

**UNITED
NATIONS**

Distr.
GENERAL

CEIP/S3.RR/2016/Macedonia
19/10/2016

ENGLISH ONLY

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

**STAGE 3 REVIEW REPORT
FORMER YUGOSLAVIAN REPUBLIC OF MACEDONIA
(the FYROM)**

CONTENT

INTRODUCTION	3
PART A: KEY REVIEW FINDINGS PART A: KEY REVIEW FINDINGS	4
INVENTORY SUBMISSION	4
KEY CATEGORIES	5
QUALITY	5
Transparency	5
Completeness	6
Consistency, including recalculations and time-series	6
Comparability	7
CLRTAP/NECD comparability	7
Accuracy and uncertainties.....	7
Verification and quality assurance/quality control approaches	7
FOLLOW-UP TO PREVIOUS REVIEWS	8
AREAS FOR IMPROVEMENTS IDENTIFIED BY THE FYROM	8
PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY	9
CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT	9
SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT	11
ENERGY	11
TRANSPORT	15
INDUSTRIAL PROCESSES	20
SOLVENTS	24
AGRICULTURE	29
WASTE	33
LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW	37

INTRODUCTION

1. The mandate and overall objectives for the emission inventory review process under the LRTAP Convention is given 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 – 2014 reflecting current priorities from 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 the Former Yugoslavian Republic of Macedonia (the FYROM) coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 20th June 2016 to 25th June 2016 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 – Ms. Charlotte Vanpoucke (Belgium), Energy - Ms. Kristina Juhrich (Germany), Transport - Ms. Yvonne Pang (United Kingdom), Industry - Mr. Sebastian Plickert (German), Solvents - Mr. Ardi Link (Estonia), Agriculture - Mr. Jim Webb (United Kingdom), Waste - Mr. Intars Cakars (Latvia).
4. Ms. Kristina Saarinen (Finland) was the lead reviewer. The review was coordinated by Ms. 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 PART A: KEY REVIEW FINDINGS

5. The ERT recognises the effort undertaken by the FYROM in providing an emission inventory with a significant level of detail and an extensive IIR to undertake a detailed review. The ERT thanks the FYROM for providing comprehensive and timely responses during the review process that facilitated the ERT to review the inventory in detail and to provide a number of recommendations.

6. The inventory is generally in line with the 2013 EMEP/EEA Emission Inventory Guidebook (hereafter Guidebook 2013) and the UNECE Reporting Guidelines. Transport emissions are reported based on fuels sold. The ERT found the inventory to be sufficiently detailed.

7. The ERT found the 2016 submission to be of good quality and to show improvements in a number of issues, thanks to the EU funded Twinning project in which the FYROM was supported by experts for training and establishing an emission inventory team of six experts.

8. The ERT greatly appreciates the efforts made by the FYROM to improve their emission inventory and the elaboration of the IIR. The ERT encourages the FYROM to continue the improving work. However, the ERT identified some need for further improvements of the inventory as described in Part B of the review report.

9. In this report there is a table in the beginning of the review of each sector. Please note that under the column titled "Recommendations provided" the cross (X) marks both actual recommendations as well as encouragements.

INVENTORY SUBMISSION

10. The FYROM submitted NFR tables under the CLRTAP on 15th February 2016 by the set deadline date of 15th February. Resubmissions were made on 14th March and 6th April. In the 2016 submission, the FYROM reported emissions and activity data for the full time series, covering the protocol base years 1980 (SO_x), 1987 (NO_x) and 1988 (NMVOC) up to 2014 (the most recent year), for all pollutants except for black carbon (BC). The submission was done in the NFR 2014-1 format. The ERT notes that a new template NFR 2014-2 is available and recommends that the FYROM report future submissions in this format.

11. The Informative Inventory Report (hereafter IIR) was submitted on 29th March after the deadline date of 15th March.

12. No projected emissions were reported as part of the 2016 submission. The FYROM has indicated in the IIR that it will update the projections in future submission. The ERT welcomes this plan and encourages the Party to carry out the improvement.

13. The 2016 submission included LPS data for 2014 but no gridded emissions. The ERT recommends that the FYROM include gridded data in their future submissions.

KEY CATEGORIES

14. The FYROM has compiled Key Category Analysis (KCA) consistent with the Guidebook. For some pollutants, e.g. NMVOCs, NH₃, heavy metals and PCBs, an aggregation of sectors was used, which resulted in differences compared to the CEIP analysis for the 2014 data. The FYROM indicated to be aware of the different importance of sectors and that it is planning to correct the KCA. The ERT welcomes this plan and encourages the FYROM to carry out the KCA on the level of NFR subcategories for all pollutants.

15. In the inventory improvement plan, the FYROM indicated to carry out a trend assessment within the KCA in future years. The ERT welcomes this plan and encourages the Party to carry out the improvement.

16. During the review, the ERT pointed out that Tier 2 or higher tier methods should be used for key categories instead of Tier 1 methods that are used for most categories at the moment. The FYROM replied that due to time limitations they could not implement higher Tier levels even though data would be available to allow this but that for some major industries and the transport sector, higher Tier methods will be implemented for the next submission. The ERT welcomes these improvement plans and recommends that the use of higher Tier methods for all key categories will be of high priority for inventory improvements.

17. The FYROM does not specify in the IIR if the results of the KCA are used to identify priorities in improvements of the inventory. The ERT recommends that the FYROM uses the results to prioritise improvements in the inventory.

QUALITY

Transparency

18. The ERT found the inventory of the FYROM to be generally transparent and that assumptions made and methodologies used in the preparation of the inventory are clearly described for the majority of sources. The IIR is detailed and follows the recommended structure for an IIR according to Annex II of the Reporting Guidelines. However, during the review, the ERT identified some issues and therefore encourages the FYROM to complement the IIR with information indicated below at the sector level.

19. The FYROM uses some notation keys "IE" (Include Elsewhere) in the NFR tables. Explanations on where these emissions are included were requested by the ERT during the review. The ERT recommends that the FYROM include this information in the IIR to increase the transparency of the inventory.

20. Regarding the use of the notation key "NE" the Party explained in the IIR the reason for the use of "NE" to be the lack of activity data. The ERT encourages the

FYROM to provide explanations for each of the notation keys “NE” used in the NFR tables in the IIR, to increase the transparency of the inventory.

21. The ERT noted an inconsistent use of notation keys between pollutants and years from some sources as indicated in the sector chapters below. The ERT recommends that the FYROM analyse the whole inventory on the correct use of notation keys as defined in the Reporting Guidelines.

Completeness

22. The inventory is complete regarding pollutants and years reported as well as geographical coverage.

23. Regarding the completeness of sources, the ERT identified some possible missing emission estimates reported as “NE” (Not Estimated) or “NA” (Not Applicable). As the completeness of the inventory is essential for the checking of compliance with obligations under the conventions, emission values or at least an assessment of the quantitative importance of the sources currently not estimated is needed. The ERT recommends that the FYROM complete the inventory by calculating and reporting sources currently missing from the inventory as explained under the sector chapters in Part B below.

24. The FYROM has reported emissions and activity data for the complete time series from protocol base years 1980 (SO_x), 1987 (NO_x), 1988 (NMVOC) and 1990 up to 2014 for all pollutants except BC. The Party indicated to plan reporting emissions estimates for BC using Tier 1 emission factors (hereafter EFs) for the next submission. The ERT welcomes the plan and encourages the Party to report BC on voluntary basis.

25. The ERT understands the difficulty in the FYROM to fill in missing data for previous years in the current structure. However, the ERT encourages the FYROM to explain the situation in the IIR as it is important to know e.g. if an activity did not occur in the past or if data on the activity is not available.

26. The FYROM reports zero emissions under NFRs 1.B.2.a.iv, 2.D.3.g (Se) and 5.C.2 (PAHs). The FYROM replied that this will be corrected for the next submission. The ERT welcomes this plan and recommends that the Party, in case of low emission levels, report the actual value of emissions instead of a plain zero, or replace the value with an appropriate notation key.

