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Istituto Superiore per la Protezione
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RAPPORTI

# Quality Assurance/Quality Control Plan for the Italian Emission Inventory. Year 2010


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# Quality Assurance/Quality Control Plan for the Italian Emission Inventory. Year 2010

Rapporti 121/2010

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April, 2010

# National Air Emission Inventory: General overview

## I. Objective

This document summarizes the specific Quality Assurance (QA) Quality Control (QC) activities and different verification procedures which are applied thoroughly the current inventory compilation as part of the estimation process.
In addition to a description of the current activities applied and the documentation, archiving and reporting processes, a specific section illustrates the main findings and recommendations of the latest review process together with the response and actions undertaken by the inventory team.
Further improvements and planned QA activities identified during the preparation of the National Inventory and National Inventory Report 2010 are also presented.
A summary of previous QA/QC procedures which helped to understand the improvement of the inventory over the years concludes the general part of the report.

Sector specific QA/QC and verification documentation are explained in the relevant chapters.

## II. QA/QC activities and verification

Quality control checks and quality assurance procedures together with some verification activities are applied both to the national inventory as a whole and at sectoral level.
The QA/QC procedures are those described in the manual 'Quality Assurance/Quality Control Plan for the Italian Inventory' (APAT, 2006). Verification activities are also part of the overall QA/QC program. These activities have the ultimate objective of increasing the confidence and reliability of the inventory estimates.

Feedbacks for the Italian inventory derive from communication of data to different institutions and/or at local level. For instance, the communication of the inventory to the European Community result in a pre-check of the GHG values before the submission to the UNFCCC and relevant inconsistencies may be highlighted.

Results and suggestions from expert peer reviews of the national inventory within the UNFCCC process can provide valuable feedback on areas where the inventories can be improved.

An official independent review and public review of the Italian inventory are not implemented yet. Nevertheless, the process of review is carried out and has feedbacks once the inventory, the inventory related publications and the national inventory reports are posted on the website, specifically

http://www.isprambiente.it, and from the communication of data to different institutions and/or at local level.
The inventory is presented every year to a Technical Committee on Emissions (CTE), coordinated by the Ministry for the Environment, Land and Sea, where all the relevant Ministries and local authorities are represented. Emission figures and results are shared and discussed.

Expert peer reviews of the national inventory also occur annually within the UNFCCC process; results and suggestions can provide valuable feedback on areas where the inventory should be improved. Specifically, the Italian GHG inventory was subjected to in-country reviews by the UNFCC Secretariat in September 2005 and in June 2007; results and recommendations are available at http://unfccc.int/resource/docs/2005/arr/ita.pdf (UNFCCC, 2005) and at http://unfccc.int/resource/docs/2007/arr/ita.pdf (UNFCCC, 2007). In 2009 and 2010, the Italian inventory was subjected to centralised review; results are reported at http://unfccc.int/resource/docs/2009/arr/ita.pdf (UNFCCC, 2009) and http://unfccc.int/resource/docs/2009/arr/ita.pdf (UNFCCC, 2010).

The responses and actions to the review process are described in details in section IV.
The only official review, apart from reviews from the UNFCCC, was performed by Ecofys, in 2000, in order to verify of the effectiveness of policies and measures undertaken by Italy to reduce greenhouse gas emissions to the levels established by the Kyoto Protocol. In this framework, an independent review and checks on emission levels were carried out as well as controls on the transparency and consistency of methodological approaches (Ecofys, 2001). More recently, VITO, Öko-Institut and the Institute for European Environmental Policy, for DG Environment, undertook a review on the methodologies and EU Member States best practices used for GHG projections to indentify possible ways to improve GHG projections and ensure consistency across the EU. The results were presented in 2008 at the Workshop 'Assessing and improving methodologies for GHG projections'. Further analyses were presented in the Workshop on 'Quantification of the effects on greenhouse gas emissions of policies and measures'.

The preparation of environmental reports, where data are needed at different aggregation levels or refer to different contexts, such as environmental and economic accountings, is also a verification for emission trends. At national level, for instance, emission time series are reported in the Environmental Data Yearbook published by the Institute. Emission data are also published by the Ministry of Environment in the Reports on the State of the Environment, the National Communications as well as in the Demonstrable Progress report. Moreover, figures are communicated to the National Institute of Statistics to be published in the relevant Environmental Statistics Yearbooks as well as used in the framework of the EUROSTAT NAMEA accounting.

Comparisons between national activity data and data from international databases are usually carried out in order to find out the main differences and an explanation to

them. Emission intensity indicators among countries (e.g. emissions per capita, industrial emissions per unit of added value, transport emissions per car, emissions from power generation per kWh of electricity produced, emissions from dairy ruminants per tonne of milk produced) can also be useful to provide a preliminary check and verification of the order of magnitude of the emissions. This is carried out at European and international level by considering the annual reports compiled by the EC and the UNFCCC as well as related documentation available from international databases and outcome of relevant workshops.
Additional comparisons between emission estimates from industrial sectors and those published by the industry itself in the Environmental reports are carried out annually in order to assess the quality and the uncertainty of the estimates.
The quality of the inventory has also improved by the organization and participation in sector specific workshops. Follow-up processes are also set up in the framework of the WGI under the EC Monitoring Mechanism, which address to the improvement of different inventory sectors. In 2008, a workshop was held, on the implications of the implementation of the 2006 IPCC Guidelines for national GHG inventories. Previous workshops addressed: the use of European emissions trading scheme data in the national greenhouse gas inventories, management of uncertainty in national inventories, methodologies to estimate emissions from the agriculture and LULUCF sectors, involving the Joint Research Centre, from the waste sector, involving the European Topic Center on Resource and Waste Management, as well as from international bunkers, involving the International Energy Agency and EUROCONTROL. Presentations and documentation of the workshops are available on the website at the address: http://air-climate.eionet.europa.eu/meetings/past_html.
A national conference on the Italian emission inventory was organized by APAT in October 2006. Methodologies used to carry out national figures and results of time series from 1990 to 2004 were presented detailing explanations for each sector. More than one hundred participants from national and local authorities, Ministries, Industry, Universities and Research organizations attended the two days meeting.
In 2007, in the framework of the National Conference on Climate Change, an event previous to the Conference presented the National GHG emission Inventory and specifically the time series of emission estimates from 1990 to 2005; besides a specific session of the Conference was dedicated to the National and local Inventories focusing on methodological issues and policies and measures to be adopted to reduce GHG emissions. In 2010, the time series 1990-2008 will be presented in a specific national Kyoto Protocol event.

Other general improvements regarded the establishment of a National Inventory System and in general the implementation of QA/QC activities.
A specific procedure undertaken for improving the inventory regards the establishment of national expert panels (specifically, in the sectors of road transport, land use change and forestry and energy) which involve, on a voluntary basis, different institutions, local agencies and industrial associations cooperating for improving activity data and emission factors accuracy.

