to IIR page 40, no UC analysis has been performed. The ERT encourages Croatia to conduct such analysis.

107. Due to the use of Tier 1 method, there is a risk to either overestimate or underestimate emissions. Moreover, the use of Tier 1 method does not allow following up the evolution of emissions resulting from the implementation of

regulations to limit the emissions. Croatia is encouraged to set up a step by step approach to improve the emission inventory.

Improvement:

108. The ERT took note of some improvement plans for 3A and 3B. The ERT recommends Croatia to continue the improvements for the Solvent use inventory. The Tier 1 methodology currently used is an insufficient method for key sources; at least a Tier 2 method should be used. Activities concerned could be prioritized according to their relative contributions to total emissions. Croatia indicated to schedule the improvement plan for activities for which the emission factor is based on the population (such as degreasing, dry cleaning). The ERT supports this initiative and highly encourages Croatia to prioritize and investigate in depth these sectors.

Sub-Sector Specific Recommendations.

Category issue 1: 3.A. Paints and Coatings – NMVOC

109. NFR sector 3A3 is a key source of NMVOC emissions. The ERT recommends Croatia to develop methodologies to enable distinguishing at least the use of decorative paints for building and household applications (NFR 3A1) from the use of paints for industry and car repairing (NFR 3A2). The characteristics of those types of paints are different and the reduction techniques in each of those sectors are different. In building and general public applications, reduction of VOC emissions can be achieved by reduction of the solvent content of solvent based paints and/or the increase in the use of water based paints. In industry, VOC emission reduction is achieved by reduction of the solvent content of solvent based paints, increase in the use of powders, water based paints and UV paints but also reduction techniques such as oxidation and adsorption. Useful sources of information can be found at the European federation of paint producers, the Croatian federation of paint producers, experts from paint manufacturing and paint users.

110. In its reply to ERT questions, Croatia provided information related to trends of emissions. The ERT recommends Croatia to include this information in the IIR.

111. The ERT took note of the planned improvements scheduled by Croatia for the next submission. Croatia is planning to collect industry data from registered installations but, unfortunately, the project has been stopped for economical reasons. The ERT encourages Croatia to try to set up this data collection which can be very helpful for the accuracy of the inventory. The ERT also took note that improvements in the methodologies have not been set up due to the economic crisis.

Category issue 2: 3.B. Dry Cleaning and Degreasing – NMVOC

112. NFR sector 3B1 is a key source of NMVOC emissions. Currently, emissions are estimated with an emission factor related to the population. The ERT encourages Croatia to develop more detailed methodologies in order to better estimate the use of solvents in degreasing and to be able to evaluate if the EU directive 1999/13 on solvent from some industrial sources has effects on emissions of NMVOC .

113. In NFR sector 3B2, emissions are also estimated according to the population. The ERT encourages Croatia to develop more detailed methodologies to better estimate the use of solvent in dry cleaning.

114. To further develop the methodologies, a source of information for the chlorinated solvent sales is the European Federation ESCA⁵. The Croatian Chemical Industry Association could be a source of information as well. Trichloroethylene was the most widely used solvent for degreasing applications in the past. It is now widely recognized as a carcinogenic product and its use is decreasing. Information on the characteristics of machines used for dry cleaning could be found at the Croatian Federation of Dry Cleaners and technical centres and at the dry cleaning machine manufacturers.

115. The ERT also took note that Croatia indicated that improvements in the methodologies are difficult to set up because of the economic crisis and the lack of capacity.

Category issue 3: 3.C. Chemical Products, Manufacture & Processing – NMVOC

116. The ERT recommends Croatia to provide detailed activity levels in the IIR and encourages Croatia to also provide information on the reasons behind the rapid evolution of the activity levels for activities such as polyester processing, PVC processing, polystyrene processing, rubber processing, paint manufacturing, ink manufacturing and glue manufacturing.