Consistency, including recalculations and time-series

27. The FYROM has undertaken recalculations for almost all pollutants and sectors and carried out these recalculations consistently throughout the time series. Reasons for recalculations as well as the quantitative information on differences with previous submission are provided in good detail in the IIR. The ERT commends the FYROM for this.

28. Explanations on emission trends, fluctuations, dips and jumps are generally transparently provided with detailed information on the share of sources contributing to

the totals. The ERT commends the FYROM for this and encourages the Party to complete this information as explained in Part B of the report below.

Comparability

29. The ERT notes that the inventory of the FYROM is comparable with those of other reporting parties. The allocation of source categories follows that of the UNECE Reporting Guidelines and the methodologies are consistent with the Guidebook. However, the ERT noted some errors in the use of Guidebook default methods as explained in detail under the sector chapters below in Part B of the report. The ERT also noted that the latest version of the Guidebook is not always used and recommends that the FYROM always update the default EFs according to the latest Guidebook version, to increase the comparability of the inventory with other Parties.

CLRTAP/NECD comparability

30. The FYROM is not an EU country and therefore does not report emissions under the EU National Emission Ceilings (NEC) Directive.

Accuracy and uncertainties

31. The ERT did not find any systematic over- or underestimations in the inventory of the FYROM, however there is need to further improve the completeness of the inventory as described above under "Completeness".

32. The FYROM did not perform an uncertainty analysis as part of the 2016 submission. In the IIR, it is indicated that an uncertainty assessment is planned for future submissions. The ERT welcomes this plan and encourages the Party to carry out the improvement.

33. For most sectors Tier 1 methodologies and default EFs from Guidebooks 2009 and 2013 are used. Tier 2 methods have only been used for NFR categories 1.B.1.a, 2.A.3, 2.D.3.g and 2.H.2. Implied EFs have been used in categories 1.A.1.a and 2.C.2. The ERT recommends that the FYROM improve their inventory by implementing higher Tier methodologies and investigate the possibility to develop national EFs to increase the accuracy of the inventory.

Verification and quality assurance/quality control approaches

34. According to the IIR the QA/QC plan is currently under development. QA and QC procedures already undertaken in 2016 are clearly described in the IIR. In 2016 an external review of the inventory has been carried out by Umweltbundesamt Austria inventory experts. The ERT commends the FYROM for providing information on QA/QC and verification procedures in the IIR and recommends that the Party implement QA/QC procedures during the planning, preparation and management of the inventory and encourages the FYROM to document these in the IIR.

35. The ERT recommends that the Party develop QA/QC procedures for the use of data reported by the plants in the inventory and encourages the Party to include documentation of these in the IIR.

FOLLOW-UP TO PREVIOUS REVIEWS

36. Results from the Stage 1 and Stage 2 reviews on the 2014 emission data have been used in this Stage 3 review. The ERT invites the FYROM also to refer to these previous reviews when examining this review report and when updating its improvement plans.

37. The ERT encourages the FYROM to reply on the findings of the Stage 2 review on CEIP's website.

The ERT commends the FYROM for the improvement of its inventory by the implementation of almost all recommendations made in the previous Stage 3 review report.

AREAS FOR IMPROVEMENTS IDENTIFIED BY THE FYROM

38. The ERT commends the FYROM for presenting an inventory improvement plan in the IIR. The Party identified the following priorities for future inventory improvement:

- (a) Establishment of a Copert IV model calculation for road transport sector emissions;
- (b) Improvement of the methodology for the calculation of NMVOC emissions from "Other solvent and product use";
- (c) Establishment of better QA/QC procedures and development of a documented QA/QC plan;
- (d) Updating and reporting of emission projections;
- (e) Establishment of an uncertainty analysis;
- (f) Perform a KCA trend assessment;
- (g) Calculation and reporting of emissions for categories currently reported as "NE";
- (h) Verification of emission data with data submitted under the UNFCCC.

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

39. The ERT identified the following cross-cutting issues for improvement:
- (a) to estimate and report emissions from sources currently missing from the inventory, or to use the appropriate notation keys according to the Reporting Guidelines, and to explain their use in the IIR:
- | | |
|---------------------|--|
| NFR 1A2f | Stationary combustion: Non-metallic minerals |
| NFR 1A3ei | Pipeline transport |
| NFR 1A5a | Other stationary |
| NFR 1B2d | Other fugitive emissions from energy production |
| NFR 1A2gvii | Mobile combustion in industries and construction (SO _x) |
| NFRs 1A3bi-iv | Road transport (PM _{2.5} , PM ₁₀ , BC, POP's) |
| NFR 1A3c | Railways (SO _x) |
| NFR 1A3eii | Other |
| NFRs 1A4aii/bii/cii | Mobile machinery |
| NFR 1A5 | Other Stationary/Mobile |
| NFR 2D3i | Other solvent use (glass and mineral wool enduction, application of glues and adhesives, vehicle dewaxing) |
| NFR 2G | Other Product use (use of fireworks) |
| NFR 5B | Biological treatment of waste |
| NFR 5C1a and 5C1b | Waste incineration, except NFR 5C1biii |
| NFRs 5D1-3 | Waste water handling |
| NFR 5.E | Other waste |
- (b) to check and correct the incorrect use of notation keys according to their definitions in the Reporting Guidelines;
- (c) to use notation keys consistently for all pollutants and over all categories and years;
- (d) to complete the explanations in the IIR on the use of each of the notation keys "NE" in the NFR tables.
- (e) to report emissions in the latest NFR 2014-2 format;
- (f) to give priority to improvements regarding the use of higher Tier methodologies for all key categories;
- (g) to always update the default EFs according to the latest Guidebook version.

- (h) to carry out a key category analysis on the level of NFR subcategories for all pollutants;
- (i) to check the validity of zero values in the inventory and to (1) report the actual emission values for very low emissions or to (2) calculate and report not estimated emissions, or to (3) use the appropriate notation keys.
- (j) to develop QA/QC procedures for the use of data reported by the plants in the inventory and to document these in the IIR.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5} , Cd, Hg, Pb, Dioxin, PAH		
Years		1990 – 2014		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
1A1a	Public electricity and heat production	X		X
1A1b	Petroleum refining	X		X
1A1c	Manufacture of solid fuels and other energy industries	X		
1A2a	Iron and steel	X		
1A2b	Non-ferrous metals	X		
1A2c	Chemicals	X		
1A2d	Pulp, Paper and Print	X		
1A2e	Food processing, beverages and tobacco	X		
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	X		X
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	X		
1A3ei	Pipeline transport	X		X
1A3eii	Other (please specify in the IIR)	X		
1A4ai	Commercial/institutional: Stationary	X		
1A4bi	Residential: Stationary	X		
1A4ci	Agriculture/Forestry/Fishing: Stationary	X		
1A5a	Other stationary (including military)	X		X
1B1a	Fugitive emission from solid fuels: Coal mining and handling	X		
1B1b	Fugitive emission from solid fuels: Solid fuel transformation	X		
1B1c	Other fugitive emissions from solid fuels	X		
1B2ai	Fugitive emissions oil: Exploration, production, transport	X		
1B2aiv	Fugitive emissions oil: Refining / storage	X		X
1B2av	Distribution of oil products	X		
1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)	X		X
1B2c	Venting and flaring (oil, gas, combined oil and gas)	X		
1B2d	Other fugitive emissions from energy production	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

40. The ERT commends the FYROM for presenting IEFs calculated on basis of measurements carried out at combustion plants in the country. All EFs for NFR 1.A.1.a (IIR page 65) are in a plausible range. The ERT considers the NCV and sulphur content of lignite, presented in the IIR on page 63 to be consistent with SO₂ EFs. The retention of sulphur within the ash is in a realistic range.

41. The ERT commends the descriptions of the plants (number, abatement technology) and measurements presented in the IIR. However, the ERT encourages the FYROM to add explanations for some important changes of the IEFs, such as the changes of the SO₂ and TSP IEFs between 2009 and 2010 and notes that this information also functions as a quality check.

42. The ERT encourages the FYROM to include information on the existence of abatement technology in the IIR, e.g. that the coal fired plants in the FYROM do not have secondary abatement technology to reduce NO_x, SO₂ or TSP emissions, to further increase the transparency of the inventory.