In addition to these expert panels, ISPRA participates in technical working groups within the National Statistical System (Sistan). These groups, named *Circoli di qualità*, coordinated by the National Institute of Statistics, are constituted by both producers and users of statistical information with the aim of improving and monitoring statistical information in specific sectors such as transport, industry, agriculture, forest and fishing. These activities should improve the quality and details of basic data, as well as enable a more organized and timely communication.

QC procedures are also undertaken on the calculations of uncertainties in order to confirm the correctness of the estimates and that there is sufficient documentation to duplicate the analysis.
The assumptions, which uncertainty estimations are based, on are documented for each category. Figures to draw up uncertainty analysis are checked with the relevant analyst experts and literature references and they are proved to be consistent with the IPCC Good Practice Guidance (IPCC, 2000).
Quantitative estimates of the uncertainties for the Italian GHG inventory are calculated using a Tier 1 approach as defined in the IPCC Good Practice Guidance (IPCC, 2000), which provides a calculation based on the error propagation equations. In addition, a Tier 2 approach, corresponding to the application of Monte Carlo analysis, has been applied to specific categories of the inventory but the results show that, with the information available at present, applying methods higher than the Tier 1 does not make a significant difference in figures. The results of the study, 'Evaluating uncertainty in the Italian GHG inventory', were presented at a EU workshop on Uncertainties in Greenhouse Gas Inventories, held in Finland in September 2005, and they are also available on website at the address: http://air-climate.eionet.europa.eu/docs/meetings/050905_EU_GHG_Uncert_WS/meeting050905.html.
A further research on uncertainty, specifically on the comparison of different methodologies to evaluate emissions uncertainty, was also carried out (Romano et al., 2004).

## III. Documentation, archiving and reporting

All the material and documents used for the inventory preparation are stored at the Institute.
All information relating to the planning, preparation, and management of inventory activities are documented and archived. The archive is organised so that any skilled analyst could obtain relevant data sources and spreadsheets, reproduce the inventory and review all decisions about assumptions and methodologies undertaken. A master documentation catalogue is generated for each inventory year and it is possible to track changes in data and methodologies over time. Specifically, the documentation includes:

- electronic copies of each of the draft and final inventory report, electronic copies of the draft and final CRF tables;

- electronic copies of all the final, linked source category spreadsheets for the inventory estimates (including all spreadsheets that feed the emission spreadsheets);
- results of the reviews and, in general, all documentation related to the corresponding inventory year submission.

After each reporting cycle, all database files, spreadsheets and electronic documents are archived as 'read-only' mode.

A 'reference' database is also compiled every year to increase the transparency of the inventory. This database consists of a number of excel files that references all documentation used during the inventory compilation, for each sector and submission year, the link to electronically available documents and the place where they are stored as well as internal documentation on QA/QC procedures.

## IV. Review process recommendations

In the following table, the list of recommendations from the latest review process related to cross-cutting and general issues, as reported in the document FCCC/ARR/2009/ITA, which should be considered for the 2010 submission, is presented; responses to each subject are also included.

| Review report para | Subject | Description | Response |
|---|---|---|---|
| 9 | General – Overview- Completeness | The ERT encourages Italy to explore the possibility of reporting CRF table 7 for all years of the time series. | Planned for the next submissions |
| 10 | General – Overview - Completeness | The ERT recommends that Italy improve the completeness of its inventory by the next annual submission, especially with regard to reporting on those categories in which emissions are known to occur in the country and for which methodologies to estimate emissions are available in the Revised 1996 IPCC Guidelines and/or the IPCC good practice guidance.<br>The ERT also recommends that the Party, when reporting data on emissions for the first time for a given category, ensure that these data are provided for the entire inventory time series, and that the rationale for the choice of methods, emission factors (EFs) and other parameters is clearly explained in the NIR. | GHG emissions from Biomass fuel consumption in pulp and paper industry have been estimated; $N_2O$ emissions from the use of explosives have been estimated and reported under category 3 D other uses of $N_2O$. The relevant information about methodologies used has been included and reported in the NIR. |
| 11 | General - Main findings - | However, the ERT found that Italy could improve the transparency of its | Additional information has been reported in the NIR with |

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| | Transparency | inventory submission, by providing information in the NIR to explain and justify its use of EFs (e.g. for ferroalloys) and other parameters (e.g. oxidation factors for liquid fuels used in the energy sector (see para. 56 below)) from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as the 2006 IPCC Guidelines). The ERT also found statements in the NIR clarifying that the Party had used data obtained from the European Union emissions trading scheme (EU ETS) to estimate emissions from a number of categories in the industrial processes sector and to improve EFs and verify activity data (AD) in the energy sector; however, the ERT concluded that the Party has not provided sufficient information in its NIR, particularly for the energy sector, to allow the ERT to verify:<br>(a) Whether these data have been prepared and incorporated into the inventory submission in line with the IPCC good practice guidance;<br>(b) Whether these data have been subjected to quality assessment (QA) and/or verification and how this relates to corresponding QA and/or verification procedures set out in the IPCC good practice guidance;<br>(c) How time-series consistency has been ensured when using these data in the inventory, and the effect of the use of these data on the trend in emissions. | the aim to clarify the issues. |
| 16 | General - Main findings – National System | The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1. However, the ERT identified a potential problem that will need to be addressed by the Party in the preparation for its 2010 annual submission. This potential problem relates to the cut in the funding of the national system and the effect of this cut on the capacity of the Party's national registry for forest carbon sinks to identify areas of land and land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1, | At the end of 2009 and in the beginning of 2010 fundings have been made available from the Ministry of Environment to start with some of the activities planned in the national registry for forest carbon sinks to improve the knowledge and the estimate of emissions and removals. A protocol between the Ministry of Environment and the Ministry of Agriculture is under approval and it will permit to start with the new 2012 forest inventory. |

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| | | and to provide information, including estimates of emissions/removals, on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (see paras. 82, 83 and 84 below). | |
| 18 | General - Main findings - Comparability | The ERT encourages Italy to explore the possibility of structuring its reporting, in its next annual submission, following the annotated outline of the NIR, and the guidance contained therein, that can be found on the UNFCCC website | The NIR has been modified in the way so as to follow the suggested structure. |
| 25 | General - Inventory planning – National System | The ERT strongly recommends that Italy ensure, by whatever available means, that its national system has the capacity and required resources to plan, prepare and manage an inventory for LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol (hereinafter referred to as the KP-LULUCF inventory), noting that this reporting is mandatory under Article 7, paragraph 1, of the Kyoto Protocol, commencing with the annual submission due on 15 April 2010. | See comment above on paragraph 16. |
| 27 | General - Inventory preparation – Key categories - Transparency | Detailed information on how the Party uses its key category analysis to prioritize improvements to its inventory submission has not been provided in the NIR. The ERT reiterates the recommendation of the previous ERT that Italy include this information in its NIR. | The key categories analysis with the TIER2, using uncertainties, is already used to prioritize and plan the inventory improvements. Additional information has been included in the NIR to clarify the issue. |
| 29 | General - Inventory preparation - Accuracy | The ERT encourages Italy to explore the possibility of increasing the coverage of categories of its tier 2 uncertainty analyses and to report thereon in its next annual submission. | Activities have been planned for the 2009 but postponed to 2010 for lack of time. |
| 30 | General - Inventory preparation - Transparency | The Party uses the uncertainty analysis to prioritize improvements to its inventory, especially with regard to those categories for which high uncertainties in AD, EFs or other parameters are observed (e.g. categories in the agriculture and LULUCF sectors and for fluorinated gases). However, the ERT recommends that Italy include a more detailed description of its use of the uncertainty analysis as a driver for prioritizing inventory improvements, in the relevant chapter of its NIR. | See the comment above on paragraph 27. |

