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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:**

**STAGE 3 REVIEW REPORT  
IRELAND**

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## 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*'<sup>(1)</sup> – hereafter referred to as the 'Methods and Procedures' document.
2. This annual review has concentrated on SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, NH<sub>3</sub>, plus PM<sub>10</sub> & PM<sub>2.5</sub> for the time series years 1990 – 2013, 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 Ireland coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 22<sup>nd</sup> June 2015 to 27<sup>th</sup> June 2015 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 – Charlotte Vanpoucke (Belgium), Energy - Thomas Gustafsson (Sweden), Transport - Michael Kutzulla (Germany), Industry - David Kuntze (Germany.), Solvents - Kees Peek (Netherlands), Agriculture + Nature - Hakam Al-Hanbali (Sweden), Waste - Dirk Wever (Netherlands).
4. Anne Misra (United Kingdom) was the lead reviewer. The review was coordinated by Katarina Marečková (EMEP Centre on Emission Inventories and Projections - CEIP).

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<sup>1</sup> 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 ERT recognises the effort undertaken by Ireland in providing an inventory with a significant level of information, enabling the ERT to undertake a thorough review.
6. The inventory is generally in line with the 2013 *EMEP/EEA Inventory Guidebook* and the UNECE Reporting Guidelines. Emissions are provided for the full time series 1990-2013. Emissions reported under CLRTAP and NECD are consistent.
7. The ERT notes that recalculations have mostly been applied consistently through the entire time series. The ERT also notes that Ireland applies Tier 1 methods and default parameters for some key categories.
8. The 2015 submission shows improvements for some issues. Nevertheless, the ERT has identified a need for further improvements in transparency and completeness.
9. Ireland participated actively in the Stage 3 review process providing further information and data when requested. Based on that information, the ERT was able to review the inventory within the given period.

### INVENTORY SUBMISSION

10. In the 2015 submission, Ireland has reported emissions for its NO<sub>x</sub> Protocol base year (1987) and a full time series of emissions and activity data for the years from 1990 to 2013 (the most recent year) for its Protocol pollutants (NO<sub>x</sub> and SO<sub>2</sub>) and other pollutants (NMVOC, NH<sub>3</sub>, CO), particulate matter (PM<sub>2.5</sub>, PM<sub>10</sub>, TSP, BC), heavy metals (Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn) and POPs (PCDD/F, PAHs, HCB and PCB) in the NFR14 format. Ireland also submitted a detailed IIR including most of the required information in the IIR structure as recommended in Annex II of the revised Guidelines.
11. The CLRTAP inventory submitted by Ireland is of good quality and is in general well documented in the informative inventory report (IIR).

### KEY CATEGORIES

12. Ireland has compiled and presented in its IIR a Tier 1 level Key Source Category Analysis (KCA) for the following pollutants: NO<sub>x</sub>, CO, NMVOC, SO<sub>2</sub>, NH<sub>3</sub>, TSP, PM<sub>10</sub> and PM<sub>2.5</sub>, heavy metals, Dioxins, PAHs, HCB and PCBs. The KCA from Ireland is consistent with the 2013 EMEP/EEA Guidebook and identical to the CEIP analysis. All sectors have been included. A trend assessment has been performed for 2013 for NO<sub>x</sub>, SO<sub>2</sub>, NMVOC and NH<sub>3</sub>. During the review, Ireland responded that it would consider an extension of the trend assessment to other pollutants and include more information in the IIR. The ERT welcomes this plan.

### QUALITY

#### ***Transparency***

13. Ireland's IIR is detailed and well presented. It includes specific and detailed chapters for the different NFR sectors and subsectors occurring in Ireland. These include information on assumptions, Emission Factors (EFs), activity data and references. The ERT compliments Ireland on the excellent work done on the IIR.

14. Ireland uses zero values in a few cases in the reporting tables. Also, the ERT has noticed an inappropriate use of the notation key '*NO-Not Occurring*'. The ERT encourages Ireland to use the appropriate notation keys for reporting where estimates are not available or occurring (e.g. NO for all pollutants when an emission source is "Not Occurring", NE where emissions are "Not Estimated", IE where emissions are "Included Elsewhere" and NA where emissions from an existing source are not applicable). Following the review, Ireland has indicated that zero values will be replaced by 'NO' and notation keys will be revised in future reporting.

15. Information explaining the use of the notation key IE (Included Elsewhere) is not provided in NFR tables, nor is it included in the IIR. The ERT strongly recommends that Ireland provides such information for better transparency of the inventory. The ERT encourages Ireland to explain the reason for the aggregation in the IIR, and to investigate and report whether it is possible for future submissions to report these emissions in the appropriate NFR categories.

16. The ERT commends Ireland for its comprehensive documentation on QA/QC, recalculations and uncertainty analysis in the IIR and encourages Ireland to continue this work in the next submissions.

### ***Completeness***

17. The ERT acknowledges the effort to which Ireland has gone to provide estimates of emissions for all sub-sectors and all pollutants reviewed.

18. Ireland has submitted a full time series of emissions and activity data and the inventory for the pollutants reviewed is generally complete. However, the ERT has identified some possibly missing emissions in the Industrial Processing sector (e.g. PM in 2A5, 2D3c, 2H2, etc) and Agriculture (NO<sub>x</sub>), see further in Sector-specific recommendations. These and other sources are reported as 'NE Not Estimated' Explanations for the use of 'NE' was provided during the review week. The ERT strongly encourages Ireland to include this information and to include descriptions in the IIR of plans to estimate these sources/pollutants in the next submissions.

19. The ERT recommends that the party performs additional reviews to identify potential gaps in the inventory. The usage and explanations for the use of notation keys is highly recommended to support the identification of such gaps.

### ***Consistency, including recalculations and time series***

20. Ireland has undertaken recalculations of the complete time series for the years since 1990 and has provided, in each sector chapter of the IIR, detailed data on and descriptions for the recalculations made. The ERT commends Ireland for providing this information. For national level totals, the recalculations are very important for almost all pollutants (giving rise to changes of more than 10% and up to 1200% for PAHs). The recalculations have an impact on the time trends for heavy metals. The ERT recommends that Ireland provides complementary information in the IIR on the recalculations, particularly additional detail on the impacts of the changes on the national estimates and trends in the time series.

21. The largest jumps, dips or fluctuations are either explained within the IIR, or by the Party giving complementary explanations during the review week. Where the time series is not consistent (2L), Ireland has provided an adequate explanation.

## ***Comparability***

22. The ERT notes that the inventory of Ireland is comparable with those of other reporting parties. The allocation of source categories follows that of the EMEP/EEA Reporting Guidelines. The ERT encourages Ireland to continue with this approach to national inventory calculation.

## ***CLRTAP/NECD comparability***

23. Emission inventories reported under NECD and CLRTAP are fully consistent, both on the sectoral and the national level.

## ***Accuracy and uncertainties***

24. Ireland has compiled a semi-quantitative uncertainty analysis using a Tier 1 propagation of errors for NO<sub>x</sub>, SO<sub>2</sub>, NMVOC, NH<sub>3</sub>, CO and PM<sub>10</sub>. Although the uncertainty assessment in itself is rather uncertain, it gives a first indication of which sectors contribute most to the overall uncertainty and which sectors should, therefore, be targeted for improvement. The ERT recommends that Ireland continues and, where possible, improves the uncertainty analysis with better estimates of uncertainty for EFs or activity data.

## ***Verification and quality assurance/quality control approaches***

25. Ireland has developed and implemented a good quality assurance/quality control (QA/QC) plan, which includes a good framework and general QA/QC procedures. Several spreadsheet-based tools have been developed, also for individual categories, to provide more information on the QA/QC process and to provide outcomes for the checks performed. The ERT commends Ireland on its general and sectoral quality assurance/quality control (QA/QC) activities. In addition, the ERT encourages Ireland to add the QA/QC plan to the IIR.

