**UNITED
NATIONS**

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
MOLDOVA

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 – 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 Moldova coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place from 22nd June 2015 to 26th 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 – Kristina Saarinen (Finland), Energy – Stephan Poupa (Austria) and Kristina Juhrich (Germany), Transport – Yvonne Pang (United Kingdom) and Jean-Marc Andre (France), Industry – Juan Luis Ortega (Spain), Solvents – Mirela Poljanac (Croatia), Agriculture – Michael Anderl (European Union) and Jim Webb (United Kingdom), Waste – Intars Cakars (Latvia).

4.   Ole-Kenneth Nielsen (Denmark) served as 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.   The inventory is generally in line with the *EMEP EEA Inventory Guidebook* and the UNECE Reporting Guidelines. The ERT noted that Republic of Moldova had carried out major improvements both in estimating emissions and in documenting the inventory in the IIR. The ERT commends this development and encourages the Republic of Moldova to carry on with the good work.

6.   The ERT commends Moldova for providing a full time series of emissions and an IIR to enable a review of the inventory, and for responding to questions raised by the ERT during the review. These responses enabled the ERT to provide recommendations for the further development of the inventory.

7.   ERT also noted that the methods used for the calculation of emissions were not consistent between the inventory for 2013 and the previous years (1990-2012). Due to the quality of the year 2013 inventory, the ERT based its review on the methodologies used for the years 1990-2012. Recommendations for further improvements of the inventory are provided below.

INVENTORY SUBMISSION

8.   Republic of Moldova submitted NFR tables on 20th February 2015, after the deadline of 15th February. The IIR submitted on 30th December 2014 was used in the review. The submission in 2015 included year 2013 emissions while the whole time series 1990-2012 was submitted in 2014.

9.   The Party has reported emissions for its Protocol base years (1990) and a full time series up to 2013 (the most recent year) for its protocol pollutants in the NFR format.

10.   Moldova has not submitted projections. In response to the question raised by the ERT, Moldova explained because it was not yet a Party to the Gothenburg Protocol and because of resource restrictions, Moldova was currently concentrating on preparing and improving the inventory. The ERT thanks Moldova for this information. The submission by Republic of Moldova did not include LPS or gridded data. To the question raised about the issue Moldova replied that their emissions inventory team was already aware of the changes to reporting gridded emissions and was currently including information on gridded data on agriculture in their 2014 IIR. The ERT recommends that Moldova extends the reporting of gridded data to all sectors by February 2017 at the latest.

11.   The inventory submitted by the Party is of good quality and is in general well documented in the informative inventory report (IIR).

12.   During the review the ERT noticed major differences in several places between the 2014 submission and the 2015 submission. The 2014 submission presented a consistent time series for 1990-2012, while in the most recent submission the 2013 data differed significantly. The 2015 submission did not include an update of the IIR. During the review the ERT was informed that questions related to 2013 in the 2015 submission could not be answered and that Moldova was aware of the quality issues concerning the data reported for 2013. Consequently, the ERT focused its review on the 1990-2012 data reported in 2014. In some cases this resulted in the ERT making reference to the categories as they were defined in the Reporting Guidelines valid for the 2014 submission, e.g. referring to waste as sector 6,

while in the current Reporting Guidelines waste is sector 5. The ERT notes that while the 2014 submission of Moldova was of good quality, the 2015 submission is not. The ERT notes that the work carried out in connection with the 2014 submission is a good starting point to complete the inventory for 2013. The ERT recommends that Moldova builds upon the 2014 submission to report a fully consistent time series in the next submission.

KEY CATEGORIES

13.   Moldova has compiled and presented in its IIR a level Key Category Level Analysis according to the Guidebook methodology for the following pollutants: NOx, CO, NMVOC, SOx, NH_3, TSP, PM_{10}, $PM_{2.5}$ heavy metals and POP compounds. The ERT commends Moldova for carrying out the KCA and for using the results when prioritizing improvements in the inventory.

14.   The results of the KCA are not comparable with the results from the analysis carried out by the CEIP because the CEIP analysis was based on the 2015 submission with 2013 data in NFR 2014 format and the Moldovan analysis on 2012 emissions in NFR09 format.

QUALITY

Transparency

15.   The ERT recognises the level of effort undertaken by the Republic of Moldova in providing an inventory with a significant level of detail, enabling the ERT to undertake a detailed review. The ERT found the inventory to be transparent for the years 1990-2012 and commends Moldova for the comprehensive IIR containing detailed documentation of the methods used in the inventory, and encourages Moldova to carry on with the good work.

16.   During the review the ERT presented a number of questions for further clarifications, and recommends that the Party includes the information provided in its replies to the questions in the IIR.

17.   The ERT also found room for further improvement in the transparency of the IIR as listed below and in the sector chapters:

> (a)   Energy: NFR 1A5 description (para 61), NFR 1A4 separation between mobile and stationary sources (para 51)

> (b)   Transport: notation keys (para 67), separation between 1A3ai(i) and 1A3aii(i) (para 75), separation between 1A3b sources (para 76), separation between 1A4c sources between stationary and mobile (paras 77-79)

> (c)   Industrial processes: additional information (para 89), use of notation keys (para 90)

> (d)   Solvent and product use: report AD (paras 95, 101)

> (e)   Agriculture: additional information (paras 104-106, 117, 119-121, 123), use of notation keys (paras 108-110), allocation (paras 108, 124)

> (f)   Waste: additional information (paras 125,133)

18.   The ERT noted that methods used in calculation of emissions for 2013 were not documented and that they differed from those used for the previous years (1990-2012). The ERT used the documentation for the 2012 inventory as a basis for the review. The ERT recommends that Moldova documents the methods and methodological changes annually in the IIR.

19.   The IIR does not provide information on the use of notation keys in the IIR. In the NFR tables 1990-2012 information on the use of notation keys is provided for industrial processes, solvent and product use sectors. The ERT recommends that Moldova includes tables in the IIRs indicating the reasons for reporting emissions as not estimated (NE) or included elsewhere (IE) for the relevant NFR categories. These tables should be updated annually to indicate the current entries in the NFR table.

20.   Moldova has provided information on emission trends in the IIR. The ERT commends Moldova for providing this information, and encourages the Party to complete the information with a description of driving factors behind the trends, to be able to understand what has caused the changes in the annual emissions. Such information is needed, for instance, to understand changes in fuel consumption and in production volumes.

Completeness

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

22.   The ERT concludes that the inventory submitted by the Republic of Moldova is generally complete in terms of pollutants, sources and years. The ERT commends Moldova for this.

23.   The ERT has noted that the following sources are currently not included in the inventory, and recommends completing the inventory with the missing emissions from these sources:

(a)   Energy: fugitive emissions (NFR 1B), the ERT recommends preferably estimating and reporting emissions, or changing the notation key from NA to NE, and pipeline compressors (1A3e)

(b)   Transport: road transport (1A3bi-iv):TSP and $PM_{2.5}$ and PDCC/F, SO_x and heavy metals from 1A3b; gasoline evaporation (1A3bv): NMVOC; tyre and brake wear (1A3bvi): TSP, PM_{10}, $PM_{2.5}$; and railways (1A3c): SO_x (para 65)

(c)   Solvent and product use: glass and mineral wool production preservation of wood, use of fireworks and shoes (para 102)

(d)   Waste: Municipal waste incineration (para 132)

24.   The inventory is not fully complete regarding the geographical coverage as the region *Administrative Territorial Units on the Left Bank of Nistru river* (ATULBN, Transnistria) has not been included in the inventory since 1994. The ERT notes that not including the region in the inventory may correspond to omitting significant parts of emissions from power plants and manufacturing industries at the very least, and encourages Moldova to find ways to collect data from the region of Transnistria and to explain in the IIR which emission sources are or are not included in the inventory. The ERT welcomes what Moldova has indicated in

the IIR - namely that in the next inventory cycle the aim is to focus on better coverage of the whole territory of the country for the activity data review of the energy and industrial processes sectors. In response to the draft review report, Moldova explained that all available activity data had been considered in the emission inventory.