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| 35 | General - Inventory preparation - QA/QC | The ERT recommends that Italy explore the possibility of extending its use of EU ETS data for verification purposes to the energy sector. | EU- ETS data are already used for verification purposes also in the energy sector. Additional information has been added in the NIR to better clarify the use of these data. |
| 36 | General - Inventory preparation - Transparency | However, the ERT also identified areas for further improvement with regard to the transparency of the inventory, including the improvement of the presentation of some information tables in the NIR that are currently very condensed and difficult to read (e.g. table 1.7 Sources and sinks not estimated in the 2007 inventory, table 1.8 Sources and sinks reported elsewhere in the 2007 inventory, table 9.1 Explanations of the main recalculations in the 2009 submission, table 9.2 Comparison between the 2008 and 2009 submitted time series by gas and sector, and table A1.3 Results of the uncertainty analysis excluding LULUCF (tier 1)). The ERT recommends that Italy explore the possibility of improving its presentation of data and information in these tables for its next annual submission. | The tables have been changed to improve the transparency of the NIR |
| 38 | General - Follow-up – QA/QC | However, the ERT also found that a number of the source/sink-related recommendations made in the previous review report had not been addressed by the Party in its 2009 annual submission, and these are discussed in the relevant sector chapters of this report (see paras. 53 –QC energy- and 86 – uncertainty lulucf). | Quality control in the energy sector has been improved introducing further checks of the information reported in the NIR. The uncertainty of LULUCF estimates will not change in a relevant way until the work planned in the sector finishes |
| 40 | General - Further improvements – By the ERT | The ERT identifies the following cross-cutting issues for improvement:<br>(a) The improvement of the completeness of the inventory, specifically with regard to the reporting on all activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, for all carbon pools and GHGs (see paras. 82, 83 and 84 below);<br>(b) The provision of information in the NIR on the use of EU ETS data, as outlined in paragraph 11 above;<br>(c) The improvement of transparency, | See comments above |

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| | as detailed in paragraph 36 above;<br>(d) The improved documentation of the uncertainty analysis, at least by improving the readability of the underlying information (see para. 36 above). |

## V. Planned improvements and QA activities

The main institutional and legal arrangements required under the Kyoto Protocol have been finalized. Some problems still regard the implementation of national registry for forest carbon sinks to identify areas of land and land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1, and to provide information, including estimates of emissions/removals, on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. However, actions to solve the question have been undertaken by the institutions involved; at the end of 2009 and in the beginning of 2010 funding has been available from the Ministry of Environment to start with some of the activities planned in the national registry for forest carbon sinks to improve the knowledge and the estimate of emissions and removals. A protocol between the Ministry of Environment and the Ministry of Agriculture is under approval and it will permit to start with the new 2012 forest inventory.

General priority will concern the improvement of the transparency in the NIR.
Other sector specific improvements are identified in the relevant chapters and specified in the 2010 QA/QC plan; they can be summarized in the following.

For the energy and industrial sectors, the database where information collected in the framework of different directives, Large Combustion Plant, E-PRTR and Emissions Trading, is under finalisation. The database has helped highlighting the main discrepancies in information and detecting potential errors leading to a better use of these data in the national inventory.
For the agriculture and waste sectors, improvements will be related to the availability of new information on emission factors, activity data as well as parameters necessary to carry out the estimates; specifically, improvements are expected for the review of nitrous oxide emission factors in the agricultural soil emissions and availability of information on waste composition and other parameters following the entering into force of the European landfill directive.
For the LULUCF, activities planned in the framework of the National Registry for Forest Carbon Sinks should improve the quality and details of basic data, allowing the upgrade of the used model to obtain more accurate estimates of carbon emissions and removals.
Additional studies will regard the comparison between local inventories and national inventory and exchange of information with the 'local inventories' national expert

group. Researches are carried out also in the context of the European Commission initiative 'Covenant of Mayors' which is a commitment by signatory towns and cities to go beyond the objectives of EU energy policy in terms of reduction in CO2 emissions, i.e 20% by 2020.

Further analyses will concern the collection of statistical data and information to estimate uncertainty in specific sectors by implementing the Tier 2 approach of the IPCC Good Practice Guidance.

## VI. Major QA/QC activities over the past years

- *Energy Balance Verification.* A task force made up of energy and inventory experts (Ministry of Production Activities, ENEA and APAT) established to examine differences in basic data between the CRF and the joint EUROSTAT/IEA/UNECE questionnaire submissions and to improve the details of the National Energy Balance finalised its study and reported the results in the document "Energy data harmonization for $CO_2$ emission calculations: the Italian case" (ENEA/MAP/APAT, 2004).
- *Carbon Emission Factors Review.* A sampling and measurement campaign was carried out jointly with the Stazione Sperimentale Combustibili in order to check the $CO_2$ emission factors used for emission estimation in the energy sector, specifically the road transport and residential and commercial sector. Representative samples of Italian fuels, specifically gasoline, diesel oil and LPG, were collected and analysed from September 2000 - August 2001. Measurements were compared with default $CO_2$ emission factors proposed by the IPCC in the 1996 Revised Guidelines and those proposed by the EEA and used in COPERT III methodology. Values of national emission factors resulted higher than the default ones for gasoline and LPG, while those of diesel were lower. Emission factors have been substituted for the years 2000 onwards. The study and the results are described in detail in the APAT report (Contaldi, Ilacqua, 2003).
- *Road Transport Emissions Review.* The Italian Expert Panel on Transport, which comprises experts from Research Institutes, Universities, Industrial Associations, Local Authorities, Ministries and Public Authorities, continues its work on the improvement and assessment of emission estimations from road transport. There has been a considerable improvement on the details of basic data to be used within the COPERT model, both in terms of availability and timeliness. Studies of the expert panel group as well as presentations held in different meetings can be found on the website www.inventaria.sinanet.apat.it/ept.
- *F-gases Review.* A review with industrial associations and the electrical company ENEL was undertaken in order to improve the quality of estimates by implementing the use of the Tier2 methodology. $SF_6$ estimates improved with the cooperation of the national electrical company ENEL and the main electrical associations. Specifically, for PFC emissions from aluminium production, the estimates were carried out jointly with the only national producer. The Tier 1

method was applied for the time series from 1990-1999, whereas from 2000, the Tier 2 method has been followed using national site specific values. A revision has also concerned HFC emissions on account of major information on the leakages made available by the European Association of Responsible Use of HFCs in Fire Fighting.