## **FOLLOW-UP TO PREVIOUS REVIEWS**

26. The current Stage 3 review has used outputs from the Stage 1 and Stage 2 review processes. ERT invites Ireland to also refer to these previous reviews when examining the current review report and when updating its improvement plans.
27. The ERT commends Ireland for the implementation of the following recommendations made in the previous Stage 3 report:
28. Implementing the new NFR format, including activity data.
29. Applying the new recommended structure for the IIR.
30. Implementing uncertainty estimates and using the uncertainty analysis as a tool to target key categories for planned improvements.
31. Recommendations from the previous Stage 3 review that have not been addressed are repeated in Part B below.

## **AREAS FOR IMPROVEMENTS IDENTIFIED BY IRELAND**

32. The IIR has identified several areas for improvement per sector. These include:
33. Continuation of the implementation of updated emission factors from the 2013 EMEP/EEA Guidebook in the Energy sector.
34. Applying Tier 2 emission factors that refer to different types of stationary combustion of commonly used fuels, especially in 1A4a Commercial/Institutional combustion and 1A4b(i) Residential combustion.
35. Reducing the use of NE (Not Estimated) by adding currently missing sources (2D3b, 2D3c, 2H1, 2H2) or using the appropriate notation key.
36. Extending the time series in the Industrial Processes sectors by including heavy metals and POPs. The main priority will be given to estimating emissions from PCDD/F for all years after 2001 and to developing estimates of PCB and HCB for the full time series from iron and steel production sector 2C1.
37. Further investigation of the product breakdowns in the Solvents and Other Product Use sector.
38. Revising the NH<sub>3</sub> emission factors in the Agricultural sector - if necessary, based on updates in the 2013 EMEP/EEA Guidebook - for the next submission.
39. Including information on fire statistics for the years 2008-2012 to update emissions of POPs from 5D Accidental Fires.

## **PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY**

### **CROSS-CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT**

40. The ERT has identified the following cross-cutting issues for improvement:

41. Emissions from mobile sources are included under stationary sources. In response to this year's review, Ireland indicates it will try to estimate the fuel used by mobile sources in the commercial and manufacturing/construction sectors in conjunction with the energy balance provider, SEAI, for the next submissions. The ERT strongly encourages this plan.

42. The ERT recommends that Ireland provides explanations for the use of IE 'Included Elsewhere' and NE 'Not Estimated' in the next IIR. The ERT encourages Ireland to explain the reason for the aggregation in the IIR, and to investigate and report whether it is possible for future submissions to report these emissions in the appropriate NFR categories.

43. The ERT recommends that Ireland replaces the few zero values used and to use the appropriate notation keys instead for reporting where estimates are not available or necessary.

44. The ERT recommends that Ireland provides complementary information in the IIR on the recalculations, particularly additional detail on the impacts of the changes on the national estimates and trends in the time series.

45. The ERT encourages Ireland to extend the information on the key source trend analysis in the IIR.

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

## SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

### ENERGY

#### Review Scope

Pollutants Reviewed		SO <sub>2</sub> , NO <sub>x</sub> , CO, NMVOC, NH <sub>3</sub> , TSP, PM <sub>10</sub> & PM <sub>2.5</sub> , Cd, Hg, Pb, Dioxin, PAH		
Years		1990 – 2013		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
1A1a	Public electricity and heat production	X		
1A1b	Petroleum refining	X		
1A1c	Manufacture of solid fuels and other energy industries	X		
1A2a	Iron and steel	X		X
1A2b	Non-ferrous metals	X		X
1A2c	Chemicals	X		X
1A2d	Pulp, Paper and Print	X		X
1A2e	Food processing, beverages and tobacco	X		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		X
1A3ei	Pipeline transport	X		
1A3eii	Other (please specify in the IIR)	X		
1A4ai	Commercial/institutional: Stationary	X		X
1A4bi	Residential: Stationary	X		X
1A4ci	Agriculture/Forestry/Fishing: Stationary	X		X
1A5a	Other stationary (including military)		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		
1B2av	Distribution of oil products	X		
1B2b	Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other)		X	
1B2c	Venting and flaring (oil, gas, combined oil and gas)		X	
1B2d	Other fugitive emissions from energy production		x	

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

## General recommendations on cross-cutting issues.

### **Transparency:**

47. Ireland has provided a detailed and generally transparent emissions inventory. Estimates are provided at the most detailed level for all categories of the Energy sector. An overview of the methodology together with the applied emission factors is provided in the IIR and its Annexes. The ERT has noted that Ireland did not include a description in its IIR of the assumptions made when choosing between Tier 1 and Tier 2 emission factors from the 2013 EEA/EMEP Guidebook and encourages Ireland to improve transparency by including such information in its next submission.

48. In addition, the ERT encourages the Party to include more details in the IIR on explanations for emissions trends, e.g. the timing and type of installed abatement technologies in public electricity and heat production, NFR 1A1a.

49. Ireland uses zero values in NFR 1A2a for liquid fuel for the years 2003-2013 in the reporting tables. The ERT recommends that Ireland uses the appropriate notation keys "NO" where emissions are "Not Occurring" in its next submission. This issue was addressed in the previous review report.

50. In the previous review in 2009, the ERT recommended that Ireland should estimate NH<sub>3</sub> emissions from stationary combustion, or use the appropriate notation key "NE". The ERT has noted that Ireland has used the notation key "NE" in its 2015 submission and commends the Party for its efforts to improve the transparency of reporting.

### **Completeness:**

51. The ERT considers the Energy sector to be complete and comprehensive with good levels of detail in the methodology descriptions.

52. In the previous review report, Ireland was encouraged to include estimates of NMVOC and PM from Fugitive emission from solid fuels: Coal mining and handling (NFR 1B1a) for the years 1990-1995. The ERT has noted that the Party has estimated these emissions by applying EFs from the 2013 EEA/EMEP Guidebook and commends Ireland for improving the completeness of its inventory.

### **Consistency including recalculation and time series:**

53. Ireland has recalculated its inventory for all years and almost all sectors for several pollutants using the updated emission factors from the 2013 EMEP/EEA Guidebook rather than the previous Guidebook version. The ERT commends Ireland for its efforts to improve the accuracy of its reporting activities. The ERT considers that the recalculations are described transparently in the IIR.

54. In addition, Ireland has revised national emission factors for Heavy metals and POPs in NFR 1A1, 1A2 and 1A4 by applying default emission factors from the 2013 EEA/EMEP Guidebook. In response to a question from the ERT on the rationale behind the revision, Ireland explained that the 2013 EMEP/EEA Guidebook represented up-to-date scientific knowledge and that the emission factors used previously had come from studies conducted almost 10 years ago, based on the UK NAEI database and older versions on the Guidebook. The ERT believes that older national EFs may still be more representative of Ireland than

2013 EMEP/EEA Guidebook default emission factors and encourages Ireland to provide sufficient evidence of actual improvements in the emission estimates for any revision in future submission.

#### **Comparability:**

55. The ERT considers that the methods used in the Energy sector are consistent with those proposed in the 2013 EEA/EMEP Guidebook.

#### **Accuracy and uncertainties:**

56. In the previous review in 2009, the ERT recommended that Ireland should estimate PM emissions from Public Electricity and Heat Production using Tier 2 or Tier 3 methods. The ERT notes that Ireland, in its 2015 submission, uses Tier 2 emission factors from the 2013 GB and commends the Party for its efforts to improve the accuracy of its reporting activities.

57. It was noted in the previous review report in 2009 that Ireland lacked an uncertainty analysis for the Energy sector. Since then, Ireland has developed such a sector analysis and the ERT commends Ireland for its efforts. The ERT encourages Ireland to use the uncertainty analysis when setting priorities in its future improvement plans.

58. The Party describes some QA/QC checks for the Energy sector in its IIR (p. 57), including checks of activity data, emission factors and aggregated emission data. However, the ERT has noted several errors in Irish reporting. E.g. unit error in IIR table 3.2 and lower TSP emissions than PM<sub>2.5</sub> and PM<sub>10</sub> emissions in NFR 1A2a 1990-2002. During the review, Ireland acknowledged some of the errors and informed the ERT of its intention to rectify them for the next submission. The ERT encourages Ireland to further strengthen its sector-specific QA/QC procedures at the final stage of inventory preparation, e.g. by checking that  $PM_{2.5} \leq PM_{10} \leq TSP$ .