Consistency, including recalculations and time series

25.   The ERT noted that the methods used in the calculation of emissions were not consistent between the inventory for 2013 and the previous years (1990-2012). The ERT recommends that Moldova uses consistent methodologies over the years to enable a better understanding of the trends and drivers behind the emission levels.

26.   Moldova has reported a recalculated inventory for all pollutants and sources for 1990-2012 in the 2014 submission and provided information on the reasons for the recalculations in the IIR. The ERT commends Moldova for the recalculations which have improved the emission estimates and for providing general justifications for the calculations, and recommends including detailed explanations of the reasons that prompted the recalculations and, for any future recalculations, including also information on the impacts of the recalculations in the IIR.

Comparability

27.   The ERT notes that the inventory of the Party is generally comparable with those of other reporting parties. However, the ERT notes that Moldova uses methodology from the 2009 Guidebook, i.e. the Russian version of June 2010, and that the years 1990-2012 are reported in NFR2009 format. The ERT notes that Moldova has indicated that it would apply GB 2013 methods in the future inventories and recommends that Moldova always uses the most recent Guidebook version, i.e. currently 2013, when available in Russian and that it reports emissions in NFR 2014 for the whole time series. In response to the draft review report, Moldova explained that the recalculation of the whole time series is very demanding in terms of resources and that the resources available are not always sufficient. The ERT acknowledges that maintaining and updating the emission inventories are putting a strain on resources, but that they are nevertheless important for consistent time-series and an accurate assessment of emission trends.

28.   The allocation of source categories generally follows that of the EMEP/UNECE Reporting Guidelines. The ERT noted some misallocations of emissions such as NFR 1A2 subcategories under 1A2a instead of NFR09 1A2fi (para 51), mobile diesel consumption in the NFR 1A4 categories under NFR1A4 stationary sources (para 51). The ERT recommends that Moldova corrects the allocation of sources.

CLRTAP/NECD comparability

29.   Not relevant for the Republic of Moldova.

Accuracy and uncertainties

30.   The ERT notes that it is likely that there is an underestimation of emissions from biomass consumption in the residential sector (para 60) and recommends that Moldova (re-)estimates and reports emissions from these sources or provides an assessment of the significance of the magnitude of emissions.

31.   The ERT found that the methodology used to estimate emissions from aviation may lead to an overestimation of CO emissions (para 75).

32.   Moldova has compiled the inventory using Tier 1 methods for many sources. The ERT notes that Moldova plans to move on to Tier 2 methodology and welcomes this development. The ERT recommends especially that Moldova moves on to the use of higher tier methods for key sources and develops national methodologies where possible, so as to more accurately reflect the actual emissions in the country.

33.   Moldova has carried out an uncertainty analysis and reported level (2012) and trend (1990-2012, 2005-2012) uncertainties for NO_x, SO_x, NH_3, CO, $PM_{2.5}$, PM_{10}, TSP, Pb, Zn and PAHs. The ERT also noted that Moldova indicated quantitative UC analysis as one of the areas for further improvement. The ERT commends Moldova for this and encourages it to carry on with this work.

Verification and quality assurance/quality control approaches

34.   The ERT notes that Moldova has implemented QA/QC procedures for the inventory. The IIR also provides information on general QA/QC procedures. The ERT commends Moldova for providing this information.

35.   Moldova has not carried out an inventory verification procedure, as defined in the EMEP EEA Emission Inventory Guidebook of 2013[2], i.e. using external verification methods and applying independent data. The ERT encourages Moldova to find ways to implement external verification to ensure the accuracy of the inventory.

FOLLOW-UP TO PREVIOUS REVIEWS

36.   The ERT notes the extensive improvements to the reporting of NFR tables and the IIR carried out by the Republic of Moldova in various sections of the inventory since the last review in 2012 and commends Moldova for this achievement.

37.   Moldova has not replied to S1-2 review questions.

AREAS FOR IMPROVEMENTS IDENTIFIED BY MOLDOVA

38.   Moldova did not include a dedicated chapter of the inventory improvement plan in the IIR, but has provided information on some sector-specific improvement needs in the IIR, such as (a) focus on better coverage of the entire territory of the country when activity data is reviewed in the energy and industrial processes sectors, (b) updating AD, (c) collect data on manure management systems, develop country specific N excretion rates, (d) waste sector: quantitative uncertainty analysis, improvement of QA/QC actions, use of the updated EMEP/EEA Emissions Inventory Guidebook 2013, collect AD for clinical waste incineration, move to Tier 2 methods. The ERT commends Moldova for these plans and encourages Moldova to implement them.

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[2] Chapter 6 Inventory management, improvement and QA QC p. 11

PART B: RECOMMENDATIONS FOR IMPROVEMENTS TO THE PARTY

CROSS CUTTING IMPROVEMENTS IDENTIFIED BY THE ERT

39.   The ERT recommends that Moldova:

   (a)   submits an inventory report annually and includes NFR tables and an annually updated IIR

   (b)   uses consistent methodologies over the years

   (c)   completes the documentation of the inventory report according to recommendations for the sector chapters presented in paragraph 17

   (d)   completes the emission estimates by including sources and pollutants listed in paragraph 23

   (e)   checks the use of notation keys and provides explanations for them in the IIR

   (f)   checks the allocation of emissions in the NFR categories

   (g)   provides information on drivers behind the emission trends in the IIR

   (h)   establishes verification methods for the inventory

   (i)   investigates possibilities for completing the inventory by including emissions from Transnistria.

SECTOR-SPECIFIC RECOMMENDATIONS FOR IMPROVEMENTS IDENTIFIED BY ERT

ENERGY

Review Scope

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		All		
Years		1990 – 2012		
1A1a	Public electricity and heat production	X		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		
1A2c	Chemicals	X		
1A2d	Pulp, Paper and Print	X		
1A2e	Food processing, beverages and tobacco	X		
1A2f	Stationary combustion in manufacturing industries and construction: Non-metallic minerals	X		X
1A2gviii	Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR)	X		
1A3ei	Pipeline transport	X		
1A3eii	Other (please specify in the IIR)	X		
1A4ai	Commercial/institutional: Stationary	X		
1A4bi	Residential: Stationary	X		
1A4ci	Agriculture/Forestry/Fishing: Stationary	X		
1A5a	Other stationary (including military)	X		
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		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		
1B2d	Other fugitive emissions from energy production	X		X

General recommendations on cross-cutting issues.

Transparency:

40.   The IIR includes emission factors as well as activity data by fuel group for all years and relevant sources. The IIR also includes sources of emission factors (which is consistent with the 2009 Guidebook). The information provided in the IIR is consistent with the information in the NFR tables. The ERT considers the inventory of Moldova to be quite transparent.