- *MeditAIRaneo Project.* A three years project involving the Inventory Reference Centres of the European Mediterranean Countries (Italy, Spain, France, Greece, Portugal) started at the end of the year 2000. The aim was to examine in details emissions that are specific and/or typical of the Mediterranean Countries. Four different studies on air emissions from vegetation, agriculture, solvent use and urban road transport in Mediterranean areas were funded by APAT. Common objectives are analysis of methodologies and emission factors used by Mediterranean countries for estimating emissions, individuation of Mediterranean peculiarities, in comparison with other European countries, such as climate, technologies, industrial management, identification of methodological points which need in-depth examination and uncertainty assessment. An Italian case study has been developed for each of the four projects. In 2006, all the projects were concluded and the results have been used in the national inventory to improve country-specific emission factors.
- *Emissions Trading Scheme*. Analyses of sectoral industrial data from the Italian Emission Trading Scheme database are used to develop country-specific emission factors and check activity data levels.
- *European Pollutant Emission Register (EPER).* Data from the Italian Pollutant Emission Register from some industrial sectors are used in the inventory compilation or as a check with the estimates carried out at national level. In particular, this regards the production of non-ferrous metals, chemical productions, cement and lime productions and the production of iron and steel.
- *Database of industrial emissions.* The databases of industrial emissions and basic information from the European Directives on the Emission Trading Scheme, Large Combustion Plant and EPER-E-PRTR Registry, are examined jointly and compared in order to check all the relevant information included.
- *Local inventories.* A study on the top-down approach to the preparation of local inventories was conducted and Italian emissions for different local areas were derived for the years 1990, 1995, 2000 and 2005. The results were checked out by regional and local environmental agencies and authorities in order to find out the main weak points and contribute with information available to characterise the local environment, this contributing as well as a feedback to the improvement of the national inventory. Final estimates and the detailed methodologies followed for each SNAP sector to carry out emission figures are published in technical reports (Liburdi et al., 2004; ISPRA, 2009).

# QA/QC Energy
# 2009 activities and future improvements

Prepared by: Riccardo De Lauretis

April, 2010

# National Air Emission Inventory: Energy

## I. Objective

The improvements carried out during the preparation of the 2010 national inventory submission for the energy sector and those expected for the next future are summarised in the following.

## II. Review process recommendations

In the following table, the list of recommendations from the latest review process related to the energy sector, as reported in the document FCCC/ARR/2009/ITA, which should be considered for the 2010 submission, is presented; responses to each subject are also included.
Further improvements and planned QA activities identified during the preparation of the National Inventory and National Inventory Report 2010 are also presented.

| Review report para | Subject | Description | Response |
|---|---|---|---|
| 46 | Energy - Sector overview - Transparency | The ERT recommends that Italy document more explicitly category-specific QA/QC procedures for non-mobile energy categories, consistent with the UNFCCC reporting guidelines. | The energy chapter has been updated including a more detailed explanation of methodologies, the use of EU ETS data, QA/QC activities, recalculations and planned improvements especially for non-mobile energy sources |
| 47 | Energy - Sector overview - Transparency | In response to questions raised by the ERT during the review, the Party explained that EU ETS data are used to improve EFs and verify AD for the energy sector. The ERT recommends that this information be included in the Party's next annual submission, along with the information referred to in paragraph 11 (b) above. | See comment above on paragraph 46 |
| 48 | Energy - Sector overview - Transparency | The ERT encourages the Party to include in its NIR planned improvements specific to all categories in the energy sector, including non-mobile categories. If there are no planned improvements then this should also be stated. | See comment above on paragraph 46 |
| 52 | Energy – Feedstocks and non-energy use of fuel - | The ERT noted from CRF table 1.A(d) that a percentage value (100 per cent) had been reported by the Party for the fraction of carbon stored, whereas this | Percentage values have been changed, from 100 to 1. More detailed information has been included in the NIR to better |

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| | Comparability | should be a fraction value (1.0). Also, the carbon EF should be expressed in t C/TJ, whereas Italy has reported its values in kt C/TJ. In addition, the ERT concluded that the fraction of carbon stored reported by Italy for naphta was high when compared to other Parties. The ERT recommends that the Party, in its next annual submission, provide an explanation as to why this value is higher than the values of most other reporting Parties and describe how the fraction of carbon stored is estimated. | explain the methodology to estimate the carbon stored in petrochemical sector including the calculation of carbon stored for naphta |
| 53 | Energy - Stationary combustion: solid fuels – $CO_2$ – Accuracy/Transparency/QC | The ERT recommends that Italy implement its planned improvements to the statistical data on coal and its estimation of the moisture content of the coal. The ERT also recommends that Italy explore the possibility of improving the transparency of the underlying data for this category by reporting its coal imports by source. In addition, the ERT reiterates the recommendation made in the previous review report that Italy implements improved QC procedures in order to reduce transcription errors in the data for this category. | The NIR has been updated to take into account these remarks |
| 55 and 57 | Energy – Navigation and civil aviation: liquid fuels – $CO_2$ - Transparency | The ERT recommends that Italy improve the transparency of its recalculations for this categories (navigation and aviation) by providing, in future submissions, information on the impact of each recalculation (i.e. separate the effects of the recalculations on each mode of transport) for all GHGs, and information on how time-series consistency is ensured. | The NIR has been updated to take into account these remarks |
| 56 | Energy - Civil aviation: liquid fuels – $CO_2$ - Transparency | The ERT recommends that the Party, in its next annual submission, clearly document its justification for using an oxidation factor from the 2006 IPCC Guidelines, and also provide an explanation of the difference between the oxidation factors used in the sectoral and reference approaches. The ERT also recommends that Italy explore the possibility of implementing category-specific QA/QC procedures that could identify such discrepancies in the future. | The NIR has been updated to take into account these remarks |

## III. Planned improvements and QA activities

The revision of the Energy chapter of the NIR has been completed; further improvements will regard the transparency of the reporting if needed.
Documentation collected in the framework of the different European Directives, and Regulations (EPER/E-PRTR, Large Combustion plants and the Emissions Trading scheme) is being completely integrated in a unique database, with the aim to verify emissions and activity data reported for the same year under different reporting obligations and identify possible improvements in emission estimations.
Agreements have been established with ISTAT for aviation and maritime data provision which should allow a yearly availability of basic data and the application of more advanced Tiers for the estimation of these sectors.
Off-road basic activity data are planned to be checked and updated especially concerning technological information. The project is waiting for being funded.