117. The ERT recommends Croatia to check the accuracy of the statistics used in the calculation and their comparability from year to year as the activity level trends are not consistent over the years. The ERT encourages Croatia to take into account import and export data in the inventory in order to improve the current assessment of the activity levels.

118. The ERT recommends Croatia to better explain the selection of the emission factors used and to carry out a bibliography survey to select the best emission factors, or to conduct some specific enquiries for some activities, such as production of pharmaceutical products and polystyrene foam processing. Croatia indicated that they use the EMEP/EEA Guidebook version 1994. As the EMEP/EEA Guidebook has been updated regularly, the ERT recommends Croatia to use the latest version of the Guidebook (2009).

Category issue 3: 3.D1. Printing activities – NMVOC

119. The ERT commends Croatia for the detailed presentation of activity levels in the IIR and recommends Croatia to provide information on the reasons of the rapid evolution of the activity levels.

120. The ERT also encourages Croatia to better explain which processes are taken into account in the inventory and to complete them with printing processes not included in the inventory at the moment, if existing (e.g. cold set web offset, screen printing).

⁵ European Chlorinated Solvent Association

121. The ERT invites Croatia to verify the accuracy of the statistics used and their comparability from year to year as the activity level trends are not consistent over the years. The ERT encourages Croatia to take into account import and export data to improve the current assessment of the activity levels.

122. The ERT recommends Croatia to better explain the selection of the emission factors used. The ERT encourages Croatia to continue carrying out a bibliography survey to select the best emission factors or to conduct some specific enquiries for some activities. Sources of information can be found with the associations of printers and paint manufacturers.

123. According to the IIR, no improvement plan is scheduled by Croatia for the solvent sector. Croatia indicated that a database to gather industry data from registered installations should have been developed for the purpose of emissions inventory, but unfortunately the project has been stopped for economical reasons. The ERT encourages Croatia to try to continue this data collection as it can be very helpful for the accuracy of the inventory.

Category issue 3: 3.D2. Domestic uses of solvent – NMVOC

124. The ERT recommends Croatia to better explain the selection of the emission factors used. The ERT encourages Croatia to carry out a bibliography survey to select the best emission factors or to conduct some specific enquiries for some activities.

125. The ERT encourages Croatia to better explain in the IIR why NMVOC emissions are not estimated for the preservation of wood and whether this activity exists or not.

Category issue 3: 3.D3. Uses of glues – NMVOC

126. The ERT commends Croatia for providing detailed information on activity levels in the IIR and recommends Croatia to provide information on the reasons for the rapid evolution of the activity levels.

127. Furthermore, the ERT invites Croatia to verify the accuracy of the statistics used and their comparability as the activity level trend is inconsistent over the years. The ERT encourages Croatia to also take into account import and export data to improve the current assessment of the activity levels.

128. The source category NFR 3D3 covers usage of glues. The ERT recommends Croatia to better explain in the IIR why NMVOC emissions are not estimated for activities such as extraction of vegetable oils and fats and domestic use of pharmaceutical products, if these activities exist or not and to provide information on the methodologies applied.

129. The ERT invites Croatia to better explain the selection of the emission factors used and to carry out a bibliography survey to select the best emission factors or to conduct some specific enquiries, this sector being the second key source in Croatia. Sources of information can be found at the associations of glue manufacturers.

AGRICULTURE

Review Scope:

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2006 + (Protocol Years)		
NFR Code	CRF_NFRName	Reviewed	Not Reviewed	Recommendation Provided
4 B 1 a	Cattle dairy	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 1 b	Cattle non-dairy	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 2	Buffalo			
4 B 3	Sheep	NH ₃		
4 B 4	Goats	NH ₃		
4 B 6	Horses	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 7	Mules and asses	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 8	Swine	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 9 a	Laying hens	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 9 b	Broilers	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 9 c	Turkeys	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 9 d	Other poultry	NH ₃ , PM _{2.5} , PM ₁₀ and TSP		
4 B 13	4 B 13 Other			
4 D 1 a	Synthetic N-fertilizers	NH ₃		
4 D 2 a	Farm-level agricultural operations including storage, handling and transport of agricultural products			
4 D 2 a	Off-farm storage, handling and transport of bulk agricultural products			
4 D 2 c	N-excretion on pasture range and paddock unspecified (Please specify the sources included/excluded in the notes column to the right)			
4 F	Field burning of agricultural wastes			
4 G	Agriculture other(c)			
11 A	(11 08 Volcanoes)			
11 B	Forest fires			

Note: Where a sector has been partially reviewed (e.g. some of the NFR codes please indicate which have and which have not in the respective columns.