41.   Moldova reports many of the source categories as 'IE'. Emissions from all 1A2 sub-categories are reported together in category 1A2a. The ERT recommends that Moldova includes the total 1A2 emissions under category NFR09 1A2f (NFR14 1A2gviii)

42.   The IIR includes trend descriptions by main categories. However, the emission trend descriptions are limited to the trend in fuel consumption and does not include reasons for the changes in fuel consumptions, e.g. it is not clear what has caused the large decrease in PM emissions from residential plants. The ERT recommends that Moldova also describes the reason for the particularly strong upward/downward trends in fuel consumption.

43.   The ERT notes that category 1A4ci includes rather high levels of liquid fuel consumption, which could refer to diesel oil used for mobile machinery. However, category 1A4cii is reported as 'NA' instead of 'IE'. The ERT encourages Moldova to clarify in the next submission whether fuel use for mobile sources is included under stationary combustion.

Completeness:

44.   The ERT considers the Energy sector 1.A to be complete and comprehensive. The time series for all reviewed pollutants are complete for 1990 to 2012, even for PM, heavy metals and POPs.

45.   The ERT notes that the inventory (statistics data) does not include the *Administrative Territorial Units on the Left Bank of the Nistru river* (ATULBN, Transnistria) in a consistent way for the period since 1994. This could imply an underestimation of emissions, especially from the manufacturing industries and power plants which are situated in the ATUBLN region. The ERT recommends that Moldova continues with its efforts to acquire statistical data on the ATULBN region and includes the data in the emission inventory, where possible.

46.   Moldova uses the notation key 'NA' for the whole sector 1B and the IIR does not provide any information about this sector. The ERT notes that e.g. NMVOC emissions from fuel handling and distribution should be included here and that 'NE' should be reported in this sector. During the review Moldova responded that it was planning to report emissions from sector 1B in future submissions. The ERT welcomes this improvement and recommends that Moldova includes these emissions in the next submission.

47.   Moldova uses 'NE' for NH_3 for all sources of the Energy (stationary combustion) sector except for 1A4bi. However, the ERT assumes that these sources are not a key source of NH_3. 'NE' is also used for all pollutants of 1A3e *pipeline compressors.* It is not clear if pipeline compressors are situated in ATUBLN which could be one of the reasons why relevant emissions are not included in the inventory. The ERT encourages Moldova to estimate emissions for the categories reported as NE.

Consistency including recalculation and time series:

48.   The (Tier1) methods have been applied consistently and therefore the inventory is - besides completeness problems – consistent for the whole time series 1990-2012.

49.   Moldova has reported 2013 emissions in a different format (based on NFR14) showing large discrepancies when compared to the 1990-2012 time series. The IIR provides information about 1990-2012 time series only. During the review Moldova could not provide any explanation about the methodologies and data sources which were used for the 2013 estimates.

50.   Moldova has recalculated its inventory for all sectors and years. The IIR only provides general information about improvements made but does not provide any recalculation values. According to the Stage 1 review results, Moldova has revised its data significantly for the whole time series. The ERT recommends that Moldova, in future submissions, provides information on the recalculation at a sectoral level.

Comparability:

51.   Moldova used the Tier 1 method emission factors of the GB 2009 for all energy sector subcategories and pollutants. The ERT notes that sector details do not conform to the Reporting Guidelines because emissions from 1A2 subcategories are included in *1A2a iron and steel* instead of the NFR09 category 1A2f *other manufacturing industries*. Furthermore, diesel consumption from mobile machinery (agriculture, industry) is included in the categories of stationary consumption (use of non-conforming Tier 1 emission factors). The ERT recommends that Moldova uses higher tier methods for key categories and reports emissions from mobile machinery in the appropriate NFR categories.

Accuracy and uncertainties:

52.   Moldova has provided quantitative uncertainty estimates in its IIR. The ERT commends Moldova for carrying out an uncertainty analysis.

53.   The IIR includes a chapter about QA/QC, which includes general information about QA/QC procedures. It is not clear which of the procedures have been applied. The ERT recommends that Moldova clarifies which of the QA/QC procedures listed in the IIR have been applied at the sectoral level.

54.   The IIR does not state if an independent expert review has been performed. The ERT encourages Moldova to perform such a review in order to guarantee the accuracy and quality of its emissions estimates.

Improvement:

55.   In the last inventory cycle Moldova was planning to improve and review data on emissions from the Energy sector, with a focus on better coverage of the whole territory of the country (IIR 2014 chapter 3.1.8). The ERT strongly encourages Moldova to implement such a review in the next inventory cycle because the data reported for 2013 indicated major problems in time series consistency and reporting.

56.   During the review Moldova provided information about ongoing improvements (UNDP project "Energy and Biomass Moldova") in the area of biomass consumption to the ERT. The

ERT recommends that Moldova considers the outcome of these improvements in its future inventories, if applicable.

Sub-sector Specific Recommendations.

1A – stationary sources - SO$_X$

57.   The ERT notes that SO$_X$ emissions are calculated with default emission factors from the 2009 version of the Guidebook. The ERT recommends that Moldova investigates the sulphur content of the solid and liquid fuels used within the country and that country specific emission factors are derived as this would increase the accuracy of SO$_X$ emissions and require a comparably low effort.

1A1a Public electricity and heat production - NO$_x$, SO$_x$, PM$_{2.5}$, PM$_{10}$

58.   The ERT notes that NO$_x$ (-81%), SO$_x$ (-93%) and PM$_{2.5}$ (-86%) emissions decreased between 1990 and 1994, which correlates to a decrease in the consumption of solid and liquid fuels. Moldova informed the ERT that from the year 1994 onwards, only fuel consumption in the 'Right Bank' region had been considered in the energy balance. The ERT strongly recommends that Moldova incorporates the energy data of the 'Left bank' region in the estimates. The ERT also recommends that Moldova includes a more specific source description about the power generation sector (e.g. capacity, closure of plants, new coal plants) in order to make the energy consumption trends more transparent. The ERT further recommends that Moldova starts to collect data (combustion technologies, flue gas measurements) from large combustion plants in order to apply higher tier methods for this key source.

1A1 Energy Industries – all pollutants

59.   The ERT notes that the IIR includes a statement which suggests that the selected default emission factors consider specific measures and technologies of Moldova's power plants (IIR 2014, page 77). The ERT recommends that Moldova edits or removes this statement as the default emissions factors from the Guidebook do not consider country specific circumstances.

1A4bi Residential stationary plants - biomass

60.   The ERT notes that biomass consumption of the residential sector makes up about 11 % of the total in 2012. The ERT also notes that biomass consumption could be underestimated as Moldova has a large rural area. Moldova informed the ERT that the problem of incomplete statistical data of biomass had been raised in the country. The ERT recommends that Moldova investigates if more complete biomass statistics are available, which may be used for the emission estimates.

1A5a – other stationary sources

61.   The ERT notes that the IIR does not provide a source description of category 1A5a. The ERT recommends that Moldova investigates the fuel use indicated in category 1A5a and that it includes a description of the source category 1A5 in the IIR.