# QA/QC Industrial Processes
# 2009 activities and future improvements

Prepared by: Andrea Gagna, Barbara Gonella, Ernesto Taurino

April, 2010

# National Air Emission Inventory: Industrial Processes

## I. Objective

The improvements carried out during the preparation of the 2010 national inventory submission for the industrial processes sector and those expected for the next future are summarised in the following.

## II. Review process recommendations

In the following table, the list of recommendations from the latest review process related to the industrial processes sector, as reported in the document FCCC/ARR/2009/ITA, and which should be considered for the 2010 submission is presented; responses to each subject are also included.
Further improvements and planned QA activities identified during the preparation of the National Inventory and National Inventory Report 2010 are also presented.

| Review report para | Subject | Description | Response |
|---|---|---|---|
| 62 | Industrial processes - Cement production – CO2 - Transparency | The ERT noted that Italy had reported how data from industry were verified, but that the Party had not provided information in the NIR on the outcome of this verification. The ERT recommends that Italy provide improved information on the verification of these data in its next annual submission. | Additional information has been provided in the NIR. |
| 63 | Industrial processes - Adipic acid production – N2O - Transparency | Italy has improved the transparency of the information in its NIR on the method and data used to estimate N2O emissions from adipic acid production, particularly with regard to the use (operating time) of the abatement technology. The ERT recommends that Italy further improve transparency by including more information in its NIR on the efficiency of this abatement technology and an explanation of how this information is used, along with information on the use of the abatement technology and the default N2O generation factor used to derive the EF for this category. The ERT noted that Italy provided much of this information during the review in response to questions of the ERT; | Additional information has been provided in the NIR. |

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|---|---|---|---|
| | | however, the ERT calculated the post-control emission rates using this information and it was found to be inconsistent with the value reported by Italy. This issue remains unresolved. | |
| 64 | Industrial processes - Aluminium production – PFCs - Transparency | For this category, emissions were estimated using a variant of the tier 1 methodology for 1990-1999 and a tier 2 methodology for 2000-2006. …<br>… The ERT found that Italy did not provide in the NIR rationale for the use of two different approaches; however, in response to questions raised by the ERT during the review, Italy referred the ERT to a finding contained in document FCCC/ARR/2006/ITA which stated that a recalculation was not possible due to plant closures and upgrading of technology. The ERT recommends that Italy explore whether historical operating data (anode effect minutes and/or overvoltages) are available to extend the use of the tier 2 methodology to estimate emissions for the whole time series for smelters that remain in operation (these data were tracked by most smelters during the 1990s). If this is not feasible, the ERT recommends that Italy enhance the transparency of its inventory by adding more discussion as to why the current approach to estimating these emissions is conservative, including a comparison between the IPCC default EFs and the EFs used by Italy for 1990. …<br>… The ERT further recommends that Italy explain in more detail in the NIR how the reporting company (Alcoa) estimated its PFC emissions (i.e. using technology-specific IPCC slope factors and facility-specific anode effect minutes) and why these emission estimates were higher for 2003 than for other recent years (i.e. because Alcoa used conservative assumptions to estimate the emissions for a three-month period for which no data were available). | Additional information has been provided in the NIR. |
| 65 | Industrial processes - Substitutes of ozone | The ERT recommends that Italy revise table 2(II).F to provide a more detailed breakdown of the AD and EFs for this category, and that the Party clarify that | Activities have been planned for the next years. Notes under Table 2(II).F have been revised according to the remark. |

| | | | |
|---|---|---|---|
| | depleting substances – HFCs - Transparency | emissions from equipment disposal are included with the emissions during the products' life. | |
| 66 | Industrial processes - Electrical equipment – SF6 - Transparency | The method used to estimate recent emissions from electrical power systems has been indicated to be a tier 3c method (country-level mass-balance) in the Party's NIR; however, in response to questions raised by the ERT, Italy clarified that the tier 3c method was used only for medium voltage electrical equipment. Annual recharges were used to estimate emissions from electrical power systems. The ERT encourages Italy to clarify this in its NIR, including information on which IPCC method the Party's method corresponds to. | Additional information has been provided in the NIR. |
| 67 | Industrial processes - Production of hydrochlorofluorocarbon-22 - HFC-23 - Transparency | Italy has reported zero emissions of HFC-23 from production of hydrochlorofluorocarbon-22 for the period 1996-2007, stating that untreated streams are collected and sent to a thermal afterburner. Because abatement devices are likely to experience downtime during which HFC-23 is emitted unabated, the ERT asked the Party, during the review, whether the Italian production plant had measures in place to prevent this (e.g. equipment to recapture the gas). In response to this question, Italy reiterated the plant's confirmation that the thermal oxidizer was fully operational, but the Party did not provide any additional information. The ERT urges Italy, in its next NIR, to include information on how the plant avoids emitting HFC-23 during the oxidizer's downtime. | Additional information has been provided in the NIR. |

Other improvements have been carried out.

$CO_2$ emission factor regarding ammonia production has been revised for the entire series on account of new information on $CO_2$ recovered in the process thanks to the checks carried out with the producers.

A fruitful process of verification of emissions was initiated, through meetings and the documentation collected in the framework of EPER-E PRTR, with the largest steel producer in the country.

Additional information about ferroalloys has been provided in the NIR to clarify the use of EFs from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

In particular, the NIR has been improved reporting more information for each single industrial process with a focus on the key categories and verification activities. More complete information from the European emissions trading scheme and E-PRTR led, in general, to an improvement of the accuracy of emission estimates.
For F-gases, data have been collected from questionnaires in the framework of the EU F-gases regulation.

## III. Planned improvements and QA activities

Planned improvements mainly focus on the improvement of EFs and AD by means of a detailed sectoral analysis of the national E-PRTR and Emissions Trading data for all the industrial sectors. The documentation collected in the framework of the different European Directives (EPER-E PRTR, Large Combustion Plants and Emission Trading Scheme) will continue to be checked with the aim to verify emissions and activity data reported for the same year under different reporting obligations and identify possible improvements in emission estimations.
A detailed balance of the natural gas reported in the Energy Balance as no energy fuel consumption and the fuel used for the production processes in the petrochemical sector is planned.
We plan to check the average emission factor of $CO_2$ from electric arc furnaces with ETS data communicated for the years 2005-2008 in the next submission.
As for the QA activities of the sector, emissions from different industrial plants have been checked with the relevant process operators and with data reported under different regulations.
The implementation of verification activities especially regarding F-gas emissions are planned for future submissions on the basis of data collected in the framework of the EU F-gas regulation. In particular, further investigation on fire extinguishers is planned as well on the activity levels of other companies possibly involved in the import/export of fluorinated gases.

# QA/QC Solvent and other product use 2009 activities and future improvements

Prepared by: Daniela Romano

April, 2010

# National Air Emission Inventory: Solvent and other product use

## I. Objective

The improvements carried out during the preparation of the 2010 national inventory submission for the solvent sector and those expected for the next future are summarised in the following.

