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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
TURKEY

CONTENT

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 SO_2, NOx, NMVOC, NH_3, plus PM_{10} & $PM_{2.5}$ for the time series years 1990 – 2014 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 Turkey 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 – Ieva Sile (Latvia), Energy – Dirk Wever (Netherlands), Transport – Yvonne Pang (UK), Industry – Mirela Poljanac (Croatia), Solvents – Ardi Link (Estonia), Agriculture + Nature – J Webb (UK), Waste – Katja Pazdernik (EC).

4.   Kevin Hausmann was the lead reviewer. The review was coordinated by Katarina Marečková, (EMEP Centre on Emission Inventories and Projections - CEIP).

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

PART A: KEY REVIEW FINDINGS

5.   Turkey submitted full time series of air pollutant emissions reported in the NFR tables (NFR 2014-1 format), containing NOx, NMVOC, SOx, NH_3, PM_{10} and CO emissions; the UNECE notification form, as well as an Informative Inventory Report of a good quality.

6.   All information was submitted within the particular timeframe set in the UNECE Reporting Guidelines.

7.   The ERT notes that recalculations have been applied and described under particular sub-chapters.

8.   The 2016 submission shows improvements in a number of issues highlighted in the previous Stage 3 review. Nevertheless, the ERT identified a need for further improvements regarding transparency and completeness.

9.   Turkey provided support to the ERT during the 2016 centralised Stage 3 review, responding in a timely manner.

INVENTORY SUBMISSION

10.   The inventory is generally in line with the EMEP/EEA emission inventory guidebook and the UNECE Reporting Guidelines. In their 2016 submission, Turkey provided a national inventory for the years 1990-2014 for NOx, NMVOC, SOx, NH3, PM10 and CO. The ERT commends Turkey on having provided full time series. For the following sectors, emissions are reported: 1A1-1A4, 2A, 2D, 2H, 3B, 3D, 5A, 5D. No emissions have been provided in sectors 1A5, 1B, 2B, 2G, 2I-2L, 3F, 3I, 5B, 5C, 5E, and 6A.

11.   To a question raised by the ERT whether Turkey planned to report emissions not only for the above mentioned pollutants but also for other pollutants, Turkey responded that there was a nationally funded project named "National Air Pollution Emission Management System (NAPEMS)" that would lead the process for the remaining topics under the requirements of the UNECE CLRTAP reporting. The ERT recognizes the effort Turkey has made so far and encourages the Party to implement the project results in the upcoming submissions.

12.   No activity data are presented in the NFR tables, but appear in the IIR. The ERT recommends to include the activity data in the NFR tables in the next submission.

13.   The 2014 emissions submitted by Turkey are generally of good quality and well documented in the IIR.

KEY CATEGORIES

14.   Turkey has compiled and presented, in its 2016 IIR, a level KCA for the following pollutants: NOx, NMVOC, SOx, NH3, PM10, and CO.

15.   The KCA performed by Turkey is partly consistent with the EMEP/EEA Emission Inventory Guidebook. In response to a question raised by the ERT about the differences, Turkey stated that after the revision of the Guidebook, the NFR categories were changed in the structure of Turkey's inventory compilation method, resulting in some mistakes, which would be fixed in the next submission. The ERT recommends to compare the Turkish KCA results with the KCA results provided by CEIP's RepDab tool.

16.   The KCA performed by CEIP shows that transport dominates the NOx emissions, while energy produces the largest share of SOx and CO emissions. PAH emissions generally come from IPPU and Agriculture. PM10 emissions are mostly produced by IPPU, but for NH_3 emissions agriculture is the only key category.

17.   The ERT encourages Turkey to upgrade its methodologies for key categories that still use a Tier 1 approach.

QUALITY

Transparency

18.   The ERT commends Turkey for having a very transparent IIR, which follows the recommended IIR structure (Annex II of the Reporting Guidelines). The 2016 IIR submitted by Turkey provides the emissions, methodology and recalculations divided by subcategories. Emission factors are well documented and the references are given. However, information on activity data in the energy sector could be more detailed, not only mentioning the source, but also the values. In addition, the ERT recommends that Turkey includes activity data in the NFR tables.

19.   Turkey uses the notation keys NE and IE in a number of areas, and an explanation is provided in the 2016 IIR under the sectoral chapters. The ERT suggests that Turkey includes a table with explanations of NE and IE under the general chapter in order to have a more transparent inventory.

20.   The ERT commends Turkey on its comprehensive description of improvements, and encourages the Party to prepare also a continuous improvement programme to monitor progress.

21.   The ERT recommends that Turkey revises the figures of emission trends in the general chapter in the IIR. ERT would suggest to divide emissions by sectors (Energy, Transport, IPPU, Agriculture, Waste) for better transparency and to describe sub-sectors in detail in the description.

Completeness

22.   Turkey has reported emissions for NOx, NMVOC, NH_3, SOx, PM_{10} and CO. The ERT encourages Turkey to report emissions for missing pollutants in the future submissions.

23.   Turkey has provided full time series for the pollutants mentioned above.

Consistency, including recalculations and time-series

24.   The ERT commends Turkey for having provided explanations for recalculations in the the sectoral chapters. However, in the recalculations/improvements chapter upcoming recalculations for the next inventories are presented. The ERT recommends that Turkey additionally summarizes the actual recalculations from the sectoral chapters and presents them in the recalculations chapter.

Comparability

25.   Turkey's inventory is comparable with those of other Parties. The allocation of source categories follows that of the EMEP/EEA Reporting Guidelines.

CLRTAP/NECD comparability

26.   Turkey, as a non-EU member state, does not report emissions under the National Emission Ceilings (NEC) Directive.

Accuracy and uncertainties

27.   The ERT noted that emission trends described in Turkey's IIR are slightly different from those in the NFR tables. During the review week, Turkey confirmed that this was a typographical error. The ERT recommends that Turkey continues to improve its quality control management in order to present the same values in both the NFR tables and the IIR.

28.   Turkey does not perform an uncertainty analysis, although in some sectoral chapters the uncertainties are mentioned. In response to a question raised by the ERT on this issue, Turkey stated that they were planning to compile the uncertainty analysis as a whole after the completion of the project NAPEMS (see above). The ERT encourages Turkey to implement the project results in the upcoming submissions.

Verification and quality assurance/quality control approaches

29.   Turkey has QA/QC procedures, which are described in their IIR. However, the ERT recommends to double check the emissions reported in the NFR tables and the IIR.

30.   The ERT recommends that Turkey reviews its use of the appropriate notation keys. In the NFR tables, in several cells there "NO" is reported, while emissions are reported in the same sub-sector. This is not in line with the Reporting Guidelines, which state that "NO" is used "for categories or processes within a particular source category that do not occur within a Party". The ERT recommends that Turkey corrects these notation keys according to the Reporting Guidelines. There are also a few zero values reported in the NFR tables, the ERT suggests to replace those with an appropriate notation key in the next submission.

FOLLOW-UP TO PREVIOUS REVIEWS

31.   Turkey has generally improved its inventory since the 2012 Stage 3 review. More pollutants have been provided as well as full time series. However, there are still some aspects that should be improved, as listed below.

AREAS FOR IMPROVEMENTS IDENTIFIED BY TURKEY

32.   Turkey has identified improvements with regard to data provision and consistency, pollutants as well as NFR sectors in its IIR:

33.   The "Climate change and air management coordination board" was established to ensure data flow with cooperation of all stakeholders with the aim to ease the process of inventory compilation and increase its accuracy and completeness both for historical and projected emissions. The coordination board will take specific measures to ensure consistency between the air pollutants and GHG emission inventories in.

34.   It is of highest priority to obtain reliable point source data to improve NOx estimates. In addition, the input data for COPERT will be analysed and studied to compile the time series.