General recommendations on cross-cutting issues

Transparency:

130. The IIR is generally transparent for the Agriculture sector. The only significant exception is the reporting of livestock numbers in Figure 6.1-1 of the IIR. Grouping all livestock numbers in this way is not helpful to the reader who needs to be able to see

the trends for each individual livestock class in order to assess the consistency of emission trends because countries that calculate emissions using a Tier 1 methodology, emissions are directly related to livestock numbers. The most transparent way of reporting AD would be a table with livestock numbers. During the review the Croatian inventory team accepted this proposal and will present animal numbers in tables in the next reports. The ERT appreciates this response.

131. Some inconsistencies appeared between livestock numbers reported in the IIR (Figures 6.1-1 and 6.1-2) and the trends in NH₃ emissions shown in the graph. Total emissions of NH₃ appear to have decreased by about 10% since 1995. The marked decrease between 1991 and 1992 may have resulted from changes in N fertilizer use. The ERT recommends to document the changes in emissions in the IIR, as the trends cannot be determined from the information currently presented in the IIR. It would also be helpful to record N fertilizer use on crops and grass in Croatia. In addition, there is some confusion in referring to Figure 6.2-1. to illustrate N fertilizer applied since the figure's label is: 'Mineral N-fertilizers production 1990 - 2009'.

132. The use of notation keys is explained in the IIR.

Completeness:

133. The inventory is complete with respect to the years reported and includes also the most important sources of emissions. However, there is no estimation of nitric oxide (NO) emissions for any of the subcategories under 4B, although default EFs are given in the EMEP/EEA Guidebook. During the review the Croatian inventory team replied that they will correct this in its next inventory. The ERT welcomes this response.

IE is only used for NH₃ emissions from the sector 4D2C, N excretion on pasture range and paddock. This is because NH₃ emissions are calculated using the Guidebook default Tier 1 EF; emissions using that approach for NH₃ emissions from pastures will be reported under 4B, manure management.

Comparability:

134. The methodologies used in the Agriculture sector inventory are consistent with the EMEP/EEA Guidebook.

Consistency including recalculation and time-series:

135. The IIR reports that emissions for the period 2000-2007 have been recalculated using new AD for livestock numbers. As explained in paragraph 153 above, there does appear to be an inconsistency in AD on livestock numbers and N fertilizer use/production and emission trends. This may be caused by the AD for N fertilizer use actually being AD on fertilizer production. The ERT recommends Croatia to correct this inconsistency to the next submission.

Accuracy and uncertainties:

136. It is stated on page 14 of the IIR that so far, no specific uncertainty analysis has been carried out for the IIR under CLRTAP.

137. Overall QA/QC procedures are reported in Annex Table 1 of the IIR but no specific reference is made to the Agriculture Sector. An internal review is carried out as part of the internal QA/QC process. The Party carries out thorough QA/QC checks and these are reported fully in Appendix 1 of the IIR, although there is no specific mention on QA/QC procedures for the agriculture sector. Nevertheless, from the information provided in Annex 1, the ERT notes that for the agriculture sector the general QA/QC approach is satisfactory.

138. In the calculation of emissions from other poultry (NFR 4B9d), the Party uses the default EF for turkeys, which overestimates emissions as described in the sub-sector specific recommendations.