#### **Improvement:**

59. In the IIR (p. 57), Ireland describes its plans to improve the accuracy of the inventory by applying Tier 2 emission factors in small-scale combustion in NFR 1A4a(i), Commercial/institutional: Stationary and 1A4b(i), Residential: Stationary. The ERT noted that this plan had been included already in earlier IIRs and addressed in the previous review report in 2009. The ERT strongly reiterates the previous recommendation that Ireland improves the accuracy of reporting by applying higher tier methods in Other stationary combustion, 1A4a-c (i).

#### **Sub-sector Specific Recommendations..**

##### **Category issue 1: 1.A.2 Industrial Combustion – NO<sub>x</sub> and CO**

60. In the previous review in 2009, the ERT encouraged Ireland to quantify its estimates of NO<sub>x</sub> and CO in industrial combustion based on a Tier 3 method in their future inventories. The ERT notes that for all but one emission estimate, NO<sub>x</sub> from coal combustion in 1A2f, emission factors from the 2013 EEA/EMEP Guidebook have been applied. The ERT reiterates its encouragement from the previous review report, namely that Ireland quantifies its estimates based on a Tier 3 method for its future inventories, focusing on key sources.

**Category issue 2: 1A2g, 1.A.4a-b Stationary combustion plants and off-road vehicles–  
All**

61. Ireland reports emissions from mobile sources as “IE” Included Elsewhere, together with stationary combustion in 1A2g and 1A4a-b. In response to a question raised by the ERT during the review, Ireland explained that the emissions were based on fuel consumption from the national energy balances and that they did not provide a breakdown of the fuel used into mobile or stationary sources in these sectors. The ERT strongly encourages Ireland to collect the necessary activity data or to contact national experts to make assumptions on fuel split, and to estimate emissions separately in its next submission as the emission factors for stationary and mobile combustion differ significantly.

## TRANSPORT & OTHER MOBILE

### Review Scope

Pollutants Reviewed		All		
Years		1990 – 2013		
NFR Code	NFR 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		
1A3ai(ii)	International aviation cruise (civil)	x		
1A3aii(i)	Domestic aviation LTO (civil)	x		
1A3aii(ii)	Domestic aviation cruise (civil)	x		
1A3bi	Road transport: Passenger cars	x		x
1A3bii	Road transport: Light duty vehicles	x		
1A3biii	Road transport: Heavy duty vehicles and buses	x		
1A3biv	Road transport: Mopeds & motorcycles	x		
1A3bv	Road transport: Gasoline evaporation	x		
1A3bvi	Road transport: Automobile tyre and brake wear	x		x
1A3bvii	Road transport: Automobile road abrasion		(x)	x
1A3c	Railways	x		x
1A3di(ii)	International inland waterways		(x)	x
1A3dii	National navigation (shipping)	x		x
1A4aii	Commercial/institutional: Mobile		(x)	x
1A4bii	Residential: Household and gardening (mobile)		(x)	x
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	x		x
1A4ciii	Agriculture/Forestry/Fishing: National fishing		(x)	
1A5b	Other, Mobile (including military, land based and recreational boats)		(x)	
1A3di(i)	International maritime navigation	x		
1A3	Transport (fuel used)		x	

Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns.  
(x) - no data or further information provided in NFR and IIR; notation keys used instead. A proper review has not been possible.

## General recommendations on cross-cutting issues.

### **Transparency:**

62. Ireland has provided a rather transparent emissions inventory. However, estimates are not always provided at the most detailed level for the mobile sources. Instead, data on sub-sectors including off-road mobile machinery is mostly included in the related stationary combustion sub-sector without any explanation provided in the NFR or IIR. The ERT, recognising the fact that separate reporting of all kind of mobile sources depends on the availability of specific fuel data from national statistics, encourages the Party to at least include sufficient information on the sub-sectors included elsewhere in its inventory within (i) the 'Notes' column of the NFR tables and (ii) in the form of a more elaborate table in the IIR, explaining where activity data and emissions are included and why further separation has not been possible.

63. Except for NFRs 1.A.3.a and b i to iv, Ireland's methodology descriptions are considered by the ERT as not very transparent for mobile fuel combustion. The ERT encourages the Party to include more detail in the IIR including the result of the Key Category Analysis and the tier applied to the specific source.

64. Furthermore, the NFR submission includes a few zero values instead of a notation key. Here, the ERT encourages the Party to use the appropriate notation key for reporting where estimates are not available or applicable.

65. In addition, the IIR provides good descriptions for the trends in national total emissions, explaining the impact of the major sources.

66. However, the ERT notes a lack of sector-specific information, especially regarding noticeable trends driven by noteworthy national circumstances such as the closedown of several airports after the finalisation of the national highway network.

67. Furthermore, the ERT notes that the notation key 'IE' is also applied for sub-sectors likely to be key categories at least for certain pollutants (e.g. heavy metal emissions from NFR 1.A.3.b vi), resulting in a potentially misleading Key Category Analysis and restricting the inventory's transparency and comparability.

68. More specifically, the ERT also notes that the trend in activity data for road transportation has been declining since 2008 with 2013 being the first year with an increase, with the annual total still being about 18 per cent below the 2008 maximum. As the Party stated, recovery from the economic recession in Ireland did not start until 2013, with the downward trend strengthened by improved vehicle standards due to changes in the vehicle registration tax (in 2007) and an increased biofuels use. The ERT welcomes this answer and the documentation provided, encouraging the Party to include such explanatory information in future IIRs.

### **Completeness:**

69. The ERT considers the inventory to be more or less complete for mobile fuel combustion.

70. Nonetheless, the ERT notes that especially the use of liquid biofuels, which is rather likely nowadays also for the mobile sources, is reported as not occurring in Ireland, assuming

that this might result in a systematic underestimation of emissions at least for more recent years.

71. Here, within the NFR tables, the notation key 'NA' is provided for the use of biomass (biofuels) in most cases (besides 'NO' for 1.A.4.c ii and several 'IE'). As the term 'biofuels' appears just once in the IIR (projections chapter 9.8.2 on road transportation), and 'biomass' is not mentioned at all in connection with mobile combustion, the ERT asked the Party whether no biofuels were used in Ireland and the Party responded that biofuel was indeed used in road transport and that the NFR would be updated accordingly. The ERT acknowledges this planned improvement, wondering however whether (liquid) biofuels are also used in other mobile sources such as railways, navigation or even in mobile machinery for agriculture or forestry, asking the Party for further clarification in all NFRs including mobile sources.

72. Furthermore, the ERT notes that emissions from NFR 1.A.4.c iii have only been estimated for the years from 2003, resulting in another systematic underestimation of the national total emissions at least for the years from 1990 to 2002.

73. Furthermore, the ERT reiterates its request from the 2009 review, namely to put an effort into compiling the missing emission estimates for abrasive PM emissions that still have not been provided. As NFR 1.A.3.b vii is most likely to be a key category at least for PM and heavy metal emissions, such major improvement would also improve the inventory's transparency and comparability.

#### **Consistency including recalculation and time series:**

74. The ERT considers the Irish inventory to be consistent for the mobile sources sector.

75. Ireland has recalculated its inventory for several mobile sectors, giving sufficient explanations about the reasons behind the recalculations and providing data on both the absolute and relative changes against submission 2014.

76. However, not all the recalculated sub-sectors seem to be covered by the data provided, leaving room for further improvements in the consistency between the listed recalculations and the data provided.

77. Furthermore, besides the data included in COPERT and used for NFR 1.A.3.b, no revisions of activity data are described in the IIR. Here the ERT wonders whether only the emission factors have been revised, without any backward changes in the statistical fuel data used for other mobile sources at least for the recent years.

78. In addition, the ERT notes a few inconsistencies in the use of notation keys between NEC pollutants and the remaining pollutants, asking the Party to consolidate the use of notation keys.

#### **Comparability:**

79. The ERT also notes that in the IIR (sufficient) activity data has only been provided for several mobile sources, such as civil aviation and road transport, whereas for other mobile sources no such data is available. In order to underpin the trends in source specific emissions, the ERT warmly encourages the Party to provide such activity data times series in future IIR submissions.