## II. Improvements

In the following table, the specific planned improvements and remarks to be taken into account in future submissions of the national air inventory for the solvent and other product use sector are reported.
The improvements carried out during the 2010 submission occurred in category 3D where NMVOC emission factors for the category 'dish cleaning' in domestic solvent use have been changed for the whole time series on the basis of new information communicated by the relevant industrial association. Other modifications from 1998 regarded activity data on room deodorisers and air fresheners. These recalculations affected $CO_2$ emissions. Furthermore, a new category has been added to improve the completeness of the Italian inventory, $N_2O$ emissions from explosives which were estimated for the entire time series.

| | **Sub-category** | **NMVOC Emission** | **Emission factor** |
|---|---|---|---|
| *Paint application* | Construction and buildings | 10% | Check the constant trend of EF in accordance with the Decopaint European Directive |
| | Check of average EFs and their potential reduction for paint application, especially in construction and buildings, on the basis of data collected in the framework of the Decopaint EU Directive. | | |
| *Degreasing, dry cleaning and electronics* | Metal degreasing | 4% | Update information, from Federchimica[1], on activity data and emission factor (these values have been found in literature, but should be reconsidered for new plants). |

[1] National chemical industrial association

# QA/QC Agriculture
# 2009 activities and future improvements

Prepared by: Rocío Dánica Cóndor

February, 2010

# National Emission Inventory: Agriculture

## I. Objective

This report describes activities and improvements carried out during the preparation of the national agriculture emission inventory - *submission 2010* (section II). Moreover, responses to the review process recommendations are reported in section III.

## II. Activities and improvements

### *2.1 General aspects*

Improvements for the Agriculture sector are described in detail. Moreover, an internal report of the "**National Agriculture UNFCCC/CLRTAP emission inventory"** has been updated. This report contains information on the procedures undertaken for preparing the national inventory *2010 submission*, provisional emission estimations from 2009, and scenario emissions for 2010, 2015 and 2020 [2].
Since 2006 submission, results from the MeditAIRaneo project have been included in the preparation of the Agriculture emission inventory (GHG/CLRTAP). Besides, results from the convention signed between APAT (now ISPRA) and the Ministry for the Environment, Land and Sea have been incorporated. At the end of 2009 another research study related to land spreading estimations and scenario have been finished[3]. Results are under consideration in order to incorporate improvements for future submissions.

### *2.2 National statistics*

The Italian National Statistical System (SISTAN) revises every year the National Statistical Plan that covers three years. In this framework, the Agriculture, Forestry and Fishing Quality Panel (*Circolo Qualità Agricoltura, Foreste e Pesca*) has been established under the coordination of the Agriculture service of ISTAT. In the last years, through this process different improvements, at activity data level, have been reached. Moreover, we have established a direct contact with a network of referents of the activity useful for the verification of the time series.
In the future, the implementation of an *ad hoc* survey on "Agricultural Production Methods", regulated by the European Commission (EC) will be crucial for improving the preparation of the national agriculture emission inventory (GHG/CLRTAP). This survey will be carried out during the 2010 General Agricultural Census in Italy. Detailed data such as animal grazing information, animal housing and storage

[2] Cóndor R.D. 2010. *Procedura per la preparazione, caricamento e reporting dell'inventario nazionale delle emissioni 1990-2008, le emissioni provvisorie del 2009 e gli scenari emissivi del 2010, 2015 e 2020: settore agricoltura. Rapporto interno AMB-MPA/ISPRA.* Roma – Italia.
[3] CRPA. 2009. *Valutazione dell'entità delle emissioni ammoniacali derivanti dall'applicazione al suolo dei fertilizzanti, delle loro possibilità di riduzione e individuazione degli elementi per un monitoraggio statistico delle tecniche di applicazione utilizzate*. Rapporto finale. Reggio Emilia – Italia.

systems characteristics, and use of manure/slurry for land application information will be collected. Already, initial efforts have been oriented to collect these data at provincial level through the incorporation of specific queries in the Farm Structure Survey (FSS) from 2005 and 2007. ISPRA together with CRPA is participating to the preparation of the instructions for specific queries (grazing, housing, storage and land spreading) of the Agricultural Census. This exercise will allow obtaining information useful as required by EC regulation and for the improvement of the emission inventory, which will include peculiarities of agricultural production in Italy. We expect to validate results obtained with FSS 2005 with information coming from the Agricultural census[4].

### *2.3 Estimation improvements*

In Table 1, a list with the different activities developed for the *2010 submission* and future improvements are described. Further specific improvements are addressed in this section.
During 2009 data collection and verification of emission factors presented in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4 – Agriculture, Forestry and other land uses, *AFOLU*) were done. In particular, emission factors related to nitrous oxide emissions from agricultural soils were compared. Different local and European scientific publications were used for this verification. Further work will be done during 2010.

For the *2010 submission*, we have identified the appropriate data from agricultural statistics (limestone and urea statistics) in order to estimate carbon dioxide emissions following 2006 IPCC Guidelines (AFOLU). The reporting of these emissions is done in the **CRF5** category (see next Chapter: QA/QC LULUCF).

N excretion in Italy has been evaluated through a N balance inter-regional project "Nitrogen balance in animal farms", funded by the Regional Governments of the most livestock-intensive Italian Regions. The N-balance methodology has been applied in real case farms, monitoring their normal feeding practice, without specific diet adaptation. In the project the most relevant dairy cattle production systems in Italy has been considered. In contrast on what normally is found in European milk production systems, poor correlation between the N excretion and milk production has been found. Probably there are two reasons for explaining the non correlation: a) extreme heterogeneity in the protein content of the forage and in the use of the feed; b) the non optimisation of the protein diet of less productive cattle[5,4]. Still further efforts on theoretical assessment of nitrogen excretion data will be done base on N balance methodology[6].

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[4] CRPA, 2010. *Personal communication - experts Laura Valli and Maria Teresa Pacchioli from Centro Ricerche Produzioni Animali (expert consultation on N excretion and natinal production systems).* Reggio Emilia, Italy.