139. In the calculation of emissions from manure management (NFR 4B) the Party does not estimate NO_x emissions as described in the sub-sector specific recommendations

140. Improvement: The IIR reports that improvements have been made by using the newest and more detailed activity data. The IIR also reports that following revision of activity data, further efforts should be put into collecting data necessary for Tier 2 NH₃ emission calculation. The ERT recommends the Party to develop Tier 2 methods for NH₃ emissions using the guidance provided by EMEP/EEA.

Sub-Sector Specific Recommendations.

Category issue 1 4.B Manure management:- NH₃

141. The ERT noted that the data on livestock numbers and N fertilizer use needed for the calculation of NH₃ emissions from NFR 4B Manure Management and 4D1a synthetic fertilizers was not clearly presented. During the review Croatia acknowledged that it will revise the reporting of AD in its next submission. The ERT commends Croatia for agreeing to undertake the suggested changes.

Category issue 1 4.B9d Other poultry :- NH₃

142. In the calculation of emissions from other poultry (NFR 4B9d) Croatia uses the default EF for turkeys. The ERT recommends to use the EMEP/EEA Guidebook NH₃ EF for ducks instead, since turkeys are the largest poultry bird for which the Guidebook provides an EF and its use might give an overestimate of emissions from this source

Category issue 2: e.g. 4.D.1 Agricultural Soils:- NH₃

Information provided in the IIR regarding the national fertilizer consumption is not clear. The ERT recommends Croatia to provide detailed information on the breakdown of national fertilizer consumption into the relevant compounds in use, which are accounted for in emission estimates under NFR 4D1 Direct Soil Emissions.

WASTE

Review Scope:

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2008 + (Protocol Years)		
NFRCode	CRF_NFRName			
		Reviewed	Not Reviewed	Recommendation Provided
6.A	Solid waste disposal on land	x		
6.B	waste-water handling	x		
6 C a	Clinical waste incineration (d)	x		
6 C b	Industrial waste incineration (d)	x		
6 C c	Municipal waste incineration (d)		x	
6 C d	Cremation	x		
6 C e	Small scale waste burning		x	
6.D	Other waste (e)		x	
Note: Where a sector has been partially reviewed (e.g. some of the NFR codes please indicate which have and which have not in the respective columns.				

General recommendations on cross-cutting issues

Transparency:

143. The IIR is informative, with all necessary explanations and information necessary for review. The ERT encourages Croatia for more detailed reporting of activity data in the waste sector.

144. The use of notation keys in the waste sector is limited to the notation key NO (not occurring) for NFR 6Cc Municipal waste incineration, NFR 6Ce Small scale waste burning and NFR 6D Other waste.

Completeness:

145. The Waste sector inventory is complete for sources and almost completed for all years for all sub-sectors, except for sub-sectors outlined as “NO” for the whole period. According to information provided by Croatia during the review data, in some sub-sectors data have been improved following the development of the National Waste Management data system. For all sub-sectors corresponding activity data are included in NFR tables or in IIR.

Consistency, including recalculation and time-series:

146. All recalculations and improvements are well explained for all sub-categories in the Waste sector.

147. The ERT found the time-series to be consistent.

148. During the review, Croatia replied to the question raised by the ERT on the significant decrease for NFR 6Cb Industrial waste incineration. This is due to the closing of the industrial waste incineration plant. The ERT recommends Croatia to complete the documentation in the IIR with such information.

Comparability:

149. The methodologies used in the Waste sector inventory are consistent with the EMEP/EEA Guidebook. Croatia stated in the IIR that country or plant specific emission factors were used for NFR 6Cb Industrial waste incineration in 2007 and 2008 and that these emission factors are based on direct emission reported to their EPR database.

Accuracy and uncertainties:

150. Croatia has provided information on the key sources in the Waste sector.

151. Croatia did not carry out an uncertainty analysis for the Waste sector emissions.

152. In the waste sector inventory, general quality control procedures have been implemented as explained in Annex 1 of the IIR.