80. In addition, and as already mentioned above under 'Completeness', the ERT notes several emission sources that are likely but are either reported as *not occurring* (use of liquid biofuels in mobile sources) or *not estimated* (1.A.4.c iii: 1990-2002, PM from 1.A.3.b vii), which might result in underestimations of the national total emissions and affect the inventory's comparability.

81. Furthermore, the ERT has noted an inconsistent use of the notation key 'NA' (not applicable) for the activity data. In the ERT's understanding, the only notation keys to be applied to fuel combustion activity data are 'NO' (e.g. no solid fuels used on railways), 'NE' (e.g. the biofuels used are as yet not included in the statistics) and 'IE' (e.g. the activity data is included in another sector) - in contrast to for example NFR 3, where the use of fuels should be *not applicable*, ('NA'). Here, in order to improve the inventory's comparability, transparency and correctness, the ERT encourages the Party to check the notation keys applied to the different groups of fuels provided in the NFR tables and to revise the use of notation keys wherever necessary.

#### **Accuracy and uncertainties:**

82. As already noted during the 2009 Stage 3 review, there is no specific uncertainty analysis of mobile sources. In order to help inform the improvement process and to provide an indication of the reliability of the inventory data, the ERT reiterates the need for carrying out such sector- or source-specific uncertainty analysis.

83. Furthermore, the ERT encourages the Party to apply appropriate methodologies for each single key category.

#### **Improvement:**

84. The ERT notes the Party's intention to continue revising the emission factors based on recent information from the 2013 EMEP/EEA Guidebook.

85. The ERT furthermore welcomes the Party's plan to reduce the use of the notation key 'NE' by replacing it with actual estimates.

86. Nonetheless, the ERT encourages Ireland to thoroughly consider the general and sector-specific issues listed in this report and to schedule them for implementation in the inventory, preferably with the next annual submission.

87. The ERT sees room for improvement in the following areas:

- reducing the use of the notation key 'IE' by reporting emissions separately on the most detailed NFR14 level
- a general consolidation of the use of notation keys (harmonisation of NEC and CLRTAP reporting, consolidation of the notation keys applied to activity data)
- provision of NFR14-specific IIR chapters including short information on the tier approaches applied and key-category notification (where necessary)
- application of appropriate methodologies for key categories

### Sub-sector Specific Recommendations.

#### **Category issue 1: 1.A.2.g vii - all pollutants**

88. The ERT notes that the entire sub-sector is reported as 'IE' without any explanation provided in the NFR tables or the IIR as to where the related activity data and emissions are included in the inventory. The ERT welcomes the Party's plan to provide sufficient information for the next submission.

#### **Category issue 2: 1.A.3.d i (ii) - all pollutants**

89. Within the NFR tables, emission estimates for this sub-sector are marked as 'IE' for the main pollutants and CO whereas 'NO' is used for the remaining ones. Besides the inconsistent use of the notation keys (see Transparency issues above), the Party confirmed that there was no international inland navigation taking place in Ireland, also stating that this would be corrected in the next submission. Fully supporting this planned correction, the ERT nonetheless asks the Party to furthermore provide such information in the related IIR chapter.

#### **Category issue 3: 1.A.3.e ii - all pollutants**

90. The ERT notes that for this sub-sector the notation key 'NA' has been used for all activity data and the majority of pollutants within the NFR tables whereas emission estimates are provided for PCDD/F alone and 'NE' for all other POPs. The Party confirmed this error in reporting and the ERT fully supports the Party's intention to correct this minor error.

#### **Category issue 4: 1.A.3.a ii (i) - all pollutants**

91. During the review, the ERT noted a strong and ongoing decline in the emissions reported for domestic LTO, resulting, as mentioned in the IIR, from a decreasing number of domestic flights especially after 2010 (from 23,757 in 2007 to 5,417 in 2013). The ERT welcomes the Party's explanation that after the motorway network was completed in 2008/09 and the Cork to Dublin rail line upgraded, domestic air travel was no longer competitive, leading to a shutdown of several regional airports and specific routes respectively. The ERT encourages the Party to explain such country-specific circumstances in future IIRs.

#### **Category issue 5: 1.A.3.b vi - TSP**

92. Furthermore, the ERT notes that within the NFR tables, estimates are provided for abrasive emissions of PM<sub>2.5</sub> and PM<sub>10</sub> whereas TSP emissions have not been estimated ('NE'), and asks the Party to clarify this issue. The inventory compiler stated that, as the COPERT software used calculates only exhaust and overall PM<sub>2.5</sub> and PM<sub>10</sub> emissions for 1.A.3.b, the non-exhaust fractions have to be calculated by deducting the exhaust emissions from the 1.A.3.b totals. Unfortunately, the software does not allow such a breakdown for TSP emissions, which are therefore considered as exhaust only, resulting in no estimates for 1.A.3.b vi. The ERT thanks the Party for the information provided and welcomes the Party's intention to further check this issue with the software provider in order to improve the inventory's comparability and transparency.

93. In addition, the ERT wishes to point out that it can be assumed that nearly all exhaust emissions are in the range of PM<sub>10</sub> and that therefore similar estimates might be provided for PM<sub>2.5</sub>, PM<sub>10</sub> and TSP from NFRs 1.A.3.b i to iv. In contrast, for non-exhaust emissions it must

be assumed that  $EF_{TSP} > EF_{PM10} > EF_{PM2.5}$ , resulting in different estimates for the three fractions.

94. However, as there is no separate information to be found in the IIR regarding non-exhaust particulate matter or the related heavy metal and POP emissions, the ERT encourages the Party to include such background information in the next annual IIR to further improve the inventory's transparency.

#### **Category issue 6: 1.A.3.b vii – PM<sub>2.5</sub>, PM<sub>10</sub> and TSP**

95. Regarding the emissions from road abrasion which are reported as Not Estimated ('NE') in the Irish inventory, the ERT has reiterated its request for the Party to provide such estimates as soon as they have sufficient capacity and to give a reason in the IIR for not yet reporting these significant emissions. Here, the Party only confirmed that the COPERT software did not include estimates for this category and explained that it would further investigate an appropriate methodology for the next submission.

#### **Category issue 7: 1.A.3.e i – BC**

96. The ERT furthermore has noted that the emission estimates are higher than the corresponding PM<sub>2.5</sub> emissions, assuming an error in the unit of the EF applied, and has asked the inventory compiler to check this issue. As the Party confirmed the error by stating that the data reported here for BC was actually given in tonnes instead of kilotonnes, and proposed a correction for the next annual submissions, the ERT considers this issue to be resolved.

#### **Category issue 8: 1.A.3.b – consumption of gaseous fuels**

97. The ERT also notes that within the NFR tables notation keys 'NO' and 'IE' (for passenger cars) are provided for the use of gaseous fuels in road transportation. When asking the Party to clarify where the amount of gaseous fuels used in passenger cars was included and why no such fuels were used in light duty vehicles or buses, the inventory compiler stated that there were no gaseous fuels used in road transport in Ireland, and that the correct information would be provided in the NFR tables in future submissions.

98. Although the ERT welcomes the Party's intention to correct the erroneous notation key used for gaseous fuels in passenger cars, the Party is nonetheless encouraged to further investigate the use of gaseous fuels especially in road vehicles and to provide some background information in the next annual IIR.

#### **Category issue 9: 1.A.3.c – consumption of solid fuels**

99. In addition to the aforementioned issue, the ERT notes that within the NFR tables notation key 'NO' is provided for the use of solid fuels on railways, and welcomes the explanation provided by the Party, namely that there were indeed only liquid fuels and electricity used on Irish railways.

100. However, as the use of solid fuels (including peat) and even solid biomass is rather likely within the railway sector (e.g. for historic steam engines), the ERT encourages the Party to further clarify this issue in future IIRs.

### **Category issue 10: 1.A.3.a i (ii) – fuel consumption**

101. In addition to the questions on activity data raised above, the ERT furthermore notes that within the NFR tables an estimate of 0 TJ is provided for biomass use in NFR 1.A.3.a i (ii), welcoming the Party's intention to replace the zero values by the appropriate notation key.