[5] *De Roest and Speroni, 2005. Il bilancio dell'azoto negli allevamenti di latte. Agricoltura. Marzo 2005. pag 112-114*

[6] Gruber, L. & Pötsch, E. M., 2006. Calculation of nitrogen excretion of dairy cows in Austria. Die Bodenkultur, 2006, Vol. 57, Heft 1- 4, Vienna. http://www.boku.ac.at/diebodenkultur/volltexte/band-57/heft-2/gruber.pdf

| Category | Sub-category | Parameter | Years | | Activities |
|---|---|---|---|---|---|
| | | | 2010 | 2011 | |
| General | Activity data | Population | √ | | Data from 2008 and provisional data from 2009 has been uploaded. ISTAT has updated the time series for the rabbit category (2000-2007). For the inventory purposes we have updated the time series from 2001 to 2007 for rabbits. The UNA has updated turkey activity data for the years 2002 and 2006. |
| | Activity data | Surface/production | √ | | Data from 2008 and provisional data from 2009 has been uploaded. |
| | Activity data | Milk production | √ | | Milk production data 2008 has been collected (ISTAT new database on-line) and provisional data for 2009 has been uploaded. |
| | Activity data | Fertilizer | √ | | Data from 2008 has been collected (ISTAT new database on-line) |
| | Emissions | Fertilizer | √ | | Carbon dioxide from limestone and urea application have been estimated and reported in CRF5 category (AFOLU-IPCC 2006). |
| Enteric fermentation | Dairy cattle | Fat content | √ | | Data from 2008 fat parameter has been collected (ISTAT new database on-line) |
| | Dairy cattle | Portion cow giving birth | √ | | Data from 2008 has been collected (AIA, 2009) |
| | Dairy cattle/buffalo | Milk production | √ | | Data from 2008 on milk production has been collected (ISTAT new database on-line) |
| Manure Management | Dairy cattle | N excretion | | √ | Still further efforts on theoretical assessment of N excretion data will be done based on N balance methodology (Gruber and Poesch, 2006). |
| | Livestock categories | Type of housing | | √ | A query on the type of housing of different livestock categories has been introduced in the Farm and structure survey 2005. Results have been analysed. According to experts from CRPA, information collected from SPA 2005 (housing data) needs to be validated with information from the Agricultural Census (CRPA, 2010). |
| | Livestock categories | Slurry and solid manure storage facilities | | √ | We are analysing and verifying information coming from the Farm and Structure Survey 2007, where a query related to storage facilities for slurry and solid manure was incorporated. |
| | Livestock categories | Production methods | | √ | Different queries have been incorporated in an specific section of the 2010 Agricultural Census. Grazing, housing, storage systems and land spreading information will be collected. |
| | Livestock categories | Biogas | | | Data on biogas from 2008 has been collected (web site TERNA) |
| Rice cultivation | Activity data | Days of cultivation and cultivars | √ | | Data from 2008 and provisional data from 2009 has been uploaded . |
| | Rice | Emission factor | √ | √ | We have contact DG Joint Research Centre Institute for Environment and Sustainability - Climate Change Unit, which have been in charge of measuring rice paddy fields in Italy. New measurements have been done from 2007. Data is still not available. Probably in 2010 a publication will be available. |
| Agricultural soils | Direct emissions | Sewage sludge | | √ | Italy is aware that sewage sludge is applied to soils but no reliable information is available to estimate emissions in the agriculture sector. |
| | Activity data | Fertilizer | | √ | Verify results obtained from the research study on land spreading (CRPA, 2009). |

**Table 1. Improvements for the Agriculture emission inventory (GHG/CLRTAP)**

## III. Individual review process recommendations

Between 7-11 September 2009 the *In-country* review process of the *2009 submission* national emission inventory took place.
This section provides the list of suggestions and recommendations given by the Expert Review Team (ERT) from the UNFCCC (*Report of the individual review of the annual submission of Italy submitted in 2009"* - FCCC/ARR/2009/ITA; 12 February 2010[7]).
In Table 2, recommendations and response are provided.

| Par. | Subject | Description | Response |
|---|---|---|---|
| 70 | Sector overview | The ERT noted that Italy intends to update and improve AD by means of the collaborative actions of national and regional entities. The ERT encourages Italy to continue its efforts in this regard and to report thereon, including any recalculations, in its next annual submission. | Every year the time series of activity data is verified directly with the network of referents of agricultural statistics. For the 2010 submission some verifications were also done with category associations from the agricultural sector for specific cultivations. |
| 76 | Agricultural soils N2O | The ERT recommends that Italy validate the AD from the aforementioned study and report thereon in its next annual submission. In addition, the Party should include the use of sewage sludge in its reporting on the agriculture sector in its next NIR. | Information regarding sewage sludge is still not reliable for estimations and need the collection of additional information. |

**Table 2. Response to the Individual Review Process recommendation document**

In general, the agriculture emission inventory (*2009 submission*) has a positive balance after the review. Questions formulated during the review process were solved and are described in the ERT report (FCC/ARR/2009/ITA).
The ERT concluded that the quality of Italy's inventory for the agriculture sector had significantly improved in recent years, with both the results of different research projects and the recommended improvements of previous ERTs having been incorporated into the inventory (par. 70 page 19). Moreover, the ERT commends Italy for its efforts to improve its estimates of emissions from the agriculture and waste sectors (par. 109 page 26).

[7] http://unfccc.int/documentation/documents/advanced_search/items/3594.php?rec=j&priref=600005693#beg

# QA/QC LULUCF
# 2009 activities and future improvements

Prepared by: Marina Vitullo

April, 2010

# National Air Emission Inventory: LULUCF

## I. Objective

The report summarizes the improvements and remarks, which have been identified during the preparation of the 2010 inventory submission for the LULUCF sector.

## II. Improvements

In the following, specific improvements and remarks to be taken into account in the next submission of the national air inventory for LULUCF sector are reported.

*Forest land (5A)*

In 2010 submission, forest definition adopted by Italy in the framework of application of elected 3.4 activity, under Kyoto Protocol, has been fully implemented also in the LULUCF sector of inventory under the Convention, in order to maintain coherence and congruity between the two forest-related reporting. Therefore plantations and shrublands, that don't fulfil national forest definition, have been moved from forest land category into cropland category (plantations) and in grassland category (shrublands).

In consideration that national statistics on total commercial harvested wood, for construction and energy purposes, have been considered underestimated, particularly concerning fuelwood consumption[8], data from a specific survey conducted in the framework of the Inventory of Forests and Carbon pools (INFC) were used to infer a correction factor, on regional basis, that was applied to the entire time series of commercial harvested wood.

Concerning fires, a mismatching of official data, published by national statistics (ISTAT for the period 1990-2005; Italian National Forest Service from 2005 onward), with data published by the National Forest Service, the only entity in charge for the detection of the burned are, has been identified for the period 1990-2007. Mismatching is due to burnt areas that weren't classified (as forest, cropland or other land-use) and weren't consequently reported. A revision process has reclassified all non-classified areas with an ex-post analysis, and an assignment to forest land was decided; resulting data were moreover reported to international entities (FAO-FRA2010). In the table 1 data referring to official statistics (ISTAT and National Forest

[8] - APAT - ARPA Lombardia, 2007. Stima dei consumi di legna da ardere per riscaldamento ed uso domestico in Italia, Rapporto Finale;
- Corona P, Giuliarelli D, Lamonaca A, Mattioli W, Tonti D, Chirici G, Marchetti M, 2007. Confronto sperimentale tra superfici a ceduo tagliate a raso osservate mediante immagini satellitari ad alta risoluzione e tagliate riscontrate amministrativamente. Forest@ 4 (3): 324-332. URL: http://www.sisef.it
- UNECE – FAO, Timber Committee, 2008 - Italian statement on potential wood supply, communication by national correspondent, March 2008.