43. The ERT commends the FYROM for providing a trend description for each pollutant in the IIR and encourages the Party to provide more information about the main drivers, such as economic and/or technologic developments, behind the trends in order to explain the dips and jumps, to increase the transparency of the inventory.

Completeness

44. The ERT noted that emissions have not been estimated for NFRs 1.A.2.f, 1.A.3.e.i, 1.A.5.a and 1.B.2.d and recommends that the Party checks if the activities exist and estimates and reports the missing emissions.

Consistency including recalculation and time series

45. Some activity data which are listed in the IIR (Tables 40 – 45, 71, 77 and 84) show gaps in previous years, especially in the early 1990's. The ERT understands the difficult situation of the FYROM since the national border changed and it is not easy to find data from the past in the current structure. The ERT encourages the FYROM to explain the situation in the IIR as it is important to know if a fuel was not used or if data on the use is not available, to facilitate assessing the completeness and consistency of the inventory.

Accuracy and uncertainties

46. The ERT commends the FYROM for the improvements made since the last review regarding the use of higher tier methods and measured emission data for NFRs 1.A.1.a and 1.A.1.b for the pollutants NO_x, SO₂, CO and TSP. The ERT also noted the correction regarding the allocation of biomass and reporting NFR categories 1.A.2.c – e separately.

47. The ERT encourages the Party to create quality checks for the use of data reported by the plants in the inventory and to document the results in the IIR.

Sub-Sector Specific Recommendations

Category issue 1: 1.A.1.a & 1.A.1.b NO_x, SO₂, CO and TSP - Transparency

48. The ERT encourages the FYROM to include the information in the IIR that data reported by the plants cannot be used for the whole energy sector due to different plant capacities, techniques and fuels. Furthermore the ERT encourages the FYROM to include a description of the methodology used to combine data reported by plants and statistical energy consumption (energy balance).

Category issue 2: 1.A.1.a HCB & PCB - Comparability

49. The ERT noted that HCB and PCBs emissions are reported as “NA” although PCDD/F emissions are reported. During the review the Party answered that they used an older version of the Guidebook. The ERT recommends the FYROM to update the EFs for HCB and PCBs according to the latest version of the Guidebook and to report the revised emissions in the next submission, or to justify the use of the older methodologies.

Category issue 3: 1.A.2.f Industrial Combustion, all pollutants - Completeness

50. In the IIR EFs are presented for clinker production (Table 51) while the emissions are reported under NFR 2.A.1. Activity data for clinker production is also presented under NFR 2.A.1. In the NFR tables all emissions under NFR 1.A.2.f are reported as “NA”. The ERT recommends that the FYROM estimates emissions separately for 1.A.2.f. or if not possible, change the notation key to “IE” in case emissions that should be reported under NFR 1.A.2.f are included in the emissions reported under NFR 2.A.1.

Category issue 4: 1.A.3.ei all pollutants - Completeness

51. Emissions under NFR 1.A.3.ei are reported as “NE”. The ERT recommends that the FYROM contacts the gas supplier in order to find out if compressor stations are used in the FYROM and which technologies they use to maintain the pressure in the pipelines. Depending on the organizational structure of your country, possible information could be available in the Ministry or Department of Infrastructure or Economic Affairs or Export Controls. The ERT encourages the FYROM to report the results of the investigation in the IIR and if possible, to estimate and report the missing emissions.

Category issue 5: 1.A.5.a all pollutants- Completeness

52. The FYROM reports emissions under NFR 1.A.5.a as “NE”. While this source category is likely to be of minor importance in the FYROM, the ERT, however, recommends calculating and reporting the emissions to increase the completeness of

the inventory. The ERT is aware that military data can be confidential and that there may be some difficulties to access the data. In many cases this data is already included in the national energy balance (commercial/ institutional sector).

Category issue 6: 1.B.2.aiv Fugitive emissions oil: Refining / storage - Accuracy

53. The ERT noted that the NFR tables contain some zero-values. The ERT recommends the FYROM to replace the zero-values by the actual emissions instead of plain zero (0) values or to use the appropriate notation keys.

Category issue 7: 1.B.2.b Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other) - Accuracy

54. All pollutants under NFR 1.B.2.b are reported as “NO” except PCDD/F which is reported as “NE”. The ERT recommends the Party to change the notation key “NE” into “NO” for PCDD/F because the source does obviously not exist in the country.

Category issue 8: 1.B.2.d Other fugitive emissions from energy production - Completeness/transparency

55. Emissions under NFR 1.B.2.d are reported as “NA” except NH₃, Hg and As which are reported as “NE”. The ERT encourages the Party to check if the activity exists in the FYROM and to estimate and report occurring emissions, or to correct the notation key to “NO” in case the source does not exist in the country.

TRANSPORT

Review Scope

Pollutants Reviewed		All		
Years		1990 – 2014		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
1A2gvii	Mobile Combustion in manufacturing industries and construction: (please specify in the IIR)	X		X
1A3ai(i)	International aviation LTO (civil)	X		X
1A3ai(ii)	International aviation cruise (civil)	X		X
1A3aii(i)	Domestic aviation LTO (civil)	X		X
1A3aii(ii)	Domestic aviation cruise (civil)	X		X
1A3bi	Road transport: Passenger cars	X		X
1A3bii	Road transport: Light duty vehicles	X		X
1A3biii	Road transport: Heavy duty vehicles and buses	X		X
1A3biv	Road transport: Mopeds & motorcycles	X		X
1A3bv	Road transport: Gasoline evaporation	X		X
1A3bvi	Road transport: Automobile tyre and brake wear	X		
1A3bvii	Road transport: Automobile road abrasion	X		
1A3c	Railways	X		X
1A3di(ii)	International inland waterways		NO	
1A3dii	National navigation (shipping)	X		X
1A4aii	Commercial/institutional: Mobile		NE	X
1A4bii	Residential: Household and gardening (mobile)	x		X
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	x		
1A4ciii	Agriculture/Forestry/Fishing: National fishing		NE	X
1A5b	Other, Mobile (including military, land based and recreational boats)		NE	X
1A3di(i)	International maritime navigation		NO / NE*	X
1A3	Transport (fuel used)	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.
 * In the inventory of the FYROM the notation key NO was used for NO_x, while NE was used for other pollutants

General recommendations on cross cutting issues

Transparency

56. The IIR is generally transparent for the transport sector, including activity data and EFs used for the emission calculations. Regarding Guidebook default factors the version and tables of EFs of the Guidebook are presented.

57. During the review, the Party provided further clarification on questions raised by the ERT regarding the methodology for NFR 1.A.3.b, source of heavy metal EFs in NFR 1.A.3.b and the derivation of activity data time series in NFR 1.A.2.g.vii.

58. The ERT recognised the effort made by the Party to be as transparent as possible in its methodology description in the IIR. However, the Party acknowledged that it could not be sure of some aspects (e.g. the source of heavy metal EFs under NFR 1.A.3.b) due to insufficient information provided by the consulting company who prepared the previous IIRs. In such cases, the ERT recommends that the Party reviews the unknown EFs against those from the latest Guidebook and see if they are comparable, and documents the rationale for whether to continue the use of those factors or to switch to another methodology.

59. The ERT also encourages the FYROM to review the unknown sources of activity data in parts of the time series and to check whether another methodology would be more appropriate to gap fill the time series, and to document these in the IIR, in order to increase the transparency of the inventory.

60. To the question raised by the ERT on the data reported under the Memo item NFR 1.A.3 Transport (fuel used) the Party clarified that the road transport inventory is based on fuel sold available in the national energy balance. Following on from this confirmation, the ERT recommends the Party to use the notation key "NE" for this Memo item.

Completeness

61. The ERT commends the Party for the inclusion of non-exhaust emission estimates (fuel evaporation, tyre, brake and road surface wear) in the inventory based on recommendations from the previous Stage 3 review.

62. The FYROM has not estimated emissions from the sources and pollutants listed below. During the review, the Party indicated its intention to include these emission estimates in its next submission. The ERT welcomes this plan and recommends the Party to carry out this improvement.