TRANSPORT

Review Scope

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed	All			
Years	1990 – 2012			
1A2fii (*or 1A2gvii in NFR14*)	Mobile Combustion in manufacturing industries and construction (please specify in the IIR)	X		X
1A3ai(i)	International aviation LTO (civil)	X		X
1A3ai(ii)	International aviation cruise (civil)		X	
1A3aii(i)	Domestic aviation LTO (civil)	X		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	X		
1A3dii	National navigation (shipping)	X		
1A4aii	Commercial/institutional: Mobile	X		
1A4bii	Residential: Household and gardening (mobile)	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	

General recommendations on cross-cutting issues.

Transparency:

62.   The Republic of Moldova did not submit an IIR in the previous Stage 3 inventory review, but the Party has now produced an IIR to accompany the 1990-2012 emissions data submission. This includes information on the methodologies used to estimate emissions from mobile sources.   The ERT commends this improvement and encourages Moldova to continue producing an IIR for future submissions.

63.   In the previous Stage 3 inventory review, the ERT noted that the Party did not complete the NFR "additional info" sheet to explain the notation keys in the NFR tables. The "additional info" is now included with the 1990-2012 emissions data submission, with an

explanation provided for the use of notation keys for Industrial processes and product use. The ERT commends this improvement made for the other sectors, and encourages Moldova to provide this information for the mobile sources sector in future submissions.

64.   The ERT commends the Party for providing tables of emission factors and activity data used in the IIR, along with references to the source of data. During the review, the ERT asked Moldova to clarify which version of the 2009 EMEP/EEA Emission Inventory Guidebook had been used and Moldova confirmed that Tier 1 emission factors had been used from the June 2010 edition (Russian version). The ERT encourages Moldova to include references to the version of the Guidebook in future IIRs for transparency purposes

Completeness:

65.   The ERT considers the transport sector to be nearly complete. However, the ERT notes that the Republic of Moldova has not estimated emissions for the following sources and pollutants:

(a)   TSP and $PM_{2.5}$ emissions for 1A3bi-iv. During the review, the Party explained that the 2009 Guidebook did not specify the size of particulate matter for its Tier 1 emission factors and thus it was assumed to be PM_{10}. However, the Guidebook states that all PM mass emission factors for vehicle exhaust emissions reported in the Guidebook's road transport chapter refer to $PM_{2.5}$. So, the Party can report the same values for TSP, PM_{10} and $PM_{2.5}$ for 1A3bi-iv in future submissions.

(b)   NMVOC emissions from 1A3bv (gasoline evaporation). During the review, the Party explained that emissions were not estimated for this source because specialised software was required. However, the ERT informed the Party that Tier 1 EFs are available in the Guidebook to estimate evaporative emissions of NMVOCs, and therefore the use of specialised software is not required.

(c)   TSP, PM_{10} and $PM_{2.5}$ emissions from 1A3bvi (tyre and brake wear) and 1A3bvii (road abrasion). The ERT has informed the Party that there are emission factors available in the latest version (2013) of the EMEP/EEA Emission Inventory Guidebook to estimate PM emissions from these sources.

(d)   Emissions of dioxins, SO_x and other heavy metals from 1A3b. The ERT has informed the Party that there are emission factors and methodology available in the latest version (2013) of the EMEP/EEA Emission Inventory Guidebook to estimate emissions of these pollutants for road transport sector.

(e) SO_x emissions from 1A3c. During the review, Moldova explained that the Tier 1 SO_x EF was not available in the Guidebook to allow the Party to make emission estimates. However, the ERT explained to the Party that SO_x emissions from 1A3c can be estimated based on the sulphur content of the fuel and that the Guidebook has provides a methodology for this.

66.   The ERT recommends that the Party reports emissions for the above sources and pollutants in their future submissions.

Consistency including recalculation and time series:

67.   The ERT noted an inconsistent use of notation keys by the Republic of Moldova for the following sectors in the NFR emission reporting tables:

(a)   **1A3a**: The IIR states that emissions from 1A3aii(i) Civil Aviation are included within 1A3ai(i) International aviation, as international flights represent the majority of flights within the territory of the Republic of Moldova. However, the ERT notes that emissions have been reported under 1A3aii(i) and that the notation key 'IE' has been used for 1A3ai(i) in the NFR tables. During the review, Moldova confirmed that the statement in the IIR was correct, and that the NFR tables should be amended in accordance with the statement made in the IIR.

(b)   **1A3d:** The IIR states that 1A3di(ii) international inland waterways are considered under 1A3dii National navigation (shipping). However, the ERT notes that emissions have been reported under 1A3di(ii) International inland waterways while the notation key 'NE' has been used for 1A3dii National navigation (shipping). During the review, Moldova confirmed that the statement in the IIR was correct and that emissions should be assigned to the 1A3dii National navigation (Shipping) source category, while the notation key 'IE' should be used for 1A3di(ii) International inland waterways in the NFR tables.

(c)   **1A3d:** Fuel consumption data for navigation were not available for 2011 and 2012; however, the notation key 'IE' was used for the year 2012 while the correct notation key 'NE' was used for year 2011. During the review, Moldova confirmed that 'NE' should be used for both years.

(d)   **1A3d:** Inconsistent notation keys are used for PAHs across the time series ('IE' was used for all years, except for 2004 and 2011 where 'NE' was used). During the review, Moldova confirmed that 'NE' should be used throughout the time series as Tier 1 emission factors for PAHs are not available in the Guidebook for 1A3d.

(e)   Moldova uses the notation key 'NA' (Not Applicable) for 1A4aii, 1A4bii, 1A4cii and 1A4ciii in the NFR tables. However, this is inconsistent with the statements made in the IIR. For instance, the IIR states that emissions from 1A4aii (Commercial/institutional: Mobile) are included in the emissions under 1A4ai (Commercial / institutional: Stationary). The ERT recommends that Moldova uses the appropriate notation keys (e.g. NE where emissions are "Not Estimated" and IE where emissions are "Included Elsewhere") in future submissions.

68.   The ERT recommends that Moldova addresses the above issues and uses correct notation keys throughout the time series in future submissions.

Comparability:

69.   Moldova uses methods that are consistent with those proposed in the Guidebook to estimate emissions of pollutants from the Transport sector, and the emissions are calculated on the basis of fuels sold.

70.   Moldova uses Tier 1 emission factors for gasoline fuelled aircraft from the 2009 version of the Guidebook to estimate LTO emissions from both domestic and international flights. However, aviation gasoline is mainly used for domestic aviation and during the review, Moldova also stated that more than 90 % of all flights in Moldova are international flights. Therefore, the ERT recommends that the Party uses Tier 1 emission factors for jet kerosene for estimating LTO emissions from international flights. Moreover, it appears that the Tier 1 CO EF for aviation gasoline in the Guidebook is unreasonably high. The use of this factor has led to unusually high (and most likely an overestimation of) CO emissions from 1A3a for Moldova when comparing them to other reporting countries. The ERT recommends that the Party reviews the CO emissions from this sector for the next inventory.

Accuracy and uncertainties:

71.   Moldova has performed a Tier 1 uncertainty analysis by NFR sector (including 1A3a, 1A3b, 1A3c and 1A3d) in accordance with the methodology outlined in the 2009 EMEP/EEA Emission Inventory Guidebook. The ERT commends Moldova for presenting the adopted uncertainty values and the result tables transparently in the Annex of IIR.