Service) and data published by the National Forest Service, with related differences in absolute and percentage terms, are reported.

| year | National Statistics (ISTAT-National Forest Service) | National Forest Service | Differences | |
|---|---|---|---|---|
| | *ha* | *ha* | *ha* | *%* |
| **1990** | 96,157 | 98,410 | 2,253 | 2.3 |
| **1991** | 24,630 | 30,172 | 5,542 | 18.4 |
| **1992** | 40,549 | 44,522 | 3,973 | 8.9 |
| **1993** | 104,385 | 116,378 | 11,993 | 10.3 |
| **1994** | 41,019 | 47,099 | 6,080 | 12.9 |
| **1995** | 18,246 | 20,995 | 2,749 | 13.1 |
| **1996** | 15,008 | 20,329 | 5,321 | 26.2 |
| **1997** | 49,831 | 62,775 | 12,944 | 20.6 |
| **1998** | 58,741 | 73,017 | 14,276 | 19.6 |
| **1999** | 28,136 | 39,362 | 11,226 | 28.5 |
| **2000** | 59,957 | 58,234 | -1,723 | -3.0 |
| **2001** | 38,006 | 38,186 | 180 | 0.5 |
| **2002** | 20,218 | 20,218 | 0 | 0 |
| **2003** | 44,202 | 44,064 | -138 | -0.3 |
| **2004** | 18,874 | 20,866 | 1,992 | 9.5 |
| **2005** | 19,040 | 21,470 | 2,430 | 11.3 |
| **2006** | 16,422 | 16,422 | 0 | 0 |
| **2007** | 116,602 | 116,602 | 0 | 0 |

The INFC data related to the soils survey, expected at the end of 2010, will definitely constitute a robust database, allowing for refined estimates and lower related uncertainty. The 'National Registry for Carbon sinks', instituted by a Ministerial Decree on 1st April 2008, is part of National Greenhouse Gas Inventory System in Italy (ISPRA, 2010 [a]) and includes information on units of lands subject of activities under Article 3.3 and activities elected under Article 3.4 and related carbon stock changes. The National Registry for Carbon sinks is the instrument to estimate, in accordance with the COP/MOP decisions, the IPCC Good Practice Guidance on LULUCF and every relevant IPCC guidelines, the greenhouse gases emissions by sources and removals by sinks in forest land and related land-use changes and to account for the net removals in order to allow the Italian Registry to issue the relevant amount of RMUs. In 2009, a technical group, formed by experts from different institutions (ISPRA; Ministry of the Environment, Land and Sea; Ministry of Agriculture, Food and Forest Policies and University of Tuscia), set up the methodological plan of the activities necessary to implement the registry and defined the relative funding. Some of these activities, which are planned to be completed by 2010, are expected to supply data useful to update and improve the estimations. Activities planned in the framework of the National Registry for Forest Carbon Sinks

should also provide data to improve estimate of carbon sequestration due to Afforestation/reforestation activities (with a special focus on soil organic content), and should allow to refine the estimate of forest land category. For 2010 submission, emissions and removals from 3.3 and 3.4 activities have been estimated on the basis of data and methodologies used for the inventory under the Convention.
Specifically, for the LULUCF sector, following the election of 3.4 activities and on account of an in-depth analysis on the information needed to report LULUCF under the Kyoto Protocol, a Scientific Committee, *Comitato di Consultazione Scientifica del Registro dei Serbatoi di Carbonio Forestali,* constituted by the relevant national experts has been established by the Ministry for the Environment, Land and Sea in cooperation with the Ministry of Agriculture, Food and Forest Policies.
A specific procedure undertaken for improving the inventory regards the establishment of national expert panels which involve, on a voluntary basis, different institutions, local agencies cooperating for improving activity data and emission factors accuracy. To this end, an interregional project, named INEMAR[9], developed to carry out atmospheric emission inventories at local scale, has added a module to estimate forest land emission and removals, following the methodology applied, at national level, to estimates removals and emissions by forest land. The module will be applied, at local scale with local data, in seven of the 20 Italian regions and the results will constitute a good validation of the used methodology.
An expert panel on forest fires has been set up, in order to obtain geographically reference data on burned area; the fraction of $CO_2$ emissions due to forest fires, now included in the estimate of the forest land remaining forest land, will be pointed out in the next submission.
In addition to these expert panels, APAT participates in technical working groups, denominated *Circoli di qualità*, within the National Statistical System (Sistan). Concerning LULUCF sector, this group, coordinated by the National Institute of Statistics, is constituted by both producers and users of statistical information with the aim of improving and monitoring statistical information for forest sector. These activities should improve the quality and details of basic data, as well as enable a more organized and timely communication.
In the next submissions an upgrade of the used model is foreseen to achieve the above cited improvements and to obtain more accurate estimates of the carbon stored in the dead wood, litter and soil pools, using the outcomes of research projects on carbon stocks inventories, with a special focus on the Italian territory.

*Cropland (5B)*
In 2010 submission, forest definition adopted by Italy in the framework of application of elected 3.4 activity, under Kyoto Protocol, has been fully implemented also in the LULUCF sector of inventory under the Convention, in order to maintain coherence and congruity between the two forest-related reporting. As a consequence, plantations, that don't fulfil national forest definition, have been moved from forest land category into cropland category.

[9] INEMAR: INventario EMissioni Aria: http://www.ambiente.regione.lombardia.it/inemar/e_inemarhome.htm

In response to ERT remark in the last review, land use changes have been derived, by the way of LU matrices, smoothing the amount of changes over a 5 year period, harmonizing the whole time series, resulting in a constant amount of C stock change in the 5 year period.
$CO_2$ emissions from urea application have been estimated, and reported in the following Table 2; it has to be noticed that CRF Reporter doesn't allow to input such a contribution to overall emissions, and therefore these emissions are not included in the 2010 submission.
The research project SOILSINK, financed by the Italian Ministry for University and Research, has the purpose of studying the climate change impact on carbon stocks in the agro-forestry sector; hopefully this project will contribute to a better characterisation of agricultural soil, in terms of impact, on carbon stocks, of different management practices. Additional researches will be made to collect more country-specific data on woody crops. Improvements will concern the implementation of the estimate of carbon change in cropland biomass at a higher disaggregate level, with the subdivision of the activity data in the main categories of woody cropland (*orchards, citrus trees, vineyards, olive groves*) and the application of different biomass accumulation rates and harvest/maturity cycles for the various categories.
Concerning the areas in transition to *Cropland*, investigation will be done to obtain additional information about the final crop types, to obtain a more precise estimate of the carbon stocks change.
Activities planned in the framework of the National Registry for Forest Carbon Sinks should also provide data to improve estimate of carbon sequestration due to Afforestation/reforestation activities (with a special focus on soil organic content), and should allow to refine the estimate of soil organic content in cropland category.