- (a) SO_x emissions from NFRs 1.A.2.g.vii and 1.A.3.c
- (b) PM₁₀/PM_{2.5} emissions from NFRs 1.A.3.b.i-iv (currently incorrect notation key NA is used)
- (c) POPs emissions from NFR 1.A.3.b

Consistency including recalculation and time series

63. The ERT noted that the trend of SO_x IEFs for NFR 1.A.3.b (between 1990 and 2014) does not follow the development of the sulphur content of road fuels over time. The ERT recommends that the Party reviews its current assumption across the time series and to use country specific information on the sulphur content of the relevant fuel types.

64. The ERT noted that emissions have been recalculated under NFR 1.A.3.c across the time series while the IIR states the no recalculation has been made. The Party clarified that the text in the IIR referred to year 2013 and not across the time series. The ERT encourages the Party to provide more a detailed explanation of the recalculations, including the rationale, information on impacts on the sector and on the trends in its IIR.

Comparability

65. The methods used by the Party to estimate emissions from mobile sources are consistent with those in the Guidebook. As mentioned under Transparency, the ERT encourages the Party to review (and to update if necessary) any non-traceable sources of activity data and/or EFs.

66. The ERT noted that methods from different versions of the Guidebook were used for different source categories, for instance, 2009 Guidebook was used for NFR 1.A.4.b.ii while 2013 Guidebook was used for NFR 1.A.4.c.ii. The ERT recommends that the Party always use the latest 2013 Guidebook version as the source of default methods, or justify the use of other methods, to improve the comparability of inventories between the Parties.

Accuracy and uncertainties

67. The IIR indicates that quality control activities are performed by sector experts during and after the inventory preparation. The ERT encourages the Party to provide more detailed information on the sector specific QA/QC procedures in the IIR in future submissions.

68. As noted in the previous Stage 3 review, the Party has not provided uncertainty estimates. During the review the Party indicated its intention to carry out an uncertainty assessment in future submissions. The ERT encourages the Party to carry out this plan.

Improvement

69. The ERT notes the Party's improvement plans related to NFRs 1.A.3.a, 1.A.3.b and 1.A.4.b.ii and recommends the Party to carry out these improvements to increase the completeness and accuracy of the inventory.

Sub-Sector Specific Recommendations

Category issue 1: 1.A.2.g.vii Mobile Combustion in manufacturing industries and construction: – Cr and Cu, Accuracy

70. The ERT noted that incorrect EFs were used for estimation of Cr and Cu emissions from NFR 1.A.2.g.vii, leading to NFR 1.A.2.g.vii becoming a key source for Cu. The Party indicated its intention is to correct this issue in the next submission. The ERT welcomes this plan and recommends the Party to carry out this improvement.

Category issue 2: 1.A.3.a Aviation – All Pollutants, Accuracy

71. To the questions raised by the ERT during the review relating to NFR 1.A.3.a on why fuel consumption for domestic cruise, as shown in the IIR, is much higher than for international cruise; on why emissions for domestic LTO are reported as NA and why EFs for domestic LTO using aviation gasoline have been used to calculate emissions from domestic cruise, the Party provided further information that seem to suggest that incorrect labelling of the NFR code for international vs domestic aviation has been used in the spread sheets and in the IIR. The ERT recommends the Party to review the calculations and emissions reported under NFR 1A3a, and to make any relevant correction in its next submission. The ERT also notes the Party's intention to check with the national aviation institution on whether the flight movements given in the national statistics only contain flights using jet kerosene or also flights using aviation gasoline. The ERT recommends the Party to carry out this improvement to increase the accuracy of the inventory.

Category issue 3: 1.A.3.b Road Transport - All Pollutants, transparency

72. To the question raised by the ERT the Party provided detailed clarification on the current methodology used for NFR 1.A.3.b. The ERT recognised the effort made by the Party to reproduce a consistent time series of emission estimates from Road Transport based on the limited background information that was documented related to the previous inventories. The Party indicated its intention to move from Tier 1 to a higher tier of methodologies for NFR 1.A.3.b by using the COPERT software, along with detailed vehicle data since 2005 that will be made available by the Party's Ministry of Interior. The ERT welcomes this improvement plan because Road Transport is a key source for NO_x, NMVOC and CO emissions in the FYROM, and encourages the Party to clearly document the methodology and any assumptions used (e.g. how the detailed vehicle data will be gap-filled consistently for years before 2005) in the IIR.

Category issue 4: 1.A.3.d Navigation - SO_x, transparency

73. During the review, the Party provided an explanation on EFs used to estimate SO_x emissions from NFR 1.A.3.d as reply to the question raised by the ERT. The ERT encourages the Party to include assumptions of the sulphur content of fuels for the transport sector in future IIRs, to increase the transparency of the inventory.

Category issue 5: 1.A.3.d.i(i) International maritime navigation- All pollutants, transparency

For NFR 1.A.3.d.i(i), the notation key "NO" is used for NO_x while "NE" used for other pollutants. The ERT recommends the Party to clarify whether emissions from international maritime navigation are occurring, and to estimate and report occurring emissions, or to use a consistent notation key for all pollutants.

Category issue 6: 1.A.4.a.ii Commercial/institutional: Mobile – All Pollutants, Completeness/transparency

74. The notation key "NE" is reported for all pollutants under NFR 1.A.4.a.ii. During the review, the Party clarified that no statistics for fuel consumption are available for

NFR 1.A.4.a.ii in the energy balance and that it will check with the statistical office whether activity data from this source has been accounted for elsewhere. If this was the case, the FYROM indicated to use the notation key “IE” in the next submission. The ERT welcomes this plan and recommends the Party to carry out this improvement.

Category issue 7: 1.A.4.b.ii Residential: Household and gardening (mobile) – All Pollutants, completeness

75. Emissions from NFR 1.A.4.b.ii are currently estimated only for the period 1991 - 2000. The ERT recognised the challenge faced by the Party due to insufficient information available from the earlier inventories to enable deriving a full time series of emissions. During the review, the ERT provided suggestions on how to proceed and the Party agreed that they could use household number as surrogate data to provide emission estimates from 2000 onwards. Moreover, the Party also indicated that it would investigate if the statistical office could gather activity data in future surveys. The ERT welcomes this plan and recommends the Party to carry out the improvement.

Category issue 8: 1.A.4.c.iii: Agriculture/Forestry/Fishing: National Fishing– All Pollutants, Completeness/transparency

76. The FYROM does not report emissions from NFR 1.A.4.c.iii. The ERT recommends the Party to clarify whether emissions from national fishing are occurring. If emissions do occur but are currently not estimated, the ERT recommends the Party to estimate and report the missing emissions, or, encourages the Party to include an explanation in the IIR on why emissions have not been estimated. If this source is not occurring in the FYROM, the notation key “NO” should be used in future submission.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5} , heavy metals (Pb, Cd, Hg), POPs (PCDD/F, Benzo(a)pyrene, Benzo(a)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB)		
Years		1990 – 2014 + (Protocol Years)		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
2A1	Cement production	X		
2A2	Lime production	X		
2A3	Glass production		X	
2A5a	Quarrying and mining of minerals other than coal	X		
2A5b	Construction and demolition	X		
2A5c	Storage, handling and transport of mineral products	X		
2A6	Other mineral products (please specify in the IIR)	X		
2B1	Ammonia production		X	
2B2	Nitric acid production		X	
2B3	Adipic acid production		X	
2B5	Carbide production		X	
2B6	Titanium dioxide production		X	
2B7	Soda ash production		X	
2B10a	Chemical industry: Other (please specify in the IIR)	X		
2B10b	Storage, handling and transport of chemical products (please specify in the IIR)	X		
2C1	Iron and steel production	X		X
2C2	Ferroalloys production	X		
2C3	Aluminium production	X		
2C4	Magnesium production		X	
2C5	Lead production	X		
2C6	Zinc production		X	
2C7a	Copper production		X	
2C7b	Nickel production		X	
2C7c	Other metal production (please specify in the IIR)	X		
2C7d	Storage, handling and transport of metal products (please specify in the IIR)	X		
2D3c	Asphalt roofing	X	X	
2H1	Pulp and paper industry		X	
2H2	Food and beverages industry	X		
2H3	Other industrial processes (please specify in the IIR)	X		
2I	Wood processing	X		
2J	Production of POPs		X	
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)		X	
2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)	X		

General recommendations on cross cutting issues

Transparency

77. The Industrial Processes sector emissions inventory is in general transparent. Recommendations and encouragements to further improve the transparency are provided in the sector specific recommendations below.