Improvement:

153. Information on specific improvements were reported in the IIR for the waste sector regarding:

- recalculation on NMVOC emissions on the basis of revised data on population in 2007 with individual system of drainage;
- recalculation of NMVOC emissions from NFR 6B2 Latrines due to wrong interpretation of activity data in the previous report ,for the whole observed period (1990-2008); the amount of incinerated clinical data and emissions were calculated to replace the data gaps for 2007 and 2008;
- recalculations for NFR 6Cc Industrial waste incineration due to previously misinterpreted data.

154. In regard to the currently missing activities for 1990 – 1999 in the inventory improvement plan, Croatia indicated that collection of data for the Clinical waste incineration sector will be undertaken.

Sub-Sector Specific Recommendations.**Category issue 1: 6.A Solid waste disposal on land**

155. Croatia reported NMVOC emissions for this sub-sector calculated by using Tier 1 methodology which is in accordance with the EMEP/EEA Guidebook. In the IIR, Croatia provides activity data in the form of a diagram only. The recommended emission factor was taken from the EMEP/EEA Guidebook, 2009 (Annex 4).

156. In the IIR Croatia explained the recalculation of NMVOC emissions for 2008 due to revision of data on solid waste disposal on land.

157. The time-series for NFR 6A is homogenous and in accordance with the activity data given in the NFR tables.

158. The ERT noted that the following emissions are not included in the current inventory: NH₃ from landfill sites, SO_x and NO_x from open burning at landfills. The

ERT encourages Croatia to calculate these emissions and to provide a description on the methodologies in the IIR.

Category issue 2: 6.B Wastewater handling

159. The NMVOC inventory for NFR 6B is in accordance with the EMEP/EEA Guidebook. Information on emission factors and activity data for the emission calculation are provided in the IIR. The time-series is in accordance with activity data which are provided in NFR Tables. In the IIR the justification is provided for the recalculations which were carried out due to revised data on population or other activity data.

Category issue 3: 6.C.a Medical waste incineration

160. The submission includes emission data on NO_x, SO_x, NH₃, TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/PCDF and PCB. The emissions are calculated in accordance with the EMEP/EEA Guidebook.

161. The time-series is homogenous and in accordance with their activity data provided in NFR Tables.

162. The justification for the recalculations for 2007 and 2008 is provided in the IIR.

163. Information on activity data (amount of incinerated waste) and the methodology and emission factors used are provided in the IIR.

Category issue 4: 6.C.b Industrial waste incineration

164. Emissions of NO_x, SO_x, NH₃, TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn, PCDD/PCDF and PCB are reported from NFR 6Cb. The emissions are calculated in accordance with the EMEP/EEA Guidebook.

165. Emissions for 2007 and 2008 are recalculated, the time-series is homogenous and in accordance with the activity data provided in the NFR tables.

166. Information on activity data (amount of incinerated waste), used methodology and emission factors are provided in the IIR.

Category issue 5: 6.C.c Municipal waste incineration

167. Municipal waste incineration does not occur in Croatia.

Category issue 3: 6.C.d Cremation

168. Croatia reports the following emissions from NFR 6.C.d Cremation: NO_x, SO_x, TSP, CO and Hg.

169. Activity data for 1990 – 2009 are presented in the IIR. The emissions are calculated in accordance with the EMEP/EEA Guidebook and the emission values are in accordance with the activity data.

Category issue 5: 6.C.e Small-scale waste burning

170. This sub-category is marked with "NO" (not occurring) in the NFR tables.

Category issue 6: 6.D Other Waste(s)

171. This sub-category is marked with "NO" (not occurring) in the NFR tables.

Category issue 7: 7 Other

172. This sub-category is marked with "NO" (not occurring) in the NFR tables.

List of additional materials provided by the Country during the Review

1. Responses to preliminary question raised prior to the review: Croatia q1 responses.doc
2. CROATIA-industry-28-06-11-R1.doc
3. Croatia Stage 2 S&A report
4. Croatia Stage 1 report 2008
5. Croatia IIR 2008
6. Croatia-Energy-R1 to R5.docx