35.   Regarding NMVOC emissions, a country-specific method for estimating emissions from solvent use will be developed and the emission factors used for residential wood combustion will be revised.

36.   It is planned to improve the data sets for the sulphur content of fuels (lignite especially), and the extent to which flue gas desulphurisation plants are installed and the operational performance of such plants are of the highest priority for improving SO_x emission estimates. Additionally, comprehensive and reliable emission data for large point-sources (electricity generation and other large scale industrial combustion plants) would significantly reduce the uncertainty of SO_x emission estimates. The data obtained from the facilities to calculate specific EFs will be studied and integrated into the inventory in the next submissions.

37.   The methodology applied to derive NH3 estimates used a combination of country specific data, default data from the literature and expert judgement. There are some important parameters in the methodology, such as N excretion from livestock, where the use of country-specific data would bring a significant improvement.

38.   The fuel data from the energy balance tables only specifies "Petroleum" for liquid fuels. A considerable improvement could be made if petroleum could be split into the following: Petrol (gasoline), Diesel (Gas Oil), Aviation fuel and Heating or Burning Oil. These issues were analysed together with the Ministry of Energy representatives and next submissions will cover the petroleum split calculations within the energy balance.

39.   There are several NFR categories where emissions from mobile machinery are reported. However, all are reported as IE. Turkey is planning to improve the level of detail of the fuel data from the energy balance tables to distribute fuel used between stationary and mobile installations. Additionally, for the next submission revised aviation data will be integrated into the inventory.

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:

(a)   The ERT encourages Turkey to report emissions for missing pollutants for the future submissions.

(b)   The ERT suggests that Turkey updates the NFR14-2 template for annual emissions due to the corrected Solvents/IPPU allocation in the GNFR classification.

(c)   The ERT recommends comparing KCA results made by Turkey with KCA results made by RepDab tool in order to have the same values for the next submissions.

(d)   The ERT encourages Turkey to improve its methodologies for key categories that use a Tier 1 approach.

(e)   The ERT suggests that Turkey includes a table with explanations of NE and IE under the general chapter.

(f)   The ERT recommends that Turkey presents activity data in the NFR tables.

(g)   The ERT recommends that Turkey continues to improve its quality control management in order to have the same values both for NFR tables and IIR.

(h)   The ERT recommends that Turkey compiles the actual recalculations from the sectoral chapters and presents those in the recalculations chapter.

(i)   The ERT encourages implementing the project results regarding uncertainty analysis in the upcoming submissions.

(j)   The ERT recommends that Turkey reviews its use of the appropriate notation keys.

SECTOR SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

Pollutants Reviewed		NOx, SOx, NMVOC, NH3, CO and PM10		
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		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	x		
1A3ei	Pipeline transport	x		
1A3eii	Other	x		x
1A4ai	Commercial/institutional: Stationary	x		
1A4bi	Residential: Stationary	x		
1A4ci	Agriculture/Forestry/Fishing: Stationary		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		x
1B2aiv	Fugitive emissions oil: Refining / storage	x		x
1B2av	Distribution of oil products	x		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		x
1B2d	Other fugitive emissions from energy production	x		x

General recommendations on cross-cutting issues

Transparency

41.   During the 2012 review, the ERT noted that there was a lack in transparency regarding the use of net calorific values (NCV) to convert mass to energy units. In the 2016 IIR only the default emission factors from the guidebook (in energy units) are repeated. No reference is made to the use of NCV. The ERT notes that in the 2016 IIR the use of NCV is only mentioned for sub-sector 1A1b (petroleum refining) and this is the only sub-sector were the origin of the NCV (UK reporting) is mentioned. In reply to a question raised by the ERT, Turkey stated that it still used the UK NCV for all energy related sources. The ERT strongly recommends that Turkey makes use of country specific NCV or provides clear evidence that the UK NCV are representative in the next submission. In addition, the ERT recommends to include a description of the use of the NCV and the actual NCV data.

42.   Several emission factors tables for the energy sectors still refer to the EMEP/EEA 2009 Guidebook. This is not explained in the inventory report. Furthermore, the ERT notes that an incorrect emission factor is used in some places or that it is used for another source than the intended one in the guidebook. The ERT recommends that Turkey thoroughly checks the emission factors used and the references made to the sources for its next submission.

43.   Turkey does not provide a full source description for the different source categories in the energy sector. The inventory especially lacks information on production processes used, production rates, abatement technology used, etc., and how this is reflected in the emission inventory. This makes the inventory less transparent. The ERT recommends that Turkey gives a full source description in the inventory report in the next submission.

Completeness

44.   During the 2012 review, the ERT noted that Turkey did not report the underlying activity data in the NFR tables. The ERT notes that Turkey does not report any energy activity data, neither in the NFR-tables, nor in the IIR with the exception of a reference to the energy balance tables from the Ministry of Energy and Natural resources. The ERT reiterates its recommendation from the 2012 review to report the activity data in the IIR and the NFR tables in the next submissions.

45.   Several source categories such as emissions from geothermal energy production and most fugitive emissions are addressed neither in this inventory report nor in the NFR tables (or the notation key NA or IE is used). The ERT notes that for several of these categories activity data is available or is easy to access and that Tier 1 emission factors are available in the EMEP/EEA 2013 Guidebook. Furthermore, the ERT notes that for some sources the emissions can be substantial and therefore the total emissions are most likely underestimated. The ERT recommends that Turkey performs an assessment of these sectors and other sources not represented in the inventory yet.

Consistency including recalculation and time series

46.   In the 2012 review, the ERT recommended Turkey to improve the IIR description of how it ensures consistent emission estimates for all years of the time series, as reported in different submissions. However, the ERT notes that the 2016 IIR is still lacking in that regard. Furthermore, the ERT notes that the chapter on recalculations states that the energy balance has been revised and that these revisions are included in the 2016 inventory. However, for several energy sources it is mentioned that no recalculations have taken place. The ERT reiterates its recommendation from the 2012 review to improve the IIR description on the subject of recalculations.

47.   Turkey uses petroleum as fuel type for several source categories. However, the emission factors chosen for this fuel differ between source categories and sometimes even within a source category. For instance, in source category 1A1c the 1A1a Tier 1 emission factor for "gaseous fuels" is used for NOx, whereas for SOx, NMVOC, CO and PM_{10} the 1A1a Tier 1 emission factors of "other liquid fuels" are employed. In the IIR no explanation is given for the reasons for these choices. The ERT recommends that Turkey improves on the consistency for its next submission.

Comparability

48.   In the 2012 review, the ERT recommended Turkey to carry out a full key category analysis (trend and level) in next submissions. The ERT notes that in the 2016 IIR it is stated that Turkey follows the IPCC approach that covers both level and trend key analysis. However, the ERT notes that table 1.1 of the IIR only gives the result of a level key source analysis for 2014 and that neither data nor results on trend key source analysis are reported in the IIR. The ERT reiterates its recommendation of the 2012 review to carry out a full key source analysis in the next submission.

49.   The ERT notes that Turkey uses a Tier 1 methodology for most of the energy key sources. Furthermore, in response to a question from the ERT it became clear that for converting these Tier 1 emission factors from mass to energy units, Turkey makes use of NCV being country specific to the UK. Then emissions are calculated with these emission factors and fuel mass is determined from the energy balance. The ERT notes that as reported in the National Inventory Report for calculating GHG emissions, Turkey uses another set (country specific) of NCV that differs from the UK NCV. The use of different NCV makes comparability between inventories and countries almost impossible. The ERT recommends that Turkey makes use of one country specific set of NCV for all the different emission reporting obligations.

Accuracy and uncertainties

50.   The ERT notes that Turkey uses a Tier 1 methodology for most of the energy key sources and that it would be appropriate and, from the point of accuracy, beneficial to use a higher Tier methodology for the key sources. The ERT recommends that Turkey uses a higher Tier methodology for key sources in the next submissions.