78. The ERT notes that for some activities not existing in the FYROM the notation key "NO" is used correctly for both activity data and for most pollutants. However, for individual pollutants also the notation keys "NE" or "NA" are used, which does not seem consistent. The ERT recommends the FYROM to use the notation key "NO" consistently throughout the NFR table for source categories not occurring in the country.

Completeness

79. The ERT considers the Industrial Processes sector to be generally complete for pollutants, sources and years covered with areas of improvement explained below.

80. The ERT notes that for some activities only emissions of particular pollutants are reported, while for the other pollutants the notation key "NA" is used, no matter if the pollutant in question is categorised as "not applicable" or as "not estimated" in the respective section of the Guidebook. The ERT encourages the FYROM to complete the reported emissions as far as data is available, or to use the appropriate notation keys. "NA" should only be used for pollutants that are not emitted from the activity (see categorisation in the respective section of the Guidebook). If emissions of the pollutant in question were reported under the corresponding NFR activity for combustion in manufacturing industries, the notation key "IE" would apply; if emissions were not estimated the notation key "NE" should be used.

Consistency including recalculation and time series

81. The ERT found the time-series to be in general consistent and has given some recommendations below to correct or explain the current inconsistencies.

82. The ERT notes that for some activities that are no longer carried out in the FYROM, such as NFR 2.C.5 Lead production and NFR 2.C.7.c Other metal production, both the notation keys "NE" or "NA" are used in the NFR tables for the later years. The ERT recommends the FYROM to use the notation key "NO" consistently from the year on since the activity no longer existed in the FYROM, and to explain the used notation key in the IIR.

83. The ERT found the recalculations to be consistent, sufficiently justified and documented.

Comparability

84. The inventory is in line with the Reporting Guidelines and the methods used the FYROM to estimate emissions are consistent with the Guidebook and country specific methods are sufficiently described in the IIR.

Accuracy and uncertainties

85. The ERT encourages the FYROM to undertake a quantitative uncertainty analysis for the Industrial Processes Sector in order to support the improvement process and to provide an indication of the reliability of the reported data.

86. The ERT notes that the FYROM describes general QA/QC procedures in the IIR. The ERT encourages the FYROM to include specific information on the application of QA/QC methods in the IP sector and on the results of QA/QC procedures in the IIR.

Improvement

87. The ERT notes the FYROM's intention to further improve the inventory with regard to available data and methods for estimating emissions from NFR 2.A.5 (Storage, handling and transport of mineral products) and from 2.D to 2.L (Solvent and product use, Other production). The ERT welcomes the indicated improvement and encourages the FYROM to clearly document the new data and the methods applied in future IIRs.

Sub-Sector Specific Recommendations

Category issue 1: 2.C.1 Iron and steel production - Accuracy

88. According to section 5.5.1 of the IIR, the emissions from NFR 2.C.1 were calculated using the Tier 1 EF from Table 3.1 in the Guidebook. According to section 3.2.1 of the Guidebook, these EFs are only applicable for steel production in integrated steel mills, whereas for other kinds of steel production Tier 2 methods should be applied. As primary steel production no longer exists in the FYROM according to the IIR, the ERT recommends that the FYROM re-calculates the emissions from NFR 2.C.1 according to the Guidebook using the Tier 2 methods specified for the relevant sub-processes, in order to increase the accuracy of the inventory. In order to apply these methods, individual activity rates for EAF steel production, hot and cold rolling would be required.

89. During the review the FYROM explained that data available from the State Statistical Office for the period 1990–2012 is not detailed enough to apply the Tier 2 methods. As such data was reported only for the last two years (2013-2014) by the operators, the FYROM indicated to apply Tier 2 methods in future submissions for the years 2013 and later. For the period 1990 to 2003, when at least part of the former integrated steelworks (Skopje Steel Works) still were in operation, the FYROM regards the Tier 1 method as appropriate, although it may overestimate the emissions. For the period 2004-2012 the FYROM asked the ERT for a recommendation on estimating and reporting emissions. The ERT found out that the Skopje Steel Works had operated

basic oxygen furnace steel converters and electric arc furnaces (EAF) in parallel since 1972, but abandoned the converter operation by the end of 1990 [EPTISA, 2007, p. 27] i.e. all steel production in the FYROM since 1990 has relied on EAF operation, whereas integrated iron and steel production via the blast furnace/basic oxygen furnace route did no longer exist. Accordingly, the ERT recommends the FYROM to calculate emissions from NFR 2.C.1 for the whole time series since 1990 by using the Guidebook default Tier 2 methods for EAF steel production, for hot and for cold rolling. Since the only EAF steel producer in the FYROM is Duferco Makstil, which already publishes some activity data on its website [Makstil], it seems likely that figures for raw steel production over the whole time series might also be available. Otherwise its activity rate could at least be estimated based on information already available on the company's website. If historic activity data for hot rolling was not available from the three operators of hot rolling plants in the FYROM, the present time series for activity data in NFR 2.C.1 could be further used for calculating emissions from hot rolling – it seems reasonable to assume that all steel produced or processed in the FYROM is hot rolled. Cold rolling is assumedly only carried out by ArcelorMittal Skopje, hence it would be very helpful if the FYROM could get the activity data directly from the company. Otherwise the ERT would propose to assume a certain percentage of the activity data for hot rolled steel that also undergoes cold rolling, and for which the Tier 2 method for cold rolling could be applied.

Category issue 2: 2.D.3.c Asphalt roofing, Transparency

90. Under NFR 2.D.3.c, emissions of NMVOC, TSP and CO have been reported using the EFs provided in the Guidebook. For all other pollutants, the notation key "NA" is used. According to the Guidebook, emissions of SO_x, NH₃, As, Cr, Cu, Ni, Se, Zn, HCH, DDT and PCB are not expected to be emitted from this source, thus the notation key "NA" is appropriate. For NO_x, Pb, Cd, Hg, PCDD/F, Benzo(a)pyrene, Benzo(a)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene and HCB the Guidebook does not provide EFs, but these emissions may still occur from the source. If no data and methodology was available, the pollutants should be reported as "NE", combined with an explanation in the IIR that no methodology exists in the Guidebook.

91. Additionally, the ERT noted that activity data for NFR 2.D.3.c was reported in the NFR table but it was not clear which dimension and unit it referred to (this information was only available in the IIR). The ERT encourages the FYROM to specify the dimension and units for every source category for which "other" activity data such as production amounts are presented in the NFR table.

SOLVENTS

Review Scope

Pollutants Reviewed		NMVOC, NO _x , NH ₃ , PM ₁₀ , PM _{2.5} , TSP, CO, HMs, PCDD/F, PAHs		
Years		1990 – 2014		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
2D3a	Domestic solvent use including fungicides	X		x
2D3b	Road paving with asphalt	X		x
2D3c	Asphalt roofing	X		x
2D3d	Coating applications	X		x
2D3e	Degreasing	X		
2D3f	Dry cleaning	X		x
2D3g	Chemical products	x		x
2D3h	Printing	X		x
2D3i	Other solvent use (please specify in the IIR)	IE		x
2G	Other product use (please specify in the IIR)	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

92. The description of the methodology and EFs in the IIR are considered by the ERT to be generally transparent and well described for the Solvent Sector. For that the ERT commends the FYROM.

93. The ERT encourages the FYROM to include more details in the IIR when describing the reasons behind the emission trends.

Completeness

94. The ERT considers the Solvent sector generally to be complete and comprehensive with good levels of detail in the methodology descriptions for key sources.

95. Some minor remarks for improving overall completeness of the Solvent sector are presented under the sub-sector specific recommendations chapter.