Improvement:

72.   The ERT commends the Party for the various improvements carried out since the last Stage 3 review.

73.   Moldova has indicated, in the IIR, that it is planning a review of the activity data used in the Energy (NFR1) sector for the next inventory, with the focus on better coverage of the whole territory of Moldova. The ERT encourages Moldova to carry out this improvement plan.

Sub-sector Specific Recommendations.

1A3 Transport – All Pollutants

74.   The ERT notes that Moldova is currently using Tier 1 emission factors from the 2009 EMEP/EEA Emission Inventory Guidebook (June 2010 edition, Russian version) to estimate emissions of pollutants for all mobile sources. The ERT recommends that Moldova uses the latest version (2013) of the EMEP/EEA Emission Inventory Guidebook which contains the most up-to-date emission factors for the relevant sources.

1A3ai(i) and 1A3aii(i) International and domestic aviation LTO – CO

75.   Emissions from 1A3ai(i) are reported under 1A3aii(i) in the NFR tables and 1A3aii(i) was a key source of CO emissions in 2012. As mentioned in the 'comparability' section above, Moldova does not currently use representative EFs for international aviation (LTO) and the CO emissions from 1A3aii(i) are unusually high when comparing them to other reporting countries. The ERT recommends that the Party uses Tier 1 emission factors for jet

kerosene for estimating LTO emissions from international flights and investigates whether 1A3ai(i) and 1A3aii(i) remain a key source of CO.

1.A.3.b Road transport – All Pollutants

76.   Emissions from 1A3bii, 1Abiii, 1Abiv are currently included in 1A3bi. The ERT recommends that Moldova reports emissions separately for 1A3bi-iv and used Tier 2 or higher tier methodology to estimate emissions for 1A3b, as it is a key source of NO_x, CO and PM_{10}.

1A4cii Agriculture off-road mobile machinery – All Pollutants

77.   The IIR indicates that all data within 1A4c Agriculture/Forestry/Fishing have been allocated to 1A4cii (Agriculture/Forestry/Fishing: Off-road vehicles and other machinery) as this is the major source of emissions. However, the ERT notes that no emission estimates have been reported under 1A4cii in the NFR tables and that the notation key 'NA' has been used. During the review, the Party explained that fuel consumption in agriculture is split into two groups: mobile combustion (diesel, gasoline) and stationary combustion (coal, fuel oil, gas). However, the majority of the fuel is consumed during mobile combustion using diesel fuel (of which 10 % is associated with on-road use and the remaining 90 % with off-road use). Moldova also explained that to avoid double counting, emissions from off-road machinery had been reported under NFR 1A4ci. However, the ERT notes that Moldova is currently using stationary combustion EFs for liquid fuels to estimate emissions from diesel agriculture off-road machinery. This will lead to an underestimation of emissions of air quality pollutants. Moreover, as the Party is able to separate the volumes of fuels into mobile combustion (diesel, gasoline) and stationary combustion (coal, fuel oil, gas), it should be possible to report emissions under 1A4ci and 1A4cii respectively, without the risk of double counting. Therefore, the ERT recommends that Moldova uses the relevant EFs for off-road machinery to estimate emissions from this source.

1A4aii Commercial and institutional mobile machinery – All Pollutants

78.   The ERT notes that emissions from this source are currently included in 1.A.4.a.i (commercial and institutional – stationary combustion). The IIR explains that the activity data source does not distinguish between different source types (stationary or mobile). The ERT encourages Moldova to make separate estimates for the 1A4aii sub-sector to avoid a potential underestimation of the emissions from the 1A4a sector, in particular NO_x and PM.

1A4bii Household and gardening mobile machinery – All Pollutants

79.   Emissions from this source are currently included in 1.A.4.b.i (residential – stationary combustion). The IIR explains that the activity data source does not distinguish between different source types (stationary or mobile). The ERT encourages Moldova to make separate estimates for the 1A4bii sub-sector to avoid a potential underestimation of the emissions from the 1A4b sector, in particular NO_x and PM.

INDUSTRIAL PROCESSES

Review Scope

Pollutants Reviewed		All		
Years		1990 – 2012		
NFR Code	**CRF_NFR Name**	**Reviewed**	**Not Reviewed**	**Recommendation Provided**
2A1	Cement production	X		X
2A2	Lime production	X		
2A3	Glass production	X		
2A5a	Quarrying and mining of minerals other than coal	X		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		X
2B1	Ammonia production	X		
2B2	Nitric acid production	X		
2B3	Adipic acid production	X		
2B5	Carbide production	X		
2B6	Titanium dioxide production	X		
2B7	Soda ash production	X		
2B10a	Chemical industry: Other (please specify in the IIR)	X		
2B10b	Storage, handling and transport of chemical products (please specify in the IIR)	X		
2C1	Iron and steel production	X		
2C2	Ferroalloys production	X		
2C3	Aluminium production	X		
2C4	Magnesium production	X		
2C5	Lead production	X		
2C6	Zinc production	X		
2C7a	Copper production	X		
2C7b	Nickel production	X		
2C7c	Other metal production (please specify in the IIR)	X		
2C7d	Storage, handling and transport of metal products (please specify in the IIR)	X		
2H1	Pulp and paper industry	X		
2H2	Food and beverages industry	X		
2H3	Other industrial processes (please specify in the IIR)	X		
2I	Wood processing	X		
2J	Production of POPs	X		
2K	Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	X		
2L	Other production, consumption, storage, transportation or handling of bulk products (please specify in the IIR)	X		

General recommendations on cross-cutting issues

Transparency:

80.   The IIR is generally transparent and comprehensive with a good level of detail in the methodology descriptions. The previous Stage 3 review of Moldova was held in 2012. The ERT of the 2012 Stage 3 review did not have an Informative Inventory Report from Moldova. Therefore, the Party did not provide information on the methodologies used to estimate the emissions. The ERT commends Moldova for providing the IIR for 2014's submission.

81.   Moldova provides in the IIR a useful overview of the sector, with a brief description for each NFR category and also information on the pollutants emitted by category. Additionally, Moldova provides a detailed explanation of the trends for the pollutants and methodological information at category level. Besides, the IIR includes a section on the source category description and another one to describe the methodology by sub-category. This chapter contains a high level of detail on activity data and the emission factors used. The ERT commends Moldova for the structure of this chapter in the IIR.

Completeness:

82.   The ERT notes that Moldova covers the main sources of emissions identified by the EMEP/EEA Guidebook for Industrial Processes. Moldova uses basic approaches to identify and estimate sources of emissions, and the ERT considers the Industrial Processes sector to be complete and comprehensive with good levels of detail in the methodology descriptions. The ERT encourages Moldova to enhance the completeness of the inventory by estimating the sources of emissions that the country has identified as "NE".

Consistency including recalculation and time series:

83.   The ERT notes that Moldova provides an overview of the recalculations made in section 4.1.7 and 8 of the IIR. The ERT encourages Moldova to provide more information on recalculations at category level.

84.   The activity data, emissions and implied emission factors of the 2014 submission of Moldova were consistent throughout the time series. Therefore, the ERT has not identified any major problems with the time series consistency.

Comparability:

85.   The ERT notes that Moldova has used the methods described in the 2009 EMEP/EEA Guidebook for this submission and considers that the inventory is comparable with those of other Parties and commends Moldova for this. The ERT encourages Moldova to use the latest version of the EMEP/EEA Guidebook.