### **Category issue 11: 1.A.3.d ii - NO<sub>x</sub>**

102. The Key Category Analysis provided in the IIR (pages 13, 14) lists this NFR sector as a key category for NO<sub>x</sub>. However, no such information can be found in the IIR where it is stated instead that '*these are minor sources of emissions in Ireland*' with default emission factors applied. The ERT encourages the Party to further clarify this issue. The Party has confirmed that for national navigation a Tier 1 approach with default EFs is applied without, however, providing any explanation why no higher tier method can be applied. The ERT has requested the inventory compiler to apply a methodology that is appropriate for a key category, i.e. Tier 3, with the next annual submission.

103. Furthermore, if no such improvement can be achieved until submission 2016, the ERT asks the Party to at least provide an explanation for applying a Tier 1 approach to this key category in the next IIR.

104. In addition, the ERT encourages the Party to include more detailed information on the tier approaches applied within each sub-sector in future IIRs.

### **Category issue 12: 1.A.3.b i – heavy metals**

105. As the Key Category Analysis provided in the IIR shows that NFRs 1.A.3.b i and ii are key categories for Cd, Cr, Cu, Ni and Zn with heavy metal emissions from 1.A.3.b vi reported as *Included Elsewhere* ('IE'), the ERT assumed that heavy metal emissions from tyre and brake wear would be reported together with the emissions from fuel combustion, which had probably been estimated as the sum of the trace concentrations in fuel and lubricants together with possible engine wear as proposed in the 2013 EMEP/EEA Guidebook. However, as the majority of these heavy metals (especially of Cu and Zn) should result from tyre and brake wear, the ERT has encouraged the inventory compiler to provide separate estimates for HM emissions from tyre and brake wear, for example by applying default EFs from the 2013 EMEP/EEA Guidebook, to improve separate reporting of non-exhaust emissions and to improve both the correctness of the KCA and the transparency and comparability of the inventory. Acknowledging the Party's intention to consider this for the next submission, the ERT also encourages the inventory compiler to at least provide sufficient explanatory information in both the NFR tables (column 'Notes') and the IIR (overview table on the use of 'IE' as mentioned above and the NFR-specific chapter).

### **Category issue 13: 1.A.4.c iii – all pollutants (1990-2002)**

106. Along with the issues raised above, the ERT notes that the entire NFR sub-sector 1.A.4.c iii has been reported as *Not Estimated* ('NE') for the years until 2002 with some explanatory information provided in IIR chapter 3.7.2. As this situation results in a systematic underestimation of the national total emissions for the years from 1990 to 2002, the ERT has asked the Party to provide further information on why data is only available for the years from 2003 onwards and about the problems with compiling an entire time series, and to provide a rough estimate of fuel use in 1990 (as possibly provided for UNFCCC reporting).

107. Despite the current obstacles, the ERT encourages the Party to put an effort into improving the completeness of its inventory by providing estimates for the entire time series, and welcomes the plan to develop a full time series with the energy balance provider for future submissions.

## INDUSTRIAL PROCESSES

### Review Scope

Pollutants Reviewed <sup>2</sup>		SO <sub>2</sub> , NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , PM <sub>10</sub> & PM <sub>2.5</sub>		
Years		1990 – 2013 + (Protocol Years)		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
2A1	Cement production	X		X
2A2	Lime production	X		
2A3	Glass production	X		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		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		
2C2	Ferroalloys production	X		X
2C3	Aluminium production	X		X
2C4	Magnesium production	X		
2C5	Lead production	X		X
2C6	Zinc production	X		
2C7a	Copper production	X		
2C7b	Nickel production	X		
2C7c	Other metal production (please specify in the IIR)	X		X
2C7d	Storage, handling and transport of metal products (please specify in the IIR)	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		

<sup>2</sup> Note: Where a sector has been partially reviewed (e.g. some of the NFR codes) please indicate which codes have been reviewed and which have not in the respective columns

## General recommendations on cross-cutting issues

### **Transparency:**

108. The Party's IIR is in general transparent. Methods and data sources of activity data, emission factors and emissions are reported in the IIR. However, Ireland often uses the notation key "IE" in the Industrial Processes sector. In addition, it is not described for all IEs where the emissions are reported. ERT recommends adding this information to the IIR for more transparency.

### **Completeness:**

109. The emissions reported by Ireland are more or less complete. Some of them, such as PM and TSP emissions from glass, ferroalloys and aluminium production, are missing. There is one important issue: Ireland reports most of the pollutants within the Industrial Processes sector as IE. This is, according to the 2013 EMEP/EEA Guidebook, a Tier 1 method. The ERT encourages Ireland to improve the quality of reporting by identifying key categories and to use a higher tier method for these key categories.

110. Ireland uses the notation key IE for several sectors, based on the fact that the Party uses a Tier 1 approach. ERT recommends the implementation of higher tier methods as well as reporting process emissions in NFR 2. Since a standard Key Source Analysis will not identify the emissions as a key category which are currently reported as IE, ERT encourages the Party to perform a qualitative key analysis and identify the most important emission sources for the pollutants in the Industrial Processes sector and apply a higher tier method and to report these emissions in the next submission under NFR 2.

### **Consistency including recalculation and time series:**

111. The consistency of Ireland's report is very good except for minor issues such as erroneous data in tables in the IIR for nitric acid production and lead production and an unusual trend for Pb emissions from glass production. ERT encourages Ireland to correct these data, and during the review Ireland indicated that they were planning to perform the corrections for the next submission.

### **Improvement:**

112. ERT recommends that Ireland continues with the improvements of the inventory and concentrates in the future on emissions of heavy metals and POPs, especially emissions of PCDD/F and PCB and HCB emissions from iron and steel production.

## Sub-sector Specific Recommendations.

### **Category issue 1: 2.A.1 Cement production**

113. The ERT notes that Ireland reports NE for PM and TSP, but in the 2013 EMEP/EEA Guidebook there are default EFs for TSP and PM. Ireland has informed the ERT that PM associated with the fuel used in Cement production is estimated in the Energy sector. Ireland does not report the process part of the PM emissions associated with cement production separately. ERT commends Ireland for reporting dust emissions from fuel consumption but recommends reporting also the dust emissions from cement production which are emitted during the production process, and using the default EFs of the 2013 EMEP/EEA Guidebook for the calculation of PM and TSP.

### **Category issue 2: 2.A.3 Glass production**

114. The ERT notes that Ireland has reported a strong increase from 2002 to 2003 of Pb emissions. Ireland has responded that there might be an error in the lead emission estimates for the time series 1990-2002 and that this will be investigated for the next submission. The ERT encourages Ireland to do so.

115. Ireland uses NE for PM and TSP, but in the 2013 EMEP/EEA Guidebook there are default EFs for TSP and PM. Ireland responded during the review that they were planning to implement these emissions in the next submission. ERT commends Ireland for this intention.

### **Category issue 3: 2.B.2 Nitric acid production**

116. ERT notes that for the years 1990 and 1991 there is a difference between the emissions of NO<sub>x</sub> reported in the IIR and in the NFR tables. Ireland has informed ERT that table 4.5 of the IIR is incorrect and promised to correct this error for the next IIR. The ERT encourages Ireland to do so.

### **Category issue 4: 2.C.2 Ferroalloys production**

117. The ERT notes that in paragraph 4.4.2 of the IIR it is mentioned that the metal emission estimates have been obtained from TSP estimates based on the 2013 EMEP/EEA Guidebook. However, TSP emissions in the NFR table are 'NO' (Not Occurring). Ireland has informed the ERT that the methodology developed for heavy metal emissions is based on metal fractions of total particulate matter and promised to consider this in the next submission and to report TSP and PM emissions from these categories. The ERT encourages Ireland to do so.

### **Category issue 5: 2.C.3 Aluminium production**

118. The ERT notes that in paragraph 4.4.3 of the IIR it is mentioned that Zn emission estimates were made using PM as an indicator. However, PM emissions in the NFR table are 'NO' (Not Occurring). Ireland has informed the ERT that the methodology developed for heavy metal emissions is based on metal fractions of total particulate matter and promised to consider this in the next submission and to report TSP and PM emissions from these categories. The ERT encourages Ireland to do so.