51. In the 2012 review, the ERT recommended that Turkey quantifies the uncertainties in its emission estimates for stationary combustion, using the most appropriate methodologies available, and considering the guidance provided in the Guidebook to help prioritise inventory improvements. The emission uncertainties are the combined result of uncertainties in the activity data (energy balance and AER's), the uncertainties in the NCV used and those from the emission factors used. The ERT notes that in the 2016 IIR for the energy sectors Turkey refers to uncertainties in the UK inventory but these uncertainties are neither included in the IIR nor used for prioritising inventory improvements. Furthermore, the ERT notes that the Turkish national energy balance will have its own uncertainty and that the use of the UK NCV will introduce an extra uncertainty for the Turkish circumstances. Therefore, the ERT strongly recommends that Turkey quantifies the uncertainties in its emission estimates in the next submission.

Improvement

52. As noted in the 2016 IIR and also in an answer to the ERT, Turkey currently works towards improving its emission inventory within the framework of a national project that started in 2013 (NAPEMS). The ERT commends Turkey for this initiative and is looking forward to seeing the improvements being implemented in future submissions.

Sub-sector Specific Recommendations

Category issue 1: 1A and 1B

53. During the 2012 review, the ERT found that Turkey was using a Tier 1 methodology for stationary combustion, but that it appeared that plant specific data was available at other ministries and that a Coordination Board was established between the different data providers/holders to improve data collection in the future. Furthermore, the 2012 ERT found that Turkey has not reported any estimates from fugitive emissions, arguing that there is a lack of activity data. The ERT notes that Turkey still uses the Tier 1 methodology for stationary combustion in its 2016 IIR. Additionally, different NCVs are used for GHG reporting and for air pollution, with fugitive emissions still not being reported. In response to several questions asked during the 2016 review, Turkey pointed out that the project NAPEMS would deal with this and that it was expected that in future submissions higher Tiers would be used. The ERT reiterates its recommendations from the 2012 review that Turkey estimates emissions from the relevant fugitive sources, by making use of existing energy-balance data and/or collecting new data, and to report these emissions in future inventory submissions and that Turkey ensures that inventory compilers have access to all relevant data for establishing transparent, accurate, comparable, consistent and complete emission estimates under both CLRTAP and UNFCCC.

Category issue 2: 1A1a – SO_x and NOx

54. In the 2012 review, the ERT recommended that Turkey moves from Tier 1 to Tier 3 when estimating emissions of SO_x and NOx from public electricity and heat production in future inventory submissions and that Turkey ensures that the plant-

specific activity data is fully reflected in the national energy balance and that the energy balance is fully reflected in the NFR reporting tables. The ERT notes that the Tier 1 methodology has still been used for estimating this key source. Questioned about the progress made, Turkey answered that several desk studies were done and a national project had been started in 2013 to deal with the use of plant specific data in the inventory. It is expected that the plant specific data will be implemented in the near future.

Category issue 3: 1A1b – all pollutants

55. The NFR tables and the IIR show a data gap for 2011. No description of the cause of this is given in the IIR. Furthermore, in the 2012 review the ERT recommended that Turkey filled the gaps where data is missing (issue 39). The ERT reiterates this recommendation.

Category issue 4: 1A1b – all pollutants

56. For the fuel type "petroleum" Turkey uses the Tier 1 emission factors for refinery gas (IIR table 3.1.5). This does not seem appropriate as petroleum is a heavier mix and sometimes more unrefined liquid oil fraction. This will most likely lead to an underestimation of some of the emissions coming from this source category. The ERT recommends that Turkey uses more suitable emission factors and recalculates the time series with these in the next submission.

Category issue 5: 1A1c – all pollutants

57. In the IIR, the data from this source category shows an irregular trend as of 2012. Furthermore, no data is reported for the year 2014. The IIR contains no description of this. However, the NFR-tables hold emission data for these years that differ from those in the IIR and appear to fit the trend. The ERT recommends that Turkey corrects the data and explains irregular trends in the next submission.

Category issue 6: 1A2b, 1A2c and 1A2e - all pollutants

58. Both in the IIR and in the NFR these source categories show exceptionally low emissions in the year 2008 (1A2e from 2008 to 2010). The IIR does not have an explanation for this. The ERT recommends that Turkey explains or corrects these values in the next submission.

Category issue 7: 1A2a, 1A2b, 1A2c, 1A2d, 1A2e and 1A2f – NMVOC, CO, PM_{10}

59. The emission factor tables refer to the EMEP/EEA 2009 Guidebook for several fuels while the actual emission factors mentioned in these tables come from the 2013 Guidebook. The ERT recommends that Turkey corrects this in the next submission.

Category issue 8: 1A2a – all pollutants

60. Turkey uses a Tier 1 approach for this source sector and uses the source related emission factors from the EMEP/EEA Guidebook. The ERT notes that the EMEP/EEA Guidebook stipulates (p. 14) that: 'In NFR sectors where large (> 50 MW)

combustion plants are known to be used, the default Tier 1 emission factors provided in chapter 1.A.1.a may be more appropriate (for example combustion activities in iron and steel production)'. Furthermore, the ERT notes that probably most (all) plants in the Iron Industry are >50 MW and that the emissions for this source sector are most likely underestimated. In reply to a question from the ERT on this subject, Turkey stated that there were several projects on the topic of large combustion plants and that the project NAPEMS would lead to a Tier 3 approach. The ERT recommends that Turkey uses a higher Tier in the next submission or to assess whether the use of the 1A1a emission factor would be more appropriate and, if so, to recalculate the complete time series.

Category issue 9: 1A2a and 1A2f – all pollutants

61.   Turkey uses a Tier 1 approach for these source sectors. The ERT notes that according to their annual company reports, most big companies in these industries control their emissions and report them (with the measurements) to the Turkish Ministry of Environment. In response to a question on this, Turkey pointed out that already for about 50% of these facilities continuous measurement systems were installed and that these measurements would be integrated into the inventory in the near future. The ERT recommends that Turkey makes use of the already available facility and statistical data in a Tier 3 approach in the next submission.

Category issue 10: 1A3eii; NOx, SO_x, NH_3, NMVOC, CO and PM_{10}

62.   This source sector is not described in the IIR while in the NFR for SOx, PM_{10} and CO the notation key IE is used and for NH_3 the notation key NA. For NOx and NMVOC, the NFR tables hold neither data nor a notation key. The ERT recommends that Turkey gives a source sector description in the IIR and uses the correct notation keys in the next submission.

Category issue 11: 1B2ai and 1B2c – NMVOC

63.   Turkey reports in the IIR (para 3.3.3.4; p. 143) that emissions from these sources are not applicable (NA). However, in the NFR the notation key IE is used. The ERT notes that Turkey is an oil (and gas) producing country and has an expanding oil and gas industry with several refineries and there are several thousand kilometres of pipeline for the transport of crude oil, oil products and natural gas. Consequently, there will be emissions from these sources. Asked for an explanation, Turkey answered that fugitive emissions were still not very well understood from the perspective of the facilities and that the project NAPEMS would be the key for obtaining activity data for these source sectors. Furthermore, Turkey stated that the correct notation key was 'not estimated' (NE). The ERT notes that activity data must be available since these sources are dealt with in the GHG emission report. The ERT recommends that Turkey corrects the notation keys, or, preferably, reports a Tier 2 (and if activity data is available preferably a higher Tier) estimate for the fugitive emissions in the next submission.