Accuracy and uncertainties:

86.   Moldova includes a quantitative uncertainty assessment for the main pollutants, particulate matter, CO, Pb, Zn and PAHs for the key categories of the inventory. The ERT commends Moldova for doing so.

87.   In section 1.9, Moldova describes the general QA/QC procedures applied to the inventory. However, other sectors of the inventory include a source-specific section on QA/QC and verification. Chapter 4.1.6 of the 2014 IIR provides a very general description of

the QA/QC for the Industrial Processes sector. The ERT encourages Moldova to incorporate further QA/QC procedures in the Industrial Processes sector.

Improvement:

88.   The ERT notes that Moldova does not provide information on sector-specific improvements for the industrial processes sector in the IIR. The ERT encourages Moldova to include information on planned improvements by sector in future editions of the IIR.

Sector-specific Recommendations.

2A1 Cement production – PM

89.   The ERT has found that Moldova uses default emission factors for an unabated production process for the years 1990-2010, while applying abatement efficiencies as provided by the EMEP EEA Guidebook for the years since 2010. The ERT commends Moldova for estimating the emission factor time evolution, but encourages Moldova to include in the IIR information on the reduction efficiency applied and the reasons for applying abatement efficiencies since 2010. In response to the draft review report, Moldova informed the ERT that new abatement equipment (filter bags) had been installed since 2010. The ERT recommends that this information is included in the IIR.

2A5 Asphalt roofing – all.

90.   The ERT found that Moldova uses three different notation keys in this category: NA, NO and NE. The ERT encourages Moldova to check the pollutants labelled as NO, and ascertain whether these emissions occur but are not estimated (NE) or the emissions do not occur (NA). If the activity does not take place in Moldova, the entire sector shall be labelled as NO.

2A6 Road paving with asphalt – all.

91.   The ERT found an increase in activity data from 108.7 kt in 2011 to 1696.6 in 2012. Moldova responded that these data, as stipulated in the IIR, had been provided by the Ministry of Transport, through an official letter. Moldova stated that they had taken note of this aspect and would include the verification of the data in the next planned improvements. The ERT commends the plan of Moldova to verify the data again and encourages Moldova to include, if appropriate, information on the findings in the next IIR.

SOLVENTS

Review Scope

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
	Pollutants Reviewed	All		
	Years	1990 – 2012		
2D3a	Domestic solvent use including fungicides	X		
2D3b	Road paving with asphalt	X		
2D3c	Asphalt roofing	X		
2D3d	Coating applications	X		
2D3e	Degreasing	X		
2D3f	Dry cleaning	X		
2D3g	Chemical products	X		X
2D3h	Printing	X		
2D3i	Other solvent use (please specify in the IIR)	X		X
2G	Other product use (please specify in the IIR)	X		X

General recommendations on cross-cutting issues

Transparency:

92.   The Republic of Moldova has provided a detailed and generally transparent emission inventory for the period 1990 - 2012. Estimates are provided at a detailed level for all solvent sectors. Moldova's methodology, data source references and assumptions and emission factors for the Solvent sector are considered to be transparent and well described in the IIR by the ERT. Still, the ERT encourages Moldova to include in the IIR the reasons for dips and jumps in the pollutant emission trends, e.g. the jump in NMVOC emissions from paint application, degreasing and dry cleaning in 2005, to facilitate transparency.

93.   The ERT notes that the emission factors used for a few source categories within the scope of the Solvent sector are country-specific and that they are properly included and referenced in the IIR.

Completeness:

94.   The ERT considers the Solvent sector to be complete and comprehensive with good levels of detail in the methodology descriptions. The ERT also considers that all key categories where NMVOC emissions are occurring is covered in Moldova's inventory.

95.   The ERT notes that only one submitted NFR table for 2012 contains information on the activity data for the Solvent sector. The ERT encourages Moldova to include the activity information in the NFR tables for all activities in the Solvent sector.

Consistency including recalculation and time series:

96.   Moldova has recalculated its inventory for one of the solvent categories in the year 2012 for the whole covered trend 1990 - 2012. However, the IIR does not include all the necessary explanations regarding the performed recalculation. The ERT encourages Moldova to provide a more detailed explanation of the recalculations, including the rationale for them, the impact on the sector and the implication for trends in the Solvent sector in its IIR.

Comparability:

97.   Moldova uses the general equation for its emission estimations, where the activity data for a specific source category is multiplied by the emission factor for a specific pollutant. The emission factors used are either country-specific or the default ones from the EMEP/EEA 2009 Guidebook and they are comparable with other Parties.

Accuracy and uncertainties:

98.   The ERT notes that Moldova has undertaken great efforts to implement an uncertainty analysis for the CLRTAP inventory. According to the IIR the uncertainties for the solvent sectors were calculated for the 2012 and 2005 (base year) with the Tier 1 method according to the EMEP/EEA 2009 Guidebook. The ERT commends Moldova for providing an uncertainty analysis.

99.   The Republic of Moldova describes general and Solvent sector-specific QA/QC procedures in the IIR on a very detailed level. The ERT considers these procedures appropriate and consistent with good practice and commends Moldova for that.

Improvement:

100.   The ERT commends Moldova for the improvements to the Solvent sector. The ERT notes Moldova's intention to improve the Solvent sector. The ERT encourages Moldova to implement planned improvements by updating the AD used to estimate NMVOC emissions from the 'Solvents and other Product Use' sector and including them through a further breakdown into categories.

Sector-specific Recommendations.

3.C (NFR 2009), 2.D.3.g (NFR 2013) Chemical industry – NMVOC

101.   Moldova has indicated, in their IIR, that for the NMVOC emission calculation for the source category 3.C the following activities have been included: polyurethane foam processing, polystyrene foam processing, rubber processing, pharmaceutical products manufacturing, paints manufacturing, inks manufacturing, glues manufacturing, leather tanning, other (tyre production, manufacture of shoes). However, in the IIR there is no trend in activity data for inks manufacturing and glues manufacturing. The ERT encourages Moldova to continue improving the inventory by providing missing activity data and including them in the next IIR. In response to the draft review report, Moldova informed the ERT that ink and glue manufacturing do not occur in Moldova, and that this would be reflected in the next IIR.

Category issue 2: 3.D.3 (NFR 2009), 2.D.3.i, 2.G (NFR 2014) Other solvent use – All pollutants

102.   The ERT has found that in Moldova's emission inventory emissions are missing in source category 3.D.3 for the following activities: glass wool and mineral wool enduction, the preservation of wood with organic solvent borne preservatives and the creosote preservative type, use of fireworks, use of shoes. The ERT encourages Moldova to consider the activity data and methods available from the 2013 EMEP/EEA Guidebook and to include them in the next submission.

AGRICULTURE

Review Scope:

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed	All			
Years	1990 – 2012			
3B1a	Dairy cattle	X		X
3B1b	Non-dairy cattle	X		X
3B2	Sheep	X		
3B3	Swine	X		
3B4a	Buffalo	X		X
3B4d	Goats	X		
3B4e	Horses	X		
3B4f	Mules and asses	X		
3B4gi	Laying hens	X		
3B4gii	Broilers	X		
3B4giii	Turkeys	X		
3B4giv	Other poultry	X		
3B4h	Other animals (please specify in IIR)	X		
3Da1	Inorganic N fertilisers (includes also urea application)	X		X
3Da2a	Animal manure applied to soils	X		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		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		X
3Dd	Off-farm storage, handling and transport of bulk agricultural products	X		X
3De	Cultivated crops	X		
3Df	Use of pesticides	X		
3F	Field burning of agricultural residues	X		
3I	Agriculture other (please specify in the IIR)	X		X
11A	Volcanoes		X	
11B	Forest fires		X	

General recommendations on cross-cutting issues

Transparency:

103.   Moldova reports estimates of NO$_x$, NMVOC, NH$_3$, PM$_{2.5}$ and PM$_{10}$ for the majority of the sub-sectors in the Agriculture sector. For field burning, estimates of HMs and POPs are also provided. Following the encouragements of the previous review report, information on activity data is included in the IIR and NFR (submission 2014). However, for the 2015 submission neither an IIR nor a complete NFR was provided.