Consistency including recalculation and time series

96. The ERT notes that the FYROM has done recalculations in sub categories “Coating application” and “Other solvent and product use” in the 2016 submission. The ERT found the recalculations to be justified and transparently documented.

97. The ERT commends the FYROM for using Tier 2 EFs in NFR 2.D.3.i “Other solvent use” and NFR 2G “Other product use” sub-categories and recommends the FYROM to investigate possibilities to use higher tier methodologies for Solvent sector key categories that contribute most to the emissions, such as NFR 2.D.3.a (Domestic solvent use), NFR 2.D.3.d (Coating applications) and NFR 2.D.3.e (Degreasing).

98. The ERT found the time series of the Solvents sector to be generally consistent.

Comparability

99. The ERT notes that the FYROM doesn't use country specific methodology to calculate pollutant emissions from the Solvent sector and that all the EFs are taken from the Guidebook 2006, 2009 and 2013 versions. The ERT wants to point out that where the older versions of Guidebook are used for emission calculations reasoning for that should be provided in the IIR because it is generally recommended to use the latest version of the Guidebook.

100. The ERT identified some errors with the used EFs as well as gaps in the activity data presented in the NFR tables. The specific observations are presented in the sub-sector recommendations below.

101. The ERT considers emissions calculated with the Tier 1 methodology to be overestimated. To tackle this problem, the ERT recommends to identify possibilities to upgrade the emission calculation methodologies to higher Tiers in order to better reflect the actual emissions in the country from the Solvents sector.

Accuracy and uncertainties

102. The ERT encourages the FYROM to undertake a quantitative uncertainty analysis for the Solvent sector in order to prioritize improvements and to provide an indication of the reliability of the inventory data.

103. The FYROM has some basic sector specific QA/QC checks in place, but some simple and avoidable mistakes were done in the inventory. The country responded that the schedule for the preparation of inventory was tight and because of that there wasn't much time for thorough QA/QC checks, but the FYROM acknowledged the mistakes found by the ERT and assured that they will be corrected for the next submission. The ERT encourages the FYROM to do that.

Improvement

104. The FYROM has provided the plan for overall improvements in the Solvent and other product use sector in their IIR, to be conducted during the second component expert mission of the undergoing Twinning project. The ERT encourages the FYROM to continue these kinds of projects to improve the quality and completeness of the inventory.

Sub-Sector Specific Recommendations

Category issue 1: 2.D.3.a Domestic solvent use including fungicides – NMVOC - Comparability

105. The FYROM uses the Guidebook 2009 NMVOC EF of 1 kg/person/year for calculating NMVOC emissions from domestic solvent use. The ERT notes that this Tier 1 EF has been updated in the last version of Guidebook and recommends to update the EF and recalculate NMVOC emissions for this sub-sector, or to provide the reasoning for using the current EF in the IIR, for the next submission in order to increase comparability with other reporting Parties.

Category issue 2: 2.D.3.d Coating application – NMVOC, Accuracy

106. The ERT identified a typo in the IIR concerning the EF for “Other coating application”. In the IIR it is presented as 500 g/kg of paint applied, but according to the Guidebook 2013 it should be 200 g/kg of paint applied. The country replied that the EF 200 g/kg paint applied is used for NMVOC emission calculations and the typo in the IIR will be corrected in next submission. The ERT welcomes this plan and encourages the Party to carry out this improvement.

107. NMVOC emissions from coating applications in 2014 are considerably lower compared to 2013. The FYROM explained that only the amount of produced paints is used for emission calculations, because the data on import and export in 2014 was not available during the inventory preparation period. The country replied that this information will be available soon and the NMVOC emissions for the year 2014 will be recalculated by the next submission. The ERT recommends the Party to carry out the recalculations, or in case this is not possible, to document the missing part of the emissions in the IIR, in order to improve the accuracy of the inventory.

Category issue 3: 2.D.3.f Dry Cleaning – NMVOC, Accuracy

108. According to the IIR, the Guidebook 2013 EF of 0.3 kg/inhabitant/year is used for calculating NMVOC emissions from dry cleaning. However, the implied EF calculation showed that the EF used was 0.31 kg/inhabitant/year. The FYROM replied that by mistake a wrong EF was used for emission calculations and that it will be corrected and NMVOC emissions recalculated for the next submission. The ERT welcomes this plan and recommends the Party to carry out this improvement.

Category issue 4: 2.D.3.g Chemical Products – NMVOC, Completeness, transparency

109. Table 136 of the IIR 2016 presents activity data for source category Chemical Products. The ERT noted that there are gaps in the activity data and also that they do not cover the whole time series. The ERT recommends the FYROM to interpolate/extrapolate the activity data for those years where there is no activity data and to calculate emissions to improve the completeness of the inventory. The ERT also encourages the FYROM to include documentation of this in the IIR to increase the transparency of the inventory.

Category issue 5: 2.D.3.h Printing – NMVOC, Transparency, accuracy

110. According to the IIR, activity data for “Printing” sector is deemed to be confidential as it is not being published yet in the statistical publication. The ERT recommends the FYROM to note the confidentiality of activity data in the IIR and when that information is being released for public include it in the future IIRs, to improve the transparency of the inventory.

111. During the review process the FYROM forwarded the activity data used for calculating NMVOC emissions from “Printing” sector to the ERT. In the IIR the FYROM has stated that the Guidebook 2013 Tier 1 EF of 500 g/kg ink is used for calculating NMVOC emissions. When calculating the implied EF the ERT found out that the EF for the years 1999-2013 differs from the Guidebook 2013 Tier 1 EF and resulted in both under- and overestimation of emissions. The country replied that an error has been made in the formula for emission calculations for the stated period and that they will correct the EF and recalculate NMVOC emissions for the next submission. The ERT welcomes this plan and recommends the Party to carry out this improvement.

Category issue 6: 2.D.3.i Other Solvent use – NMVOC, , comparability

112. Emissions from NFR 2.D.3.i are reported as “IE” under NFR 2.G Other Product use. The ERT recommends the FYROM to study closer which activities should be reported under NFRs 2.D.3.i and NFR 2.G, e.g. by using the Mapping table linking categories of different reporting formats², and to adjust the structure of the inventory in the next submission.

Category issue 7: 2.D.3.i Other Solvent use – NMVOC, completeness and transparency

113. The FYROM has not included emissions from the following activities in the inventory: SNAP 060401 Glass wool enduction, 060402 Mineral wool enduction, 060405 Application of glues and adhesives, 060409 Vehicle dewaxing, and that NMVOC emissions from NFR 2.D.3.i might therefore be underestimated. During the review the Party informed the ERT that activity data for these activities is not available and they will include an explanation regarding the issue in the next IIR. The ERT welcomes this development and recommends that the FYROM finds ways to collect this activity data and estimates and reports the emissions once activity data has become available.

Category issue 8: 2.G Other Product use – NMVOC, PAHs, accuracy and transparency

114. According Table 139 of the IIR 2016 there is a drastic drop of creosote usage for the year 2000 and a sharp increase in 2012 compared to the previous years, which might suggest an error and underestimation of NMVOC and PAHs emissions, as no explanation has been provided in the IIR on the issue and the Party could not provide an explanation on the matter during the review of the FYROM. The ERT recommends

²², available from CEIP website http://www.ceip.at/ms/ceip_home1/ceip_home/reporting_instructions/

that the Party investigate the issue and to provide the explanation in the next submission.

115. In Table 140 of the IIR 2016 the EF for PAHs from wood preservation is given as 0.533 mg/kg creosote with reference to the Guidebook 2013 which includes a minor inaccuracy compared to the Guidebook 2013 EF of 0.53 mg/kg creosote. The ERT, however, recommends that the FYROM corrects the EF and perform PAHs emissions recalculations in the next submission.

Category issue 9: 2.G Other Product use – All pollutants, comparability

116. In Table 140 of the IIR 2016 it is stated that the EFs for tobacco combustion are taken from Guidebook 2013. The ERT compared the EFs shown in Table 140 to EFs in Guidebook 2013 and found that there is a discrepancy between them. The ERT recommends the FYROM to tackle this problem and to correct the reference to Guidebook 2009 and to justify the use of these EFs, or to recalculate emissions using Guidebook 2013 EFs for the next submission.