Category issue 12: 1B2aiv and 1B2av – NMVOC

64.   Turkey reports in the IIR (para 3.3.3.4; p. 143) that emissions from these sources are not estimated yet and that efforts to obtain activity data are planned to be made mid-2016. However, the ERT notes that the notation key IE is used in the NFR. In response to a question Turkey stated that the notation keys used were not correct and should read 'not estimated' (NE) and furthermore, that for these sources the project NAPEMS would be the key for the activity data. The ERT notes that activity data must be available since these sources are dealt with in the GHG emission report. The ERT recommends that Turkey corrects the notation keys, but preferably reports a Tier 1 (and if activity data is available preferably a higher Tier) estimate for the fugitive emissions in the next submission.

Category issue 13: 1B2c – NMVOC, CO, NOx and SO_x

65.   Turkey reports in the IIR that emissions from this source are expected to be small, that they are not yet estimated and that efforts to obtain activity data are planned for mid-2016. However, in the NFR the notation key IE is used. The ERT notes that Turkey is an oil and gas producing country and has an expanding oil and gas industry with several refineries and so, venting and flaring will occur. In reply to a question, Turkey stated that the notation keys used were not correct and should read 'not estimated' (NE) and, furthermore, that for these sources the project NAPEMS would be the key for the activity data. The ERT refers to its previous recommendation on issue 12 above.

Category issue 14: 1B2d – SO_x, PM_{10}, CO and NH_3

66.   Turkey does not address this sub-sector in the IIR, although there are a few active geothermal plants. Furthermore, the 2013 Guidebook lists Tier1 emission factors for geothermal energy extraction. Turkey uses the notation key IE in the NFR tables for SO_x, PM_{10} and CO, for NH_3 the notation key NA. In response to a question from the ERT, Turkey stated that the notation keys would be corrected in the next submission. The ERT recommends that Turkey reports this source sector using a Tier 1 approach and default emission factors in the next submission.

TRANSPORT

Review Scope

Code	Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		NOx, SO$_x$, NMVOC, NH$_3$, PM10 and CO		
Years		1990 – 2014		
1A2gvii	Mobile Combustion in manufacturing industries and construction	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		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		x
1A3bvii	Road transport: Automobile road abrasion	x		x
1A3c	Railways	x		
1A3di(ii)	International inland waterways		NE	
1A3dii	National navigation (shipping)	x		
1A4aii	Commercial/institutional: Mobile		NE	x
1A4bii	Residential: Household and gardening (mobile)		NE	x
1A4cii	Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		NE	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		NE	
1A3	Transport (fuel used)		NE	

General recommendations on cross-cutting issues

Transparency

67.   The ERT commends the Party for implementing the recommendation from the previous Stage 3 review by providing a full time series of emission estimates from 1990 onwards for the transport sector (in previous Stage 3 review, Turkey only provided emission estimates for 2010).

68.   Turkey has provided a generally transparent IIR for transport, however, information on activity data is still missing in the IIR and in the NFR tables. As recommended in the previous Stage 3 review, the ERT strongly encourages the Party to include as much information as possible on the activity data used (fuel

consumption data by fuel type, sulphur content in fuel, vehicle kilometres etc.) for transparency purposes.

69. The ERT also encourages the Party to include further information on the emission trends, in particular when there are peaks and dips over the time series.

70. The ERT notes that the Party uses zero-values in a number of areas in the NFR tables (e.g. zero emissions from 1A3c in 2013 and 2014) and some of these appear to be an omission (e.g. zero NOx from 1A3aii(ii) in 2014, zero NMVOCs from 1a3bi-v in 2013 and zero CO from 1A3dii in 2013). The ERT recommends that the Party checks whether there have been omissions or to use the appropriate notation keys (e.g. NO where emissions are "Not Occurring", NE where emissions are "Not Estimated" and IE where emissions are "Included Elsewhere") for reporting where estimates are not available.

71. The notation key IE has been used for the following transport sub-sectors: 1A2gvii, 1A4aii, 1A4bii, 1A4cii, 1A4ciii and 1A5b, however, the IIR does not indicate in which NFR code(s) the emissions are included. The ERT encourages Turkey to make efforts to calculate and report these emissions separately in future submission.

Completeness

72. Turkey has provided emission estimates for 6 pollutants (NOx, NMVOC, SO_x, NH_3, PM_{10} and CO) in its current submission. The ERT notes that the following sources and pollutants are not estimated by the Party:

(a) PM emissions from 1A3a

(b) CO emissions from 1A3b before 2011

(c) Cold start emissions from 1A3b for CO and NMVOC

(d) PM emissions from 1A3bvii (road abrasion)

(e) NH3 emissions from 1A3c

73. During the review, the Party indicated its intention to include estimates for the aforementioned sources and pollutants in its next submission. The ERT encourages the Party to carry out this improvement plan.

Consistency including recalculation and time series

74. The Party has used different methodologies to calculate road transport (1A3b) estimates for 1990-2010 and 2011-2014 (See Sub-sector Specific Recommendations).

75. The ERT notes that the Party used emission factors sourced from an emissions model from the Ministry of Transport in Turkey to estimate emissions for 1A3ai(i) and 1A3aii(i) for all years except 2012 where EMEP/EEA Guidebook 2013 factors were used. This may be the reason for a step change in NMVOC emissions from these categories in 2012. The Party has not explained the rationale for such

approach in the IIR or during the review. The ERT encourages Turkey to review the emission factors used across the time series and provide clarification in its next IIR.

Comparability

76.   The methods used by the Party to estimate emissions of pollutants from mobile sources are generally consistent with those proposed in the Guidebook. As mentioned previously, the ERT notes that no activity data (AD) is provided in the NFR tables. AD in the NFR tables are helpful to compare IEFs with other countries. The ERT recommends that the Party completes the NFR tables with AD in its future submissions.

77.   Turkey used NH_3 EF for hard coal from the 2013 EMEP/EEA Emission Inventory Guidebook to estimate emissions for 1A3c. However, the ERT noted that the value used by the Party (as referenced in the IIR) is 10 times lower than the actual value quoted in the EMEP/EEA 2013 Guidebook. The ERT recommends that the Party uses the correct EF for its next submission.

Accuracy and uncertainties

78.   The IIR does not discuss any specific QA/QC procedures implemented for the transport sector and no uncertainty analysis has been made. During the review, the Party indicated its intention to undertake an uncertainty analysis for the transport sector in future submissions. The ERT encourages the Party to carry out this plan and to use the results to prioritise further improvements.

Improvement

79.   The ERT notes the Party's intention to improve its emission estimates for international aviation and its plan to obtain fuel data and numbers of LTOs for this source.

80.   The IIR states that no emission estimates have been made for 1A4aii as fuel data are not provided separately for mobile source in the energy balance. However, the Party indicates its intention to use a bottom up approach to estimate emissions from this source.

81.   The ERT encourages the Party to implement these planned improvements.

Sub-sector Specific Recommendations

Category issue 1: 1A3b – All Pollutants

82.   The Party has used different methodologies to calculate road transport (1A3b) estimates for 1990-2010 and 2011-2014. For the former period, the Party has not provided any description of methodology in the IIR; during the review, the Party indicated that estimates were made from the national energy balance tables, while for the period 2011-2014, the COPERT software (i.e. Tier 3 methodology) was used. The ERT strongly recommends that the Party uses a consistent methodology to estimate emissions across the time series and to clearly document the approach used in its future IIRs. Moreover, the ERT encourages the Party to include

information on the approach used to rescale emissions for each vehicle type so that total calculated fuel use is consistent with the national fuel data. During the review, the Party provided the missing diagram in the IIR, which shows the differences between pre-scaled and scaled emission time series for the period 1990 to 2010. The ERT thanks the Party for providing this information and encourages the Party to continue to provide this comparison in its future IIRs for transparency purposes.