104.   The ERT commends Moldova for the improved IIR 2014 but encourages Moldova to further improve transparency by providing a detailed description for activity data trends and the data sources used.

105.   There is no background information on how activity data time series were produced when using different data sets from different sources. There is only little information on the quality and characteristics of these input data, e.g. if they are based on annual census, surveys, administration data etc. The ERT encourages Moldova to provide more information regarding the quality of activity data and how the data were adopted for inventory use. In response to the draft review report, Moldova provided further information, the ERT recommends that Moldova includes this this in the next IIR.

106.   The sectoral trends chapter of the IIR includes several graphs and descriptions of these graphs, but there is only little information on the reasons behind the trends. The ERT encourages Moldova to streamline this chapter by focusing on the major trends and to provide the relevant background information that allows a proper interpretation.

107.   To facilitate the review, the ERT encourages Moldova to increase transparency by following the recommended structure of the sectoral chapter beginning with a brief description of major changes in estimation methodologies, a presentation of activity data statistics, an explanation of the methods used to calculate key categories and other sources, an assessment of uncertainties and planned improvements.

Completeness:

108.   The ERT commends Moldova for providing a very complete agriculture inventory for 1990-2012. For NH_3 all relevant sources are included in the inventory. Moldova uses NA for buffaloes - for both emissions and AD. This notation key is not correct and should be changed to NO, NE or IE, depending on the situation in Moldova. For field burning Moldova reports emissions for almost all pollutants. Moldova does not estimate PM emissions from off-farm storage and the handling and transport of bulk agricultural products. The ERT encourages Moldova to use NE instead of NA as notation key. In the category farm-level agricultural operations including the storage, handling and transport of agricultural products, Moldova reports emissions of $PM_{2.5}$, PM_{10} and NMVOC. The ERT encourages Moldova to review and reallocate NMVOC emissions in line with the source category definitions of the NFR.

109.   Following the assessment of completeness provided in the IIR 2014, Moldova reports NO under the NFR sector 4G Agriculture other. However, in the NFR Table the notation key NA is used for all pollutants. PM emissions from category 4D1a Synthetic N fertilisers are shown as not estimated, but in the NFR Table emissions for PM_{10} and $PM_{2.5}$ are reported. The ERT encourages Moldova to implement QC procedures to assure consistent reporting in the IIR and NFR.

110.   Emissions from N excretion on pasture range and paddock are reported as NA. Moldova calculates emissions using Tier 1 methodology and therefore emissions are included in the sector manure management. The ERT encourages Moldova to use the notation key IE instead of NA.

Consistency including recalculation and time series:

111. Moldova has used a consistent method (Tier 1) to calculate a time series from 1990-2012. Moldova has revised all emissions provided in the previous submissions and supplemented estimates for NMVOC and PM. The ERT commends Moldova for this improvement in completeness and time series consistency. However, the IIR does not include all the necessary explanations. The ERT encourages Moldova to provide more detailed explanations of the recalculations, including the rationale for them, the impact on the sector and the implication for trends in the Agriculture sector in its IIR.

Accuracy and uncertainties:

112. Moldova prepared an uncertainty analysis for theAagriculture sector on the basis of the recommended error ranges of emission factors provided in the EMEP/EEA Emission Inventory Guidebook of 2009, chapter 1.10 Uncertainties. The ERT commends Moldova for estimating uncertainties for the Agriculture sector.

113. Sector-specific procedures are described in the IIR, chapter 1.9.2. Special QA / QC procedures by module. The ERT encourages Moldova to implement specific OA/QC procedures to improve the consistency of reporting in the IIR and NFR (see para 109)

Improvement:

114. The ERT commends Moldova for the improvements to the inventory provided for submission 2014. The ERT encourages Moldova to revise emissions in order to implement the methodologies provided in the EMEP/EEA Emission Inventory Guidebook of 2013 as announced in the IIR, chapter 6.1.8 (source-specific planned improvements).

Sector-specific Recommendations.

4B Manure management

115. In the NFR for 2013 notation keys were used for all pollutants for the following animal categories, although estimates were provided in submission 2014 (time series 1990-2012): goats (IE), mules and asses (NO), broilers (IE), turkey (IE), other poultry (IE), Other animals (NE). For non-dairy cattle and horses no IEFs could be generated as no AD is reported for 2013. NH_3 IEFs for dairy cattle show a sharp decrease from 2012 to 2013 (from 28.91 to 20.14), swine (from 7.99 to 6.50), laying hens (from 0.48 to 0.36). The 2013 data for particulate matter are incomplete, and the IEFs were not reproducible by the ERT. Moldova explained that questions regarding the year 2013 could not be answered due to problems with the external consultant. Thus, the ERT decided to focus the review on the IIR 2014 and the NFR Tables 1990-2012.

116. The number of non-dairy cattle sharply decreased from 1990-2012 (by a factor of 10) whereas the number of dairy cattle decreased only by 63%. The consequence is that the number of non-dairy cattle reported for the years from 1995 onwards is much lower than the dairy cattle number. The number of non-dairy cattle reported for the years since 2000 is not even half the number of dairy cattle. In response to a question raised by the ERT during the review, Moldova explained that droughts, lack of an appropriate quantity of pastures and the high poverty rate in rural areas, which forces farmers to take care only of dairy cattle, are the reasons for that development. As a consequence, not enough young cattle is available for the replacement of dairy cattle in Moldova. The ERT encourages Moldova to improve the description of AD trends, especially when trends are conspicuous, i.e. by including the information provided to the ERT during the review. Additionally, the ERT encourages

Moldova to increase transparency by providing non-dairy cattle numbers on the level of the sub-categories in the IIR.

117.   In the IIR, p. 170, several data providers are listed, but there is no information on how the different data sets were combined and how consistency is achieved. Some data gaps are mentioned, but no further information is given on which years and which sources are used for gap filling. In one of its answers to the ERT Moldova explained that the National Bureau of Statistics (NBS) collects primary data in the livestock sector using the Statistical Annual Report No. 24-agr (Animal Breeding Sector), as well as the number of livestock and poultry in all household categories as of 1st January of the respective year, which is then processed and summarised per country. The data are then included in Yearbooks and published on the NBS website. Data from the statistical yearbook of ATULBD are added to the data provided by NBS in order to have data for the whole territory of Moldova. The ERT encourages Moldova to describe more clearly in the IIR which data sources have been used and how these data were processed for the preparation of a consistent time series. Background information on the quality and origin of statistical data should be given (e.g. if data are based on annual livestock accounting, random samples or complete counts, administration data etc.).