Category issue 10: 2.G Other Product use – All pollutants, completeness

117. The ERT noted that the FYROM has not estimated emissions from the use of fireworks. The ERT recommends the country to investigate if activity data for the use of fireworks is available in the country's statistics and calculate emissions using the Guidebook 2013 EFs, to increase the completeness of the inventory. If activity data is not available then the ERT suggests the FYROM to explain it in the IIR.

AGRICULTURE

Review Scope:

Pollutants Reviewed		SO ₂ , NO _x , NMVOC, NH ₃ , PM ₁₀ & PM _{2.5}		
Years		1990 – 2014		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
3B1a	Dairy cattle	Yes		Yes
3B1b	Non-dairy cattle	Yes		Yes
3B2	Sheep	Yes		Yes
3B3	Swine (Fattening pigs and Sows)	Yes		Yes
3B4a	Buffalo	IE	IE	No
3B4d	Goats	Yes		No
3B4e	Horses	Yes		No
3B4f	Mules and asses	NE	NE	No
3B4gi	Laying hens	Yes		Yes
3B4gii	Broilers	Yes		Yes
3B4giii	Turkeys	Yes		No
3B4giv	Other poultry	Yes		No
	Fur animals	NO	NA	NA
	Camels	NO	NA	No
3B4h	Other animals	NO	NA	No
3Da1	Inorganic N-fertilizers (includes urea)	Yes		Yes
3Da2a	Livestock manure applied to soils	IE	NE	Yes
3Da2b	Sewage sludge applied to soils	NA	NA	Yes
3Da2c	Other organic fertilizers applied to soils (including compost)	NA	NA	No
3Da3	Urine and dung deposited by grazing livestock	IE	IE	Yes
3Da4	Crop residues applied to soils	NA	NA	NA
3Db	Indirect emissions from managed soils	NA	NA	Not reported
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	NE	NA	Not reported
3Dd	Off-farm storage, handling and transport of bulk agricultural products	NE	NA	Not reported
3De	Cultivated crops	NE	NA	Not reported
3Df	Use of pesticides	NO	NA	NE
3F	Field burning of agricultural wastes	NO	NA	NE
3I	Agriculture other	NO	NA	NE
11A	Volcanoes	NO	NA	Not reported
11B	Forest fires		NA	NE

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

118. The inventory is generally transparently described in the IIR and the use of the notation key "IE" is explained in the IIR. However, the ERT identified a further need to complete the documentation of the methodologies regarding some emission sources

and encourages the Party to complete the IIR as explained in the sector specific recommendations below.

119. The IIR does not provide explanations for all trends. The ERT recommends that the FYROM completes the information in the IIR by describing drivers behind all trends.

Completeness

120. The inventory is complete in terms of sources, pollutants, years and geographical coverage.

Consistency including recalculation and time series

121. According to the IIR, recalculations have been carried out as a result of changes in EFs.

Comparability

122. The inventory is in line with the Reporting Guidelines and the methodologies used in the inventory are in accordance with the Guidebook.

Accuracy and uncertainties

123. Although the Party estimates that 99% of NH₃ emissions arise from agriculture and hence agriculture sub-sectors are key categories for NH₃ emissions, the emissions are calculated using Tier 1 methods. The ERT recommends the FYROM to use at least Tier 2 methods for all key categories.

124. The ERT also found some room for improvement of the documentation of methodologies in the IIR as explained below under sector specific findings.

125. The ERT encourages the Party to undertake and report an uncertainty analysis of emissions from Agriculture for the next Inventory report.

126. The Party indicates in the IIR that a QA/QC plan is being developed as part of the improvement plan. However, the implementation of QA/QC procedures was limited for this reporting round due to the need to include the entire time series and due to constraints with respect to trained staff. No specific QA/QC procedures were reported for the Agriculture sector. The ERT welcomes the improvement underway and recommends the FYROM to include a QA/QC plan and information on sector specific QA/QC procedures and their results, as well as information on any verification of the inventory, in their IIR.

Improvement

127. The ERT notes that projections for agriculture emissions were included in the inventory according to recommendations from the previous Stage 3 review.

128. The Party indicated in the IIR that emissions from the application of sewage sludge will be discussed with national experts to determine if these emissions can be included in the inventory.

Sub-Sector Specific Recommendations

Category issue 1: 3.B Manure management - Accuracy

129. The calculation of emissions from manure management is transparent as livestock numbers and EFs are given in the IIR. However, NH₃ emissions are currently estimated using Tier 1 methodologies. Since 99% of NH₃ emissions in the FYROM originate from agriculture, sub-sectors in agriculture are key categories for NH₃ emissions (e.g. dairy cattle, other cattle, pigs, sheep and laying hens). The ERT recommends that the FYROM estimate emissions from key categories by using at least the Tier 2 method provided in Chapter 3B of the Guidebook.

Category issue 2: NH₃ emissions from 3.D.1 Inorganic N-fertilizers - Accuracy

130. The ERT asked the Party for clarification regarding the statement on 'shares of fertilizer substances' (page 149 in the IIR). The Party replied that it has no data on the composition of different types of fertilizers while the data obtained from FAO and the Ministry for Agriculture covers the quantities of different fertilizers but not their N contents. Therefore the Party could only use the Guidebook Tier 1 default EF for calculations. Based on the data set provided by the Party the ERT concludes that the N contents of the fertilizers equal those of Guidebook and recommends that the Party moves to Tier 2 methodology using the N contents as follows:

- Ammonium sulphate, 0.21 kg N per kg fertilizer.
- Ammonium nitrate, 0.34 kg N per kg fertilizer.
- Calcium ammonium nitrate, 0.27 kg N per kg fertilizer.
- Urea, 0.46 kg N per kg fertilizer.
- MAP, 0.11 kg N per kg fertilizer.
- DAP, 0.18 kg N per kg fertilizer.
- NPK > 10 kg, 0.15 kg N per kg fertilizer*.
- NPK < 10 kg, 0.15 kg N per kg fertilizer*.
- Other N-fertilizers, kg N per kg fertilizer*.

Category issue 3: PM emissions from Agriculture - Transparency

131. The ERT noted that particle emissions from agriculture are reported in the NFR tables. However, while EFs are provided in Table 149 of the IIR, the methodology is not elaborated. The ERT encourages the Party to provide a more detailed description of the methodology for calculating particle emissions in the IIR.

Category issue 4: Livestock manure applied to soils (3.D.a.2.a) and from urine and dung deposited by grazing livestock (3.D.a.3) - Transparency

132. The ERT notes that emissions arising from livestock manure applied to soils (NFR 3.D.a.2.a) and from urine and dung deposited by grazing livestock (NFR 3.D.a.3) are currently included elsewhere. The ERT acknowledges that this was necessary as the Tier 1 default EFs in Chapter 3B of the Guidebook 2013 only provided a single emission estimate per animal place. However, in addition to the recommendation to use a Tier 2 method for those livestock categories that are key sources, the Guidebook Chapter 3B provides separate Tier 1 EFs for NH₃ emissions arising from manure application to land (NFR 3.D.a.2.a) and from excreta deposited during grazing (NFR 3.D.a.3). The ERT recommends that the Party estimate and report NH₃ emissions from NFRs 3.D.a.2.a and 3.D.a.3 separately even if those emissions are still calculated using Tier 1.

Category issue 5: Animal numbers 3.B.4.g.ii - Consistency and Transparency

133. To the question raised by the ERT during the review on broiler numbers for 2007, 2008, 2011 and 2013 (Table 147 in the IIR) the Party replied that a new census introduced since 2007 by the State Statistical Office (SSO) (<http://www.stat.gov.mk/PublikaciiPoOblast.aspx?id=6&rbrObl=17>), explains the discrepancies. However, no explanation was received for the high broiler number in 2013. The ERT recommends that the Party further investigates the deviation for 2013 and encourages to complete the documentation of the statistics in the IIR with this information.