Category issue 2: All mobile sources – SOx

83.   The ERT noted a number of issues (transparency, consistency and completeness) associated with SOx reporting by the Party. Zero-values were used in the following years and categories in the NFR tables:

(a)   1A3ai(i) and 1A3aii(i) for 2013 and 2014

(b)   1A3bi-iv for 2011 to 2014

(c)   1A3bvii for 1990-2014 (please note notation key NA should be used for this category)

(d)   1A3di(ii) for 1990-2012, 2014

(e)   1A3dii for 2013

84.   During the review, the Party indicated that the sulphur content of the fuel in Turkey is fully compliant with the requirements under the Directive for sulphur content of liquid fuels (Directive 1999/32/EC) and provided a weblink as the source of its national fuel information (however, the ERT noted that the web link does not open). The ERT recommends that the Party reviews and rectifies the aforementioned issues and provides the emission factors used for estimating SOx emissions for mobile sources in its next submission.

Category issue 3: 1A3dii – NOx

85.   The Party is using Tier 1 methodology to estimate emissions from 1A3dii, which is a key source for NOx according to the IIR. During the review, the Party indicated its intention to move to a higher Tier for 1A3dii by using actual shipping movement data in future submissions. The ERT encourages the Party to carry out this improvement plan and to provide detailed information on the methodology used in its future IIRs.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed			SOₓ, NOx, NMVOC, NH3, CO and PM10		
Years			1990 – 2014		
Code	**Name**		**Reviewed**	**Not Reviewed**	**Recommendation Provided**
2A1	Cement production		x		x
2A2	Lime production		x		x
2A3	Glass production		x		x
2A5a	Quarrying and mining of minerals other than coal		x		x
2A5b	Construction and demolition		x		x
2A5c	Storage, handling and transport of mineral products		x		x
2A6	Other mineral products		x		x
2B1	Ammonia production		x		x
2B2	Nitric acid production		x		x
2B3	Adipic acid production		x		x
2B5	Carbide production			NA	
2B6	Titanium dioxide production		x		x
2B7	Soda ash production		x		x
2B10a	Chemical industry: Other		x		x
2B10b	Storage, handling and transport of chemical products			NE	x
2C1	Iron and steel production		x		x
2C2	Ferroalloys production			IE	
2C3	Aluminium production		x		x
2C4	Magnesium production			NE	
2C5	Lead production		x		x
2C6	Zinc production		x		x
2C7a	Copper production		x		x
2C7b	Nickel production			NE	
2C7c	Other metal production			NE	
2C7d	Storage, handling and transport of metal products			NE	
2D3b	Road paving with asphalt		x		x
2D3c	Asphalt roofing			NE	
2H1	Pulp and paper industry		x		
2H2	Food and beverages industry		x		x
2H3	Other industrial processes			NE	
2I	Wood processing			NE	
2J	Production of POPs			NA	
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)			NA	x
2L	Other production, consumption, storage, transportation or handling of bulk products			NE	

General recommendations on cross-cutting issues

86.   The ERT notes that Turkey has only submitted emissions for the few pollutants (SOₓ, NOx, NMVOC, NH₃, CO and PM₁₀) for the period 1990 - 2014 in the

NFR tables for the industrial sector. The ERT's review work is based solely on the information provided.

Transparency

87.   The ERT notes that notation keys do seem to be properly used for the reported pollutants, while for all other pollutants Turkey uses "0" instead of the proper notation key. The ERT encourages Turkey to fill the NFR tables with notation keys instead of "0".

88.   The ERT finds that emission estimates in IIR are reported transparently with good method descriptions and references to data sources and EFs. Trends are also described transparently. However, the NFR tables are less transparent. There are no activity data in the NFR tables for the industry sector, and notation keys have not been always used for specific source categories where Turkey does not report emissions. The ERT encourages Turkey to submit complete NFR tables with appropriate notation keys and with activity data for the industrial sector.

89.   Additionally, Turkey uses the notation keys IE and NE for many source categories in the scope of the industrial sector, which also decreases the transparency of the inventory.

Completeness

90.   As Turkey only submitted emissions for a few pollutants (SOx, NOx, NMVOC, NH_3, CO and PM_{10}) the inventory is considered incomplete. The ERT recommends that Turkey calculates and provides emission estimates for all substances, for which there are reporting obligations in the LRTAP convention and its protocols: SO_x, NOx, NMVOC, NH_3, CO, PM_{10}, $PM_{2.5}$, Pb, Cd, Hg, PAHs (benzo(a) pyrene, benzo(b) fluoranthene, benzo(k) fluoranthene, and indeno(1,2,3_cd) pyrene), Dioxins and furans, PCBs and HCB.

91.   The ERT finds that not all important sources of the industrial sector are included in the inventory. Turkey has not estimated emissions for the following source categories that are likely to be emitting sources in Turkey: 2.A.1, 2.A.2, 2.A.3, 2.A.5.a, 2.A.5.b, 2.A.5.c, 2.A.6, 2.B.3, 2.B.6, 2.B.7, 2.B.10.b, 2.C.4, 2.C.6, 2.C.7.b, 2.C.7.c, 2.C.7.d, 2.D.3.b, 2.D.3.c, 2.H.3, 2.I, 2.J, 2.K and 2.L. However, in the IIR Turkey stated with each source category that they were planning to include emission estimates for at least particle emissions from each source category once information on the proper activity data would be collected. The ERT commends Turkey for the planned improvement and encourages the Party to collect all needed activity data for emission calculation for one of the next submissions.

92.   In some cases (e.g. 2.A.1) Turkey stated that annual cement production data was available but due to limited time process emissions could not be calculated and that these would be calculated in the following year. The ERT commends Turkey on transparency and encourages Turkey to calculate emissions from cement production activities. The ERT considers the industrial sector to be complete and comprehensive with good levels of detail in the methodology descriptions.

Consistency including recalculation and time series

93.   During the review, the ERT noted that emission trends for the industrial sector are not consistent. The ERT identified peaks and dips that Turkey could not justify. Recommendations on these issues are listed in the section "Sub-sector Specific Recommendations" below.

Comparability

94.   The ERT finds that the methods applied for the Turkish inventory preparation are consistent with those proposed in the EMEP/EEA Guidebook for the industrial sector. Turkey described the methodology transparently in the IIR along with the assumptions used, referencing the sources of activity data and emission factors. The ERT considers the Turkish inventory for the industrial sector to be comparable with that of other reporting Parties. The ERT commends Turkey for using methodology in accordance with the EMEP/EEA Guidebook for the industry sector and that the allocation of industrial source categories follows that of the EMEP/UNECE Reporting Guidelines. However, the ERT notes that the NFR tables submitted are not complete and that the use of notation keys is extensive. The ERT encourages Turkey to calculate all missing emissions by source category in the industrial sector.

Accuracy and uncertainties

95.   Turkey did not provide a quantitative nor qualitative uncertainty analysis for the industrial sector. In the case of 2.C.3 and 2.C.5.b, Turkey provides the uncertainty of the activity data but no uncertainty calculation is performed. The ERT encourages Turkey to undertake an uncertainty analysis for the industry sector in order to help inform the improvement process and to provide an indication of the reliability of the inventory data.

96.   Turkey has established QA/QC routines and checks, so-called QA/QC colour coding, which is used throughout the entire inventory. The ERT commends Turkey for that and suggests that Turkey includes a few examples of specific checks performed for the industrial sector in their IIR for the next submission in 2017.

Improvement

97.   Turkey followed the proposed structure for compiling the IIR and included planned improvement for the each of the source categories in the industrial sector. The ERT commends Turkey for the improvement made in the industrial sector and notes Turkey's intention to make additional improvements in the future.

Sub-sector Specific Recommendations

Category issue 1: 2A Mineral Industry

98.   As stated in the previous ERT, emissions (TSP, PM10, PM2.5, BC) from activities in the scope of the mineral industry have not been estimated by Turkey yet. The ERT strongly recommends that Turkey implements the improvement plan and estimates emissions from this activity for its next submission in 2017.