118.   Animal numbers have to represent the average annual population. Seasonal births or slaughters may cause the population size to expand or contract at different times of the year. Especially for growing populations more evaluation needs to be done as they are alive for only part of a complete year. The ERT encourages Moldova to further investigate completeness and accuracy, especially for young and growing animal populations and to fully document the results of the evaluation in the next IIR.

119.   The IIR, table 6.2, presents animal numbers for liquid systems, solid systems and grazing. The relevant information on animal waste management system distribution (AWMS) for the years from 1990 – 2010 was taken from the climate change office database (IIR, p.170). For 2011 and 2012 trend extrapolation has been applied. However, for an assessment additional documentation is needed (e.g. data based on a specific survey, official statistics, administration data, expert judgement, modelling). The ERT encourages Moldova to provide this additional information in its next IIR.

120.   Following the IIR, p.174, in the manure management of cattle and swine the usage of liquid systems show a significant decrease whereas the proportions of solid systems (cattle and swine) and grazing (cattle) show an increase for the years from 1990 to 2012. These trends deviate from the trends usually observed in the Agriculture sector and therefore the ERT recommends that Moldova checks the data and provides further explanations in the next submission. In response to the draft review report, Moldova provided further information. The ERT recommends that Moldova includes this information in the next IIR.

121.   In the sector "manure management" Moldova has applied the Tier 1 methodologies provided in the EEA/EMEP Inventory Guidebook of 2009 for the majority of pollutants. For the calculation of NMVOC and TSP emissions and the estimation of $PM_{2.5}$ and PM_{10} emissions of sheep and goats no default EFs are available in the 2009 version of the Guidebook. Thus, EFs from the 2013 EEA/EMEP Guidebook have been used. To improve consistency and the accuracy of the estimates, the ERT encourages Moldova to use the Tier 1 EFs provided in the most recent version of the Guidebook (EEA/EMEP 2013) for the estimation of all pollutants in all animal categories. The ERT welcomes Moldova's intention to

reduce uncertainties by starting investigations of the data needs for the implementation of Tier 2 methods for key sources.

122. In the IIR, p. 169, it is stated that TSP EFs from the EMEP/EEA Guidebook of 2013 have been used. During the review the ERT calculated TSP IEFs for 2012 and compared them with the default EFs. The results show that the values (kg TSP/head) for dairy cows (EF=0.96 vs. 1.38), other cattle (EF=0.52 vs. 0.59), swine (EF=1,60 vs. 1.53 for sows and 0.75 for fat. pigs) laying hens (EF=0.112 vs. 0.119), other poultry (EF=0.185 vs. 0.069 to 0.52, depending on the type of poultry) differ from the values listed in table 3.3 of the EMEP/EEA Guidebook of 2013. There was no answer when the ERT raised a question pertaining to this matter. One reason for the lower IEFs could be the application of Tier 1 EFs only for the housed animals. As Tier 1 always refers to the total average animal number this approach causes an underestimation. The ERT encourages Moldova to revise its approach and to improve its QC procedures by comparing the IEFs with the default EFs. In response to the draft review report, Moldova informed the ERT that the Tier 2 approach of the 2013 Guidebook had been applied and that hence Table 3.11 Default Tier 2 emission factors for particle emissions from animal husbandry had been used and that by mistake this had not been reflected in the IIR. The ERT recommends that Moldova revises its description in the next IIR.

4D1a Synthetic N fertilisers

123. Moldova reports emissions of $PM_{2.5}$ and PM_{10} under category 4D1a but there is no information given in the IIR. The ERT encourages Moldova to examine its estimates and to document the results of the examination in its next IIR.

4D2a Farm-level agricultural operations including storage, handling and transport of agricultural products

124. Moldova reports emissions of $PM_{2.5}$, PM_{10} and NMVOC under sector 4D2a Farm-level agricultural operations including the storage, handling and transport of agricultural products. According to the IIR, PM emissions are calculated using default EFs from the 2009 Guidebook, chapter 4.D, Table 3-1. NMVOC emissions have been estimated using EFs from the 2013 Guidebook, chapter 3.D, Table 3-1. The ERT encourages Moldova to allocate NMVOC emissions to the correct NFR emission category 4D1a Synthetic N fertilisers.

WASTE

Review Scope:

NFR Code	CRF_NFR Name	Reviewed	Not Reviewed	Recommendation Provided
Pollutants Reviewed		All		
Years		1990 – 2012		
5B1	Biological treatment of waste - Solid waste disposal on land	X		X
5B2	Biological treatment of waste - Anaerobic digestion at biogas facilities	X		X
5C1a	Municipal waste incineration	X		X
5C1bi	Industrial waste incineration	X		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		
5D2	Industrial wastewater handling	X		X
5D3	Other wastewater handling	X		X
5E	Other waste (please specify in IIR)	X		

General recommendations on cross-cutting issues.

Transparency:

125. The emission calculations of Moldova are partly transparent. The ERT encourages Moldova to provide more detailed explanations for activity data including the sources of the activity data.

Completeness:

126. The ERT encourages Moldova to include available sub-sectors for emissions calculations.

Consistency, including recalculation and time series:

127. The emissions of pollutants from the Waste sector have been recalculated for the 1990 through 2012 time series, in particular due to the use of an updated set of activity data, including the data from the left bank of the Nistru river. The ERT welcomes Moldova's recalculations.

Accuracy and uncertainties:

128. A general uncertainty assessment has been performed for the waste sector. The ERT encourages Moldova to provide the underlying assumptions on which the uncertainties are based.

Sector-specific Recommendations.

6A Solid waste disposal on land

129.   Moldova provides detailed explanations for its activity data estimations for solid waste disposal on land. The ERT encourages the Party to estimate the uncertainty of this data source.

6B Wastewater handling

130.   Moldova provides NH_3 emissions from latrines. The ERT recommends that Moldova provides the data source or the methodology used to distinguish between the part of the population that is connected to urban wastewater collection systems and the part that is not.

131.   Moldova calculates NMVOC emissions from wastewater handling. As Moldova uses the old NFR format no distinction is made between industrial and domestic wastewater amounts. The ERT recommends that Moldova, in the next submission, calculates NMVOC emissions separately for domestic and industrial wastewater and reports them in the latest NFR format.

6C Waste incineration – All subcategories – All pollutants

132.   Moldova does not provide emissions from waste incineration. Moldova reports NO for all subcategories. The ERT recommends that Moldova, in its next submission, includes a description of waste handling practices including information to substantiate that no kind of waste incineration is occurring in Moldova. In response to the draft review report, Moldova provided further information. The ERT recommends that Moldova includes this information in the next IIR.

Category issue 6E -Other waste

133.   This sub-sector could be consistent with Moldova's emission estimations about accidental fires in Moldova. The ERT encourages Moldova to obtain data from the entire country and to calculate emissions.

5B Biological treatment of waste

134.   Due to missing information in the 2015 submission, the ERT having to rely on the 2014 submission could not review category 5B (new NFR). The ERT recommends that Moldova describes, in its next IIR, whether activities of composting and anaerobic digestion occur in Moldova and if so, that it reports the relevant emissions and activity data.

LIST OF ADDITIONAL MATERIALS PROVIDED BY THE COUNTRY DURING THE REVIEW

1. Response to preliminary question raised prior to the review
2. Response to questions raised during the review
3. Moldova Stage 2 S&A report 2015
4. Moldova Stage 1 report 2015
5. Moldova IIR 2014