### **Category issue 6: 2.C.5 Lead production**

119. The ERT notes that table 4.10 in the IIR shows Pb emissions which are not consistent with the emissions data in the NFR tables. The ERT encourages Ireland to correct this for the next submission.

### **Category issue 7: 2.C.7.c Other metal production**

120. The ERT has found that Ireland uses the notation key NO for Cd and Pb emissions only for the year 2010 but reports values for all other years. For Cr emissions are reported from the year 2010 onwards and for Cu and Ni emissions from 2009 onwards are reported as 'NO'. In the IIR there is no explanation for this trend in emissions. ERT recommends analysing the time series and correcting the data, or giving a reason for this trend in the IIR with the next submission.

## SOLVENTS

### Review Scope

Pollutants Reviewed		NMVOC		
Years		1990 – 2013 + (Protocol Years)		
NFR Code	CRF_NFR 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		X
2D3f	Dry cleaning	X		X
2D3g	Chemical products	X		X
2D3h	Printing	X		X
2D3i	Other solvent use (please specify in the IIR)	X		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 codes have been reviewed and which have not in the respective columns.

### General recommendations on cross-cutting issues

#### **Transparency:**

121. The Solvents and Other Product Use sector inventory of Ireland is not completely transparent. The ERT notes that the explanations for the use of the notation keys NE (Not Estimated) and IE (Included Elsewhere) are missing. The ERT recommends that Ireland includes an overview with explanations for the use of the notation keys NE and IE in the next submission.

122. The ERT also notes that the tier methods which have been used to calculate the emissions of the key sources are missing. During the review process, the Irish inventory team provided a list with sources and the Tier method that has been used per source. The ERT recommends that Ireland includes this information in the next submission.

123. The ERT also notes that Ireland does not always use the appropriate notation keys in the NFR tables for a number of source categories of the Solvents and Other Product sector. For more detailed information see the relevant sector section.

124. Furthermore, the ERT notes that explanations of almost all major changes in emission trends are included in the IIR and compliments Party for this.

125. The ERT notes that for a number of sources, it was not possible to obtain reliable country-specific data. As a consequence of this, UK and other Parties' emission factors, and in some cases activity data (scaled by surrogate data), were used in the estimation methodology. When consulted, the Party sent the following description of its estimation methodology: *'Where no activity data was available, emissions were calculated using per*

*capita emission estimates from countries that were considered to have similar consumption patterns to Ireland (the UK). This was calculated by first establishing the countries per capita emission estimate (Per Capita Emissions = Emissions/Population). This was then applied using Irish population statistics (Irish Emissions = Per Capita Emission Estimate \* Irish Population). This method was used in previous submissions for several emission sources.'* The ERT recommends that Ireland includes this detailed description in the next submission.

### **Completeness:**

126. The ERT considers the Solvents and Other Product Use sector to be almost complete and comprehensive with good levels of detail in the methodology descriptions. Only some activity data are missing. For more information see the relevant sector section.

127. The ERT notes that Ireland uses the notation key NE very often. To avoid under-estimations, the ERT recommends that Ireland includes plans to address the missing emissions (NE, 'Not Estimated') in its IIR, either by obtaining data allowing an emission estimate, or by reporting emissions as not applicable.

### **Consistency including recalculation and time series:**

128. The ERT notes that Ireland has performed major recalculations (with updated activity data and emission factors) for some of the source categories within the Solvents and Other Product Use sector and commends Party for this.

129. The ERT notes that both the time series for the activity data and the EFs used to calculate emissions of the key source are consistent.

### **Comparability:**

130. Ireland has provided its emissions inventory in accordance with the reporting requirements and submitted it in the requested NFR format.

131. Furthermore, the ERT notes that there are no differences between CLRTAP and NECD emissions in this sector.

### **Accuracy and uncertainties:**

132. In the previous Stage 3 Review Report (from 2009) the ERT encouraged Ireland to undertake an uncertainty analysis for the Solvent sector in order to improve the reporting process and to provide an indication of the reliability of the inventory data. The ERT notes that a semi-quantitative uncertainty analysis has been used to determine the overall emissions uncertainty for a number of pollutants in 2013 data.

133. The ERT notes that the emissions of key sources are not all calculated based on Tier 2 or higher methodology and recommends that the Party calculates all key sources based on Tier 2 or higher methodology.

134. In the previous Stage 3 Review Report (from 2009) the ERT encouraged Ireland to implement sector-specific checks. The ERT notes that only general QA/QC procedures are available in Ireland. The ERT reiterates its encouragement that Ireland should implement sector-specific checks.

## **Improvement:**

135. The ERT notes that several improvements for the Solvents and Other Product sector are planned with the collection of real (activity) data as one of the important issues and commends the Party for this.

136. In the previous Stage 3 Review Report (from 2009) the ERT strongly encouraged Ireland to check the use of the emission factors of the UK which should not be replaced by the emission factors of the 2009 EMEP/EEA Guidebook. This was because the ERT did not think that the emission factors of the 2009 EMEP/EEA Guidebook were better than the emission factors of the UK.

137. The ERT notes that in this submission the Solvents and Other Product Use sector uses the emission factors of the UK and commends Party for this.

### *Sub-sector Specific Recommendations.*

#### **Category issue 1: 2D3d - NMVOC**

138. Coating Application (2D3d) covers the following subcategories:

- Car Repairing (060102)
- Construction and Buildings (060103)
- Domestic Use (060104)
- Boat Building (060106)
- Wood (060107)
- Other Industrial Paint Application (060108)
- Other Non-Industrial Paint Application (060109)

According to the 2013NFR table, paint use in 2D3d is 58 kt. In the IIR no activity data has been given for any of these subcategories. When consulted, the Party sent a spreadsheet with activity data for 060102, 060103&060104 and 060106. Activity data was not collected from the other emission sources. Either surrogate data (060107/060108) was used or emissions data was available (060109).

The ERT encourages Ireland to include this information in the next submission

#### **Category issue 2: 2D3b - all**

139. The ERT notes that emissions from "Road paving with asphalt" have not been estimated (NE). However, for PAHs the notation key IE is used. The ERT recommends that Ireland uses the correct notation keys in the next submission.

#### **Category issue 3: 2D3h – NMVOC**

140. The ERT notes that this category is included as a subcategory in paragraph 5.6 Other Use of Solvents and related Activities. According to the 2013 EMEP/EEA Guidebook, this is a separate category. To improve transparency the ERT recommends that the Party includes this category as a separate paragraph in the next submission.

## AGRICULTURE

### Review Scope:

Pollutants Reviewed		NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , PM <sub>10</sub> & PM <sub>2.5</sub> , TSP and HCB.		
Years		2013 + (Protocol Years)		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
3B1a	Dairy cattle	x		x
3B1b	Non-dairy cattle	x		x
3B2	Sheep	x		x
3B3	Swine	x		x
3B4a	Buffalo	x		
3B4d	Goats	x		x
3B4e	Horses	x		x
3B4f	Mules and asses	x		
3B4gi	Laying hens	x		x
3B4gii	Broilers	x		x
3B4giii	Turkeys	x		x
3B4giv	Other poultry	x		x
3B4h	Other animals (please specify in IIR)	x		x
3Da1	Inorganic N fertilisers (includes also urea application)	x		x
3Da2a	Animal manure applied to soils	x		
3Da2b	Sewage sludge applied to soils	x		
3Da2c	Other organic fertilisers applied to soils (including compost)	x		
3Da3	Urine and dung deposited by grazing animals	x		
3Da4	Crop residues applied to soils	x		
3Db	Indirect emissions from managed soils	x		
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	x		
3Dd	Off-farm storage, handling and transport of bulk agricultural products	x		
3De	Cultivated crops	x		
3Df	Use of pesticides	x		x
3F	Field burning of agricultural residues	x		x
3I	Agriculture other (please specify in the IIR)			x
11A	Volcanoes			
11B	Forest fires			

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

## General recommendations on cross-cutting issues

### **Transparency:**

141. The agriculture emission inventory of Ireland is generally transparent as the methodologies used as well as emission factors, assumptions for estimating emissions and trends are well described. The ERT notes that some aspects can be improved such as harmonising the use of notation keys in the NFR tables and the CRF tables of the UFCCC to report emissions from the same category (e.g. 3F Field burning of agricultural residues). The ERT encourages Ireland to continue their efforts to enhance transparency by including more detailed information on emission trends in the Agriculture sector in future submissions.