Category issue 2: 2B1 Ammonia production, 2B2 Nitric acid production

99.   The ERT notes that the time series data on ammonia and nitric acid production can be found in the IIR, but not in the reporting tables. During the review, Turkey stated that these numbers would be added to the reporting in the following years. The ERT recommends that Turkey includes these data in the NFR tables for one of the next submissions.

Category issue 3: 2B10a Chemical industry: Other

100.   During the review, the ERT asked Turkey to provide trends of activity data for each N fertilizer type in Turkey (ammonium nitrate, calcium ammonium nitrate, ammonium sulphate, urea, diammonium phosphate and NPK). Turkey responded that those data would be added to the reporting in the following years. The ERT recommends that Turkey includes these data on an aggregated level in the NFR tables, and on disaggregated level by fertilizers type in the IIR for one of the next submissions.

101.   The ERT also noted that Turkey uses an old NFR code (2.B.5.a) in the names of tables and figures instead of the NFR code 2.B.10.a. Turkey responded that this error would be corrected for the next submission.

102.   The ERT found trend outliers (drops in SO_x emissions from sulphuric acid production in 1999 and 2004, and an increase in 2000, drops in NMVOC emissions from ethylene production in 2005 and in 2014, and an increase in NMVOC emissions from polyethene production in 2006) and asked Turkey for an explanation. Turkey was able to justify only the drop in SO_x emissions from sulphuric acid production in 1999. The ERT encourages Turkey to collect information that could explain all dips and peaks in time series trends and to include that information in the IIR to ensure transparency and better understanding of possible country specific circumstances (e.g. financial crisis, reducing/increasing the production, implementation of abatement technology etc.).

103.   The ERT asked Turkey whether there was any production of 1,2-Dichloroethane, Vinyl chloride (chloroethylene), Styrene, Methanal (formaldehyde), Polystyrene in primary forms, Expansible polystyrene in primary forms, Propylene, Carbon (carbon blacks and other forms of carbon), Urea etc. in Turkey as indicated in the national Annual Industrial Products (PRODCOM) Statistics. Turkey explained that TURKSTAT had special circumstances and principles for obtaining activity data. Therefore, the activity data from PRODCOM could not be used for inventory compilation. The Party stated that the cooperation between TURKSTAT and MoEU was still ongoing. In the mid and long term, the Party would ask for the statistical data to be integrated into the CLRTAP inventory again. The ERT commends Turkey on that clarification and encourages the Party to integrate statistical data from TURKSTAT into the CLRTAP inventory.

Category issue 4: 2C3 Aluminium production

104.   The ERT finds that emissions of NOx, SO_x, CO and PM10 from aluminium production in 2013 that are presented in the IIR do not correspond to the NFR table

for 2013. The ERT recommends that Turkey revises the emission data and corrects them for the next submission to ensure better consistency between the IIR and the NFR tables.

Category issue 5: 2C5 Lead production, 2.C.7.a Copper production

105.   The ERT finds that for both primary lead and copper production, Turkey has calculated only PM10 emission while emissions of other pollutants (TSP, PM2.5, BC, heavy metals, PCB and PCDD/F) have not been calculated. Turkey explained that other pollutants would be included in the reporting in line with the overall reporting strategy of Turkey for the following submissions. The ERT commends Turkey for this planned improvement and kindly recommends doing that as soon as possible.

Category issue 6: 2.C.6 Zinc production

106.   The ERT finds that emissions from zinc production were not estimated due to doubts concerning the data source. However, Turkey submitted GHG emissions along with zinc production data in their CRF tables. Turkey responded that most data used for GHG reporting in the industry sector cannot be used due to the strict confidentiality rules of TURKSTAT. The ERT recommends that Turkey shares all available data between both conventions (UNFCCC and LRTAP) in order to ensure completeness and consistency.

Category issue 7: 2D3b Road paving with asphalt

107.   The ERT notes that Turkey does not calculate emissions for this source category, because there is no data on asphalt production volumes. The ERT asked for an explanation why Turkey did not use the data on bitumen and asphalt that could be found in the national Annual Industrial Products (PRODCOM) Statistics. Turkey responded that data on bitumen and asphalt from PRODCOM statistics would be used for an emission calculation for its next submission.

Category issue 8: 2H2 Food and beverages industry

108.   The ERT finds trend outliers (drop in NMVOC emission in 2008, particularly in sugar-cube production, and a decrease in 2008 in the production of biscuits, margarine, bread, beer, wine and raki) and asked Turkey for an explanation. Turkey was not able to justify this drop in 2008. The ERT encourages Turkey to collect information that could explain all dips and peaks in time series trends and to include that information in the IIR to ensure transparency and better understanding of possible country specific circumstances (e.g. financial crisis, reducing/increasing the production, implementation of abatement technology etc.).

Category issue 9: 2K Consumption of POPs and heavy metals

109.   During the review, the ERT found that for activities under NFR code 2.K Turkey did not calculate Hg and PCB emissions. However, according to the EMEP/EEA 2013 Guidebook, Turkey only needs the country's total population for the Tier 1 approach for calculating emissions of Hg and PCB . The ERT recommends that Turkey calculates and reports Hg and PCB emissions along with activity data for the full historic trend in its the next submission in 2017.

SOLVENTS

Review Scope

Pollutants Reviewed	NMVOC			
Years	1990 – 2014			
Code	**Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
2D3a	Domestic solvent use including fungicides	x		
2D3d	Coating applications	x		
2D3e	Degreasing	x		
2D3f	Dry cleaning	x		x
2D3g	Chemical products	x		x
2D3h	Printing	NE		
2D3i	Other solvent use	NE		
2G	Other product use	NE		

General recommendations on cross-cutting issues

Transparency

110.   Turkey's methodology and emission factors in the IIR are considered by the ERT to be generally transparent and well described for the solvents sector., The ERT commends Turkey for that.

111.   The ERT notes that Turkey uses the NFR14 format for reporting, but in some places of the IIR's solvents sector chapter there are still references to NFR09. The ERT encourages the Party to update the IIR text for the solvent sector.

Completeness

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

113.   Still, the ERT notes that Turkey has not reported any emissions for the NFR sectors 2.D.3.h Printing, 2.D.3.i Other solvent use and 2.G Other product use. During the review, Turkey explained to the ERT that the Party planned to search for suitable methods to collect related activity data for these sectors. The ERT encourages Turkey to follow up on these plans.

114.   The NFR tables show empty cells for some pollutants and NFR codes. The ERT encourages the Party to fill these gaps with data or the appropriate notation keys.

Consistency including recalculation and time series

115.   The ERT finds the time series of the solvents sector to be generally consistent, but encourages Turkey to include descriptions of emission trends in the IIR in the next submissions.

116.   The ERT notes that no recalculations have been reported.

Comparability

117.   The ERT notes that Turkey does not use a country specific methodology to calculate pollutant emissions from the solvent sector, except for the Degreasing and Dry Cleaning sectors where the Party uses emission factors based on UK's and Ireland's emission inventories. The ERT commends Turkey for using methodologies in accordance with the EMEP/EEA 2013 Guidebook for the solvents sector.

Accuracy and uncertainties

118.   The ERT notes that for key sources Parties should use higher Tier methods for emission calculation than Tier 1. In the IIR, Turkey stated that they were actively searching for better sources for sector-specific activity data to improve the inventory's quality. The ERT commends Turkey for doing that and encourages the Party to continue with that work.

119.   The ERT notes that no uncertainty analysis has been performed by Turkey for the solvents sector. The ERT encourages Turkey to undertake an uncertainty analysis for the solvents sector in order to prioritise improvement activities and to provide an indication of the reliability of the inventory data.