WASTE

Review Scope:

Pollutants Reviewed		All		
Years		1990 – 2014		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
5A	Biological treatment of waste - Solid waste disposal on land	X		X
5B1	Biological treatment of waste - composting		X	X
5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities		X	
5C1a	Municipal waste incineration		X	
5C1bi	Industrial waste incineration		X	
5C1bii	Hazardous waste incineration		X	
5C1biii	Clinical waste incineration	X		X
5C1biv	Sewage sludge incineration		X	
5C1bv	Cremation		X	
5C1bvi	Other waste incineration (please specify in the IIR)		X	
5C2	Open burning of waste	X		X
5D1	Domestic wastewater handling		X	X
5D2	Industrial wastewater handling		X	X
5D3	Other wastewater handling		X	
5E	Other waste (please specify in IIR)		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

134. The ERT found the descriptions of calculations presented in the IIR to be generally transparent and has provided some recommendations to further improve the transparency under the sub-sector specific recommendations below.

135. The ERT noted some inconsistent use of notation keys and recommends the Party to check and correct the notation keys using the definitions in the Reporting Guidelines for the whole time series:

- (a) NFR 5.B.1: “NO” is reported for NH₃ emissions, while the other pollutants are reported as “NE”;
- (b) NFR 5.B.2, “NA” is reported for the whole category
- (c) NFR 5.C.1.a: “NO” is reported for the whole category
- (d) NFRs 5.C.1.bi, 5.C.1.bii, 5.C.1.biv: “NE” is reported for NH₃ emissions, while the other pollutants are reported as “NO”; and

- (e) NFR 5.C.1.bv: "NA" is reported for NH₃ emissions, while the other pollutants are reported as "NO".
- (f) NFR 5.C.1.bvi: "NO" is reported for the whole category
- (g) NFR 5.D.1: "NA" is reported for the other pollutants than NMVOCs and NH₃, for which "NE" is reported
- (h) NFR 5.D.2: "NA" is reported for the other pollutants than NMVOCs, for which "NE" is reported; and
- (i) NFR 5.D.3: "NA" is reported for the whole category
- (j) NFR 5.E: "NO" is reported for the whole category

Completeness

136. In the Waste sector the FYROM reports emissions only from NFR 5.A Solid waste disposal on Land, NFR 5.C.1.b.iii Clinical waste incineration since 1990, and from NFR 5.C.2 Open burning of waste since 2000. The ERT recommends the FYROM to establish a national waste amount data collection system to facilitate the collection of activity data to be used in the inventories, to complete the inventory by estimating and reporting emissions from all existing sources, and to document in the IIR if sources do not exist in the country (see also the list of currently used notation keys above under "Transparency").

Consistency, including recalculation and time series

137. Based on information given in the NFR tables and in the IIR the ERT concluded that the inventory for the Waste sector is not fully consistent due to the varying use of notation keys between the years reported. No further explanation of the use of notation keys is provided in the IIR. The ERT recommends that the FYROM examines and corrects the use of notation keys over the years in the NFR tables and encourages the Party to provide explanations for their application in the IIR.

138. There is no information on the recalculation of emissions in the IIR. The ERT encourages the Party to document any recalculations and their impacts on emission trends in the IIR.

139. The ERT noted significant increases in emissions from Clinical waste incineration in 2010, 2013 and 2014. The ERT encourages the FYROM to explain these fluctuations of emissions in the IIR.

140. According to the IIR emissions from Clinical waste incineration are reported since the year 2000 as the incinerator started to operate only in 2000. The ERT recommends that the Party describes the situation of waste incineration without energy recovery for the period 1990-1999 in the IIR.

141. The FYROM reports emissions from the Open burning of wastes sub-category. The ERT encourages the Party to provide a more detailed description of the assumption of the amount of burned waste from 1 hectare of arable land in the IIR.

Comparability

The allocation of emissions is generally in line with the Reporting Guidelines and the methodologies used generally in line with the Guidebook. Recommendations for improvements are provided in sub-category specific recommendations below.

Accuracy and uncertainties

142. Tier 1 methods from the Guidebook 2013 were used for all categories, including NMVOC from NFR 5.A which is one of the key categories of NMVOCs. The ERT has provided a recommendation regarding this in the sub-sector specific recommendations below.

Improvement

143. The FYROM states in the IIR that estimation of emissions from the Waste water treatment sub-category is a priority and that further analysis of industrial waste data, gathering relevant data on industrial waste and its composition in order to improve and complete activity data for calculations of emissions in the sector Solid waste disposal on land will be done. The ERT welcomes these plans and recommends the Party to carry out these improvements.

Sub-Sector Specific Recommendations

Category issue 1: 5.A. Solid waste disposal on land – Activity data consistency

144. It is stated in the IIR that waste landfilling data from 2000 to 2014 are taken from Eurostat, whereby it has been checked that they are consistent with national statistics. National statistics on municipal solid waste are only available for 2014 and 2010. The ERT recommends the FYROM to establish a national data reporting system for waste amounts in coordination with the National Statistical Office and to try to obtain data also for the other years. In the case this is not possible, the Party could extrapolate the missing data using other parameters, such as e.g. GDP and the 2010 and 2014 existing statistics, to obtain estimates for the missing years, in order to improve the consistency of the inventory.

Category issue 2: 5.A. Solid waste disposal on land – Accuracy

145. The ERT noted that NMVOC emissions have been calculated using Tier 1 emission factors from the Guidebook. As NFR 5.A which is one of the key categories of NMVOCs, the ERT recommends that the Party uses higher tier methodologies to estimate emissions from key categories.

Category issue 3: 5.B.1– Biological treatment of waste - Composting, completeness

The FYROM does not report emissions from composting although household waste composting occurs in every European country. The ERT recommends the FYROM to establish a national data reporting system for waste amounts (see also Sub-Category Specific Recommendations, Category issue 1), where composting data should be included.

Category issue 4: 5.C – Waste incineration - Completeness

146. The FYROM reports emissions only from NFRs 5.C.1.b.iii and 5.C.2 while the other waste incineration sub-categories are reported as not occurring. The ERT recommends the Party to investigate the situation in the country regarding whether these activities occur. The establishment of a national waste data collection system as recommended above under Sub-Category Specific Recommendations, Category issue 1, will support data collection from national waste management processes.

Category issue 5: 5.C.2 Open burning of wastes - Transparency

147. The FYROM presents the calculation method for NFR 5.C.2 in the IIR, however, there is no information about assumptions made to obtain activity data. The ERT encourages the FYROM to provide a more detailed explanation in the IIR about assumptions made in this sub-category.

Category issue 6: 5.D.1 Domestic Wastewater handling – NMVOC, NH₃, completeness

148. The FYROM does not estimate emissions from wastewater handling. The ERT recommends that the FYROM apply methods from the Guidebook 2013 to estimate NH₃ and NMVOC emissions to increase the completeness of the inventory. To obtain activity data, the ERT recommends that the Party makes assumptions if more accurate data is not available (see also Sub-Category Specific Recommendations, Category issue 1).

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Response to preliminary question raised prior and during the review:
2. Stage 2 S&A report
3. Stage 1 report 2016
4. The Party's IIR 2016
5. Industrial Processes Sector: additional information provided by the Party:

[EPTISA 2007] EPTISA International; DHI ; the FYROM Ministry of Environment and Physical Planning (beneficiary) ; European Agency for Reconstruction (contracting agency): Development of remediation plans with financial requirements for elimination of industrial hotspots : FEASIBILITY STUDY – Volume IV – Makstil – Ferro Slag Dumpsite - Skopje. Skopje 2007 – URL:

http://www.moep.gov.mk/wp-content/uploads/2014/11/Volume%20IV_Makstil_feasibility_final_15_10_07.pdf

[Makstil] Published activity data for hot plate production from 1998 to 2007:

<http://www.makstil.com/02-About/about.aspx?page=HistoryAndLocation&lang=EN>;

activity data for slab and plate production from 2006 to 2015:

<http://www.makstil.com/02-About/About.aspx?page=About&lang=EN>

6. Transport Sector: additional files provided by the Party
 - 1.A.3.a - Aviation_mk.xls
 - 1.A.3.a ii.xls
 - Airplane_LTO_Twinning.xlsx
 - 1.A.3.dii National Navigation.xls