### **Completeness:**

142. The emission inventory of the Agriculture sector covers the most important sources of emissions with the exception of estimates of NO<sub>x</sub> from all NFR codes of the sector and emissions of NMVOC and PM from a number of codes under 3D. The ERT commends Ireland for its continuous efforts to complete its inventory. The ERT reminds the Party that the 2013 EMEP/EAA Guidebook provides methodologies for estimating emissions of NO<sub>x</sub>, NMVOC and PM from various categories of the Agriculture sector. The ERT recommends that Ireland estimates emissions of these pollutants in order to enhance the completeness of the Agriculture sector in the next submission.

### **Consistency including recalculation and time series:**

143. The ERT has not identified any issues concerning consistency of reporting in the Agriculture sector. Ireland has presented revisions of the NFR 2014 templates in the IIR. For example, emissions from animal manure applied to soils (3Da2a) had previously been included in estimates for manure management (4B) sub-categories. The sub-category 3Da2a is now included separately, reducing the emissions totals presented in the 3B sub-categories.

144. Moreover, Ireland reports in its IIR that estimates of emissions from manure management of 'other animals' and 'other poultry' have been made for the first time as a result of new survey data. Emissions of NMVOC, TSP, PM<sub>10</sub> and PM<sub>2.5</sub> have now been estimated from manure management for the first time. Moreover, NMVOC emissions from the application of inorganic fertilisers have been significantly revised due to the application of updated default emissions factors from the 2013 EMEP/EEA Guidebook. The ERT commends Ireland for the consistency of the time series and the recalculations that have been undertaken for the emission inventory. The ERT encourages Ireland to continue enhancing the consistency of the Agriculture sector, so that national circumstances can be reflected in future submissions.

### **Comparability:**

145. Ireland indicates in its IIR that for NH<sub>3</sub>, the Tier 2 methodology uses a mass flow approach based on the concept of the flow of Total Ammonia Nitrogen (TAN) through the manure management system. Emissions are calculated for the same animal sub-categories as those utilised in Ireland's national greenhouse gas inventory.

146. The ERT notes that for dairy cows, Ireland utilises the method described in IPCC (2006) chapter 10, enhanced by country-specific data on feeding practices and milk production (O'Mara, 2007, Duffy et al., 2013), to estimate N excretion from dairy cows. For all other categories of livestock, national values are utilised.

147. Estimates of NMVOC, TSP, PM<sub>10</sub> and PM<sub>2.5</sub> emissions from 3B Manure management have been made by using the Tier 1 and Tier 2 approaches based on emission factors of the 2013 EMEP/EEA Guidebook.

#### **Accuracy and uncertainties:**

148. The general QA/QC procedures laid down in Ireland's QA/QC plan have been undertaken for the Agriculture sector. The ERT considers Ireland's Agriculture emissions inventory to be of an adequate accuracy. The ERT encourages Ireland to undertake continuous QA/QC procedures and re-examine the assumptions made in the inventory estimates for the Agriculture sector.

#### **Improvement:**

149. The ERT commends Ireland for its plan to consider revising the emission factors for NH<sub>3</sub> based on updates in the 2013 EMEP/EEA Guidebook in future submissions.

#### *Sub-sector Specific Recommendations.*

#### **Category issue 1: 3B Manure management and 3D (Agricultural soil) - NO<sub>x</sub>**

150. The ERT notes that Ireland has reported NO<sub>x</sub> emission from 3B Manure management and 3D Inorganic N fertilisers as not estimated "NE". The 2013 EMEP/EEA Guidebook provides methodologies for estimating emissions of NO<sub>x</sub> and other pollutants. The ERT recommends that Ireland estimates emissions of NO<sub>x</sub> from 3B and 3D in order to enhance the quality and completeness of the emissions inventory of the Agriculture sector in the next submissions.

#### **Category issue 2: 3Da1 Inorganic N-fertilizers - NH<sub>3</sub>**

151. The ERT notes that NH<sub>3</sub> emissions from 3Da1 in 2013 (8.072 kt) decreased by about 37 % compared to 2010 (12.859 kt), while the activity data (total use of inorganic N fertilisers) for both years are almost the same.

152. The ERT raised this issue with the Party during the review. Ireland responded to the ERT during the review week "*that this was due to the share of urea in the AD for synthetic fertilisers. In 2010 urea use was 61.5 kt and in 2013 it was only 29.5 kt. Urea emits more NH<sub>3</sub>. We will consider providing a synthetic fertiliser breakdown in an Annex in the next IIR*". The ERT thanks Ireland for the speedy response and recommends that Ireland includes this information in the next submission in order to enhance the transparency of the emission inventory.

#### **Category issue 3: 3F Field burning of agricultural residues - main air pollutants**

153. The ERT notes that Ireland has used different notation keys to report emissions related to field burning of agricultural residues for the UNFCCC and CLRTAP. The ERT raised this issue with the Party during the review. Ireland responded to the ERT during the

review week that: *“Ireland has no burning of agricultural residues. However, there are some instances of burning on rough grazing areas on Irish mountains/hills. The notation key will be changed to “NO” in submission 2016”*. The ERT appreciates the Party’s response and recommends that Ireland harmonises emissions reporting for UNFCCC and CLRTAP in future submissions.

**Category issue 4: 3B4giv (ducks and geese) - All relevant pollutants**

154. The ERT notes that the number of ducks and geese reported is the same for all years between 1990 and 2000. Although the emissions from this sub-category are relatively small, the ERT encourages Ireland to revise the activity data for ducks and geese in order to enhance the consistency of the time series and emission data in future submission.

**Category issue 5: 3I (Agriculture other) and 3Df (Use of pesticides) - HCB**

155. The ERT notes that Ireland has reported emissions of hexachlorobenzene (HCB) from agriculture under the NFR Code 3I (Agriculture other), while the correct NFR Code for reporting HCB emission is 3Df Use of pesticides. The ERT recommends that Ireland reports the emissions of HCB that are associated with the application of pesticides in the Agriculture sector under the correct and relevant NFR code in the next submission.

## WASTE

### Review Scope:

Pollutants Reviewed		SO <sub>2</sub> , NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , PM <sub>10</sub> & PM <sub>2.5</sub> , heavy metals and POP's		
Years		1990 – 2013 + (Protocol Years)		
NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
5A	Biological treatment of waste - Solid waste disposal on land	X		X
5B1	Biological treatment of waste - Solid waste disposal on land	X		X
5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities		X	
5C1a	Municipal waste incineration	X		X
5C1bi	Industrial waste incineration	X		
5C1bii	Hazardous waste incineration	X		X
5C1biii	Clinical waste incineration	X		X
5C1biv	Sewage sludge incineration	X		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		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 codes have been reviewed and which have not in the respective columns.

### General recommendations on cross-cutting issues.

#### **Transparency:**

156. Ireland makes an incorrect use of the notation keys for several emission years, several sources and for several pollutants. The use of the notation key NO for instance is not possible in combination with other notation keys (i.e. the source/process does not exist in the country). Also, NO (Not Occurring) is still used for instance for NFR 5C1 (incineration of MSW) in 2013 although an incinerator has been included since 2011 in 1A1a.

157. Transparency: In the Stage 3 review Report (from 2009) the ERT encouraged Ireland to provide in its IIR activity time series for each NFR6 sub-sector. The ERT notes that for several, but not for all sources/processes, activity data is now presented in the IIR. The ERT notes furthermore that in the NFR table the activity data is not always complete for the time series (for instance 5A before 1999) The ERT reiterates its encouragement for Ireland to present in future IIRs the complete EF activity time series and to also present the complete times series in the NFR table.

### **Completeness:**

158. Ireland frequently uses the notation key NE and/or NA, while default emission factors are available in the 2013 EMEP/EEA Guidebook. The ERT notes that for the same source/process emissions are reported so one can assume that also activity data is available. The ERT reiterates the encouragement from the review in 2009 to report all pollutants when both activity data and either default 2013 EMEP/EEA Guidebook emission factors or other emission factors are available and furthermore, when NE is used, to summarise in the IIR the reasons for not estimating the emission.