Improvement

120.   The ERT notes that no specific improvements for the solvents sector have been reported in the IIR.

121.   The ERT notes that Turkey plans to check the consistency of the air emissions inventory with the data used in the Turkish greenhouse gas inventory and to try and fill the existing data gaps. The ERT commends Turkey for doing that and encourages the Party to continue with that work.

Sub-sector Specific Recommendations

Category issue 1: 2D3f Dry cleaning – NMVOC

122.   In order to upgrade the NMVOC emission calculations to Tier 2, the ERT recommends that Turkey checks the calculation methodology used by Iceland (Annual Icelandic Informative Inventory Report to UNECE, 2016; Page 61, Chapter 4.7.3), which uses the EMEP/EEA 2013 Guidebook methodology, but does not assume one to have the knowledge of how much solvent is used in dry cleaning. Depending on what kind of dry cleaning equipment is used in Turkey, the Party might have to use a different default abatement efficiency, given in the GB 2013 (Chapter 2.D.3.f Dry Cleaning, Table 3-3), than Iceland does.

123.   The ERT also encourages Turkey to continue investigating the possibilities of obtaining solvent consumption data (possibly using import/export/manufacturing statistical data) for better accuracy of NMVOC emission estimates.

Category issue 2: 2D3g Chemical products – NMVOC

124.	For paints, varnishes, inks and glues manufacturing, the ERT recommends that Turkey uses the EMEP/EEA 2013 Guidebook (Chapter 2.D.3.g Chemical products, Table 3-11) Tier 2 emission factor of 11 g/kg product instead of the Tier 1 emission factor.

AGRICULTURE

Review Scope

Code	Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		NH3, NMVOC		
Years		1990 – 2014		
3B1a	Dairy cattle	x		x
3B1b	Non-dairy cattle	x		x
3B2	Sheep	x		
3B3	Swine	x		
3B4a	Buffalo	x		
3B4d	Goats	x		
3B4e	Horses	x		
3B4f	Mules and asses	IE		
3B4gi	Laying hens	x		x
3B4gii	Broilers	x		
3B4giii	Turkeys	x		
3B4giv	Other poultry	NO		
3B4h	Other animals	x		x
3Da1	Inorganic N-fertilizers (includes also urea application)	x		x
3Da2a	Animal manure applied to soils	NE		x
3Da2b	Sewage sludge applied to soils	NE		x
3Da2c	Other organic fertilisers applied to soils (including compost)	NE		
3Da3	Urine and dung deposited by grazing animals	x		x
3Da4	Crop residues applied to soils	NE		
3Db	Indirect emissions from managed soils	NE		
3Dc	Farm-level agricultural operations including storage, handling and transport of agricultural products	NE		
3Dd	Off-farm storage, handling and transport of bulk agricultural products	NE		
3De	Cultivated crops	NE		
3Df	Use of pesticides	NE		
3F	Field burning of agricultural residues	NE		
3I	Agriculture other	NE		
11A	Volcanoes	NE		
11B	Forest fires	NE		

General recommendations on cross-cutting issues

125.   Overall, the ERT considers that the data provided for the agriculture sector are transparent, compiled in a way similar to that recommended by the Guidebook, consistent across the time series; calculations of pollutant emissions are as accurate as possible. The ERT asked for clarification on some items and made some recommendations for increasing the number of emissions sources calculated by the inventory and recommended some steps to clarify the information reported in the IIR. A key finding for the agriculture sector is that no PM emissions are reported for 3B although this could be a key category. Since a methodology is provided in the

Guidebook and Turkey has the activity data needed (livestock numbers) an estimate of PM emissions from this source can be made by the Party in future submissions.

Transparency

126.   The calculation of NH₃ emissions from livestock production is generally transparent (although see comment below on laying hens) as livestock numbers, nitrogen (N) excretion rates and EFs are cited in the IIR.

Completeness

127.   No PM emissions are reported for agriculture. This could be a key category.

Consistency including recalculation and time series

128.   No recalculations are reported for the preparation of the 2014 IIR.

Comparability

129.   Turkey has no emission ceilings under the National Emission Ceilings Directive (NECD) and therefore data are only reported under CLRTAP.

Accuracy and uncertainties

130.   In the section on sub-sector specific recommendations, the ERT recommends some measures to increase the accuracy of the inventory submission.

Improvement

131.   Following an earlier recommendation, Turkey now calculates NH3 emissions from ducks and geese from the pastures on which they are raised.

132.   Improved AWMS data have been included by the Party as part of the Inventory Improvement Plan.

Sub-sector Specific Recommendations

Category issue 1: 3B and 3D – PM

133.   No PM emissions are reported for agriculture. This could be a key category. The 2016 version of the EMEP/EEA Guidebook indicates PM2.5 and PM10 from livestock production to account for 3 and 9% respectively of total emissions in the EU. The ERT appreciates that in Table 1.1 the Party has accounted for 92.1% of estimated PM10 emissions by summing two sources calculated in other sectors. However, if the Party calculates PM emissions from livestock production using Guidebook methodology, there may be a significant increase in total PM emissions and new key sources might be revealed. A preliminary estimate made by the ERT using numbers of cattle reported in the IIR indicates that PM emissions from dairy and other cattle are c. 6.5 Gg. Elsewhere in the IIR PM emissions < 1 Gg are reported, e.g. in Table 3-2-3. Since the Party has livestock numbers it would be fairly easy to estimate PM emissions from agriculture using the EFs provided in Guidebook chapter 3B. Emissions from crop production may also be estimated using the EFs

provided in chapter 3D. The Party informed the ERT that the data needed would be collected in the future with the help of Coordination Board working groups. The ERT thanks the Party for this reply and strongly recommends to include PM emissions from 3B and 3D in future inventories.

Category issue 2: 3B – NMVOC

134. No information was given in the IIR as to whether a Tier 1 or Tier 2 approach was used to calculate NMVOC emissions from manure management. The Party informed the ERT that a Tier 2 approach had been used to calculate these emissions. The ERT thanks the Party for the reply and recommends that in future IIRs Turkey reports the Tier used together with the source of the EF to ensure that the calculations are transparent.

135. The reason for the large increase in NMVOC emissions from manure management after 2008 was not given in the IIR. The ERT presumed it was due to the increased number of dairy cattle and this was confirmed by the Party. The ERT suggested to the Party that it would be useful to have explanations for substantial changes in emissions from specific sources confirmed in the text. The Party agreed in include such explanations in the IIRs for future reporting cycles. The ERT thanks the Party for confirming the reason for the increase in NMVOC emissions and for agreeing to include the explanations in future IIRs.

Category issue 3: 3Da1 Inorganic N-fertilizers

136. The calculation of NH_3 emissions following application of N fertilizer is not entirely transparent. The reason given for the very large increase in NH3 emissions following N fertilizer application in 2009 (Figure 5.2) is that 'TURKSTAT announced value for 2009-2014 is increased' but it is not clear whether there was an increase in actual use of N fertilizer or whether the data are now collected in a different way. The ERT encourages the Party to include data on N fertilizer use in Turkey for the period 1990 to 2015 in the IIR together with an explanation of the current method for estimating N fertilizer use, how this method differs from previous methods and the implications, if any, for the consistency of the time series.

Category issue 4: 3B4gi Laying hens

137. On page 255, under 'Activity Data' it is written that the numbers of laying hens are estimated to amount to 33% of total chickens. Laying hens are likely to be among the key sources of NH3 emissions and efforts need to be made to estimate their numbers so that emissions from this source can be accurately estimated. If data are available on total egg production in Turkey, then layer numbers may be estimated as total egg production divided by 300, the approximate average number of eggs laid annually by laying hens, or by using the average value for layer output in Turkey if that number is available. The Party has taken note of this remark and will take it into account for the next submission. The ERT thanked the Party for agreeing to make an estimate of the number of laying hens in Turkey for future inventories.

WASTE

Review Scope

Pollutants Reviewed		All pollutants		
Years		1990 – 2014		
Code	Name	Reviewed	Not Reviewed	Recommendation Provided
5A	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		x
5C1bii	Hazardous waste incineration	x		x
5C1biii	Clinical waste incineration	x		x
5C1biv	Sewage sludge incineration	x		
5C1bv	Cremation	x		
5C1bvi	Other waste incineration		x	
5C2	Open burning of waste	x		x
5D1	Domestic wastewater handling	x		x
5D2	Industrial wastewater handling		x	
5D3	Other wastewater handling		x	
5E	Other waste		x	

General recommendations on cross-cutting issues

138.   Turkey reports on main pollutants from solid waste disposal, waste incineration and wastewater handling. Methodologies are largely in line with the EMEP/EEA 2013 Guidebook, and basic information is provided in the IIR. However, the submission is still not complete. Some sources and pollutants are not reported, many cells are still left blank. Recommendations and encouragements are listed below to improve completeness and transparency of reporting.

Transparency

139.   The IIR of Turkey is to a certain extent transparent and largely follows the structure of the reporting guidelines. Methodologies and emission factors are explained and traceable. Trends are presented using graphs, but should be further elaborated by including more detailed explanations on activity data fluctuations (especially in case of remarkable trends).

140.   No activity data is included, neither in the NFR tables nor in the IIR. The ERT recommends that Turkey includes this information in its future submissions and elaborates more clearly for which years inter- or extrapolation was necessary.

141.   Turkey gives an overview of waste sub-categories covered as a starting point at the beginning of its sectoral chapter in the IIR. The ERT commends the Party for providing this overview but encourages Turkey to add information on which pollutants are covered in the Turkish inventory and which notation keys are applied, including justifications for their use.

Completeness

142.   The inventory for waste is not complete as not all relevant pollutants and sources (e.g. industrial waste incineration) are covered. The ERT recommends that Turkey reports on all relevant pollutants in future submissions. Blank cells in the NFR should be avoided, and emission values or notation keys used instead.

143.   There are PM10 emissions reported for 5.A, 5.C.1.b.iii and 5.C.2, but no PM2.5 and TSP emissions although default emission factors are available in the EMEP/EEA 2013 Guidebook. In response to a question raised by the ERT, Turkey explained that all pollutants were calculated, but only some were reported, and informed the ERT about its plan to report on them in future submissions. The ERT commends Turkey for that.

144.   The ERT notes that for 5.A. solid waste disposal historical PM10 emissions are reported in the IIR, but not in the NFR tables, and recommends that Turkey includes this emission data in future NFR submissions.

Consistency, including recalculation and time series

145.   Methodologies and emission factors applied are clearly explained in the IIR.

146.   The ERT, however, noticed some discrepancies in reporting, in particular with regard to reporting of historical PM10 emissions from 5.A and reporting on emission factors applied for 5.C.1.b.iii clinical waste incineration (SOx and CO in Table 6-4). The ERT recommends that Turkey implements or improves its sector-specific QA/QC to avoid such discrepancies in the future.

Comparability

147.   Turkey applies methodologies largely in accordance with the EMEP/EEA Guidebook. Default emission factors are applied for most of the categories, except for NH3 from wastewater handling where an emission factor was derived from the UK inventory 2009 that is not considered fully appropriate. Please refer to the relevant section of the review report.

Accuracy and uncertainties

148.   Turkey has not provided an uncertainty analysis for the waste sector, although references to the EMEP/EEA Guidebook are given. The ERT reiterates its encouragement from the 2012 Stage 3 review to make an uncertainty analysis, and to report on that in future submission, especially with regard to national activity data.

Improvement

149.   Turkey has included planned improvements in its sectoral IIR chapter. The ERT commends the Party for adding this information in its category-specific chapters and encourages Turkey to continue reporting on improvement plans and its progress with implementation in future submissions.

Sub-sector Specific Recommendations

Category issue 1: 5A Solid waste disposal – NMVOC, PM$_{10}$

150.   Turkey reports on NMVOC and PM10 emissions from 5.A. In the NFR, NMVOC is reported for the whole time series, whereas PM10 is only reported for the latest year 2014 and historical years are reported as "NA". However, on page 268 in Turkey's IIR a time series of PM10 emissions 1990-2014 is presented in Figure 6.1 and in Table 6-1. In response to a question raised by the ERT, Turkey informed about some problems with the NFR and announced plans to report PM10 emissions for the whole time series in its future NFR submissions.

151.   According to the IIR there are some years missing in the waste statistics, so inter- or extrapolation was necessary. No time series of activity data is provided. To increase transparency of reporting, the ERT recommends that Turkey includes activity data in its future submissions and clearly indicates for which years gaps needed to be filled.

Category issue 2: 5B Biological waste treatment – NH$_3$

152.   Turkey reports "NE" for 5.B.1 Composting, without providing a justification under the respective chapter in the IIR. However, under category 5.E it is explained that there are no composting plants in Turkey. The ERT recommends that the Party includes a chapter on 5.B in the IIR providing this information and to change the notation key for this category to "NO" to improve transparency of reporting. Furthermore, Turkey plans further investigations on this issue, the ERT recommends that the Party verifies the information currently reported under 5.E.

Category issue 3: 5C Waste incineration

153.   According to the IIR, there is one facility incinerating industrial waste. However, emissions are not reported, because activity data is not available for the whole time period (IIR chapter 6.3). In response to a question raised by the ERT, the Party explained that there were some data available but not legally approved and for this reason not used for inventory purposes. The ERT recommends that Turkey clarifies this issue and reports on emissions from this source in future submissions. For years where no data is available extrapolation or surrogate data may be used for gap filling (please refer to Part A, chapter 4 on "Time series consistency" of the EMEP/EEA 2013 Guidebook).

154.   There are PM$_{10}$ emissions reported for 5.C, but no PM2.5 and TSP emissions, although default emission factors are available in the EMEP/EEA 2013 Guidebook. The ERT encourages Turkey to report also on these fractions in its future submissions.

155.   Turkey reports emissions from clinical waste incineration. However, no activity data is provided and the fluctuating trend with the peaks in 2003 and 2008 is not sufficiently explained. The ERT recommends that Turkey elaborates on that in its next submission. Moreover, the ERT commends Turkey for the plan to implement

improvements with regard to currently incomplete activity data and encourages the Party to report on its progress in future submissions.

156. Emissions from small-scale burning show a strongly declining trend (2013-2014: - 93%) that is not explained. The ERT recommends that Turkey elaborates more clearly on the trend and historical fluctuations of activity data in its next IIR.

Category issue 4: 5D Wastewater handling

157. Turkey applies an EF for NH3 emissions from wastewater based on the UK inventory for 2009, calculated by dividing the total UK emissions reported under the former category 6.B by the total UK population. This derived EF is however considerably lower than the default of the EMEP/EEA 2013 Guidebook. One reason for this difference is that the UK emission value was related to the total UK population instead of only to the part of the UK population using latrines. Turkey then applies this EF only to the number of people not connected to a sewage system. As the application of this low EF leads to an underestimation of emissions, the ERT recommends that Turkey reconsiders its methodology and applies an appropriate emission factor, e.g. the default EF of the EMEP/EEA 2013 Guidebook and calculates emissions for the part of the population using latrines.

Category issue 5: 5E Other waste

158. Turkey reports emissions from this category as "NA" with the explanation that currently there are no composting plants. The ERT encourages Turkey to investigate the significance of activities covered under this category according to the EMEP/EEA 2013 Guidebook and to report on that in its next submission.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Energy balance 1990-2014