159. Ireland describes in the IIR a comprehensive QA/QC plan with a system of reviews, to be performed preferably by third parties, for the inventory. Furthermore, Ireland reports that the estimates in the Waste sector are now fully consistent with other sectors, which means that the detailed QA/QC procedures for the inventory can now also be implemented for the data in the Waste sector. However, in the IIR there is no information on the performed checks and reviews. The ERT recommends that Ireland includes this information in future IIRs.

160. Acting on the recommendation from the 2009 review, Ireland has included the incineration of chromated copper arsenate (CAA) treated wood under Industrial waste incineration (NFR 5C1bi).

### **Comparability:**

161. In the previous Stage 3 review Report (from 2009) the ERT strongly suggested that Ireland reports emissions in disaggregated NFR codes. The ERT notes that in this submission, Ireland has reported its emissions at a disaggregated level.

### **Improvement:**

162. The ERT commends Ireland for following most of the recommendations from the 2009 review and encourages Ireland to proceed in this way.

### *Sub-sector Specific Recommendations.*

#### **Category issue 1: 5A Solid waste disposal on land – Activity data**

163. The ERT notes that Ireland reports activity data on MSW deposited in SWDS only for the years from 1998 onwards. For the years before 1998 Ireland has calculated emissions but no amounts of deposited MSW are reported. In response to a question on this issue, Ireland replied that the amounts of MSW in SDWS prior to 1998 would be added in the next submission.

#### **Category issue 2: 5A Solid waste disposal on land – NMVOC**

164. The ERT notes that Ireland, following a recommendation from the previous Stage 3 Review Report (from 2009), has now included NMVOC emissions from solid waste disposal on land in its inventory.

#### **Category issue 3: 5A Solid waste disposal on land – NMVOC**

165. In the IIR, Ireland states that it calculates NMVOC emissions based on the emission factor from the 2013 EMEP/EEA Guidebook. This would lead to a direct calculation of the

tonnage of MSW deposited. However, in fact an emission factor from the UK inventory that relates to the volume (m<sup>3</sup>) of landfill gas (LFG) produced has been used. For activity data, Ireland uses the amount (Gg) of CH<sub>4</sub> from SWDS, as calculated in its greenhouse gas inventory. From this the volume of LFG is calculated. In the IIR no explanation can be found on the reason why the UK emission factor has been used. The ERT recommends that Ireland explains in the IIR why it considers the use of the UK emission factor to be appropriate, that it describes the method (including the conversion factors) used to calculate the volume of LFG and includes the activity data used.

#### **Category issue 4: 5A Solid waste disposal on land – TSP, PM<sub>10</sub>, PM<sub>2,5</sub> and some Heavy metals**

166. The ERT notes that Ireland uses NE or NA for these emissions. When consulted, Ireland replied that there were no emission factors available, whereas for particulate matter there were EFs in the 2013 EMEP/EEA Guidebook, and table F.1 of Ireland's IIR gives the EFs for heavy metals. This table suggests that these are the EFs used for the calculations. The ERT notes that the amount of MSW in SWDS has served as the basis for the calculations in the CH<sub>4</sub> model used for NMVOC, Hg, PCDDF and PCB. As the amounts of MSW are available, the use of EFs from table F.1 of Ireland's IIR, seems appropriate. The ERT recommends including all pollutants with an EF in the IIR's table F.1 in the next submission.

#### **Category issue 5: 5B Biological treatment of waste - Composting – NH<sub>3</sub>**

167. The ERT notes that Ireland uses the notation key NE, while in the Eurostat database (which may be expected to hold data reported by Ireland) a time series is available for 1998-2013 for the amount of MSW that is biological treated (composted or anaerobic digested). The ERT notes that the amount of biological treated MSW as reported by Eurostat in 2012 was 156 ktonnes of MSW and that an EF is available in the 2013 EMEP/EEA Guidebook. The ERT encourages Ireland to include this source in the inventory and report a time series for composting in future submissions.

#### **Category issue 6: 5C1a Municipal waste incineration– All pollutants**

168. The ERT notes that in the NFR tables the notation key NO is used for this source. However, it has been found from the Eurstat database and additionally from a response provided by Ireland to a question about waste composition that since 2011 a MSW incinerator has been in operation, burning approx. 200 ktonnes of MSW per year. Ireland has informed the ERT that emissions from burning MSW for the years since 2011 have been reported in category 1A1a, as the incinerator is a waste-to-energy plant.

#### **Category issue 7: 5Cbii Hazardous waste incineration – HM and main pollutants**

169. In the 2009 review the ERT encouraged Ireland to update the annex on EFs and to present a complete time series for the EFs, as well as to take into account the impact of abatement technologies and to include the main pollutants in their inventory. The ERT notes that, however, hazardous waste incineration is now together with sewage sludge incineration (5Cbiv) included in 5Cbi (Industrial waste incineration) and that for all these NFRs the same set of EFs is used. The ERT notes furthermore that Ireland has followed up on the encouragement, updated the EFs and explained in its IIR the origin of the EFs used.

### **Category issue 8: 5C1biii Clinical waste incineration – main pollutants**

170. In the review of 2009, the ERT recommended including the emissions from this source in reporting. Ireland followed up on this and included the emissions for the time series 1990-1997. Furthermore, in the IIR it is explained that during the mid- to late 1990s a transition was made towards the use of non-incineration technology and that as of 1998 only negligible quantities of clinical waste were incinerated. In 2000 all facilities were closed and no incineration is occurring anymore.

### **Category issue 9: 5C1biii Clinical waste incineration – HM and POPs**

171. In the review of 2009, the ERT encouraged Ireland to check if the introduction of abatement technology had an impact on HM emissions. The ERT notes that in the IIR Ireland now states that it is assumed that for HM no abatement technology is applied, while emission levels for some POPs (similar to the development in the UK's environmental performance) have improved.

### **Category issue 10: 5C1biv Sewage sludge incineration – all pollutants**

172. Ireland reports in the NFR tables the process of Sewage sludge incineration as Not Occurring (NO). However, for some pollutants in the NFR tables the notation keys NA (metals) and IE (POPs) are used. Furthermore, in the IIR it is reported that the emissions coming from the incineration of sewage sludge are included in the source 5C1bi (Hazardous waste incineration) with the emission factors that originate from the 2013 EMEP/EEA Guidebook and UK NAEI. The ERT recommends that Ireland uses the proper notification keys and includes the activity used.

### **Category issue 11: 5C2 Open burning of wastes – all pollutants**

173. The ERT notes that Ireland uses the notation key NO for metals while for the main pollutants NE is used and for POPs emissions are reported. Furthermore, the ERT notes that the commonly used explanation for NO is that the source or process does not exist in the country. The ERT recommends that Ireland makes proper use of the notation key NO.

### **Category issue 12: 5D Waste-water handling (5D1, 5D2 and 5D3) – NMVOC and NH3**

In the review of 2009 the ERT concluded that waste water handling occurred in Ireland, and recommended that Ireland should include emissions of waste water handling in the inventory. The ERT notes, however, that Ireland reports the source as not occurring (NO) while it is clear from EPA reports/monitoring ([www.epa.ie](http://www.epa.ie)) that treatment of urban waste water (and production of sewage sludge) exists and that approximately 500,000 people are not connected to the sewerage system and so must use for instance latrines, septic tanks or other systems. The ERT reiterates its encouragement from the 2009 review to investigate the use of default EFs. Furthermore, the ERT recommends using the proper notification keys and including the emissions from waste water treatment in the inventory and reporting them in future submissions.

## **LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW**

1. Response to the questions raised by the ERT during the review:
2. Notation Keys in CLRTAP 2015.xlsx
3. UNECE\_NMVOC\_ERT\_Q5\_Activity\_Data\_for\_2.D.3.d.xlsx
4. UNECE\_NMVOC\_ERT\_Waste\_LFG.xlsx
5. Energy-in-Transport-2014-report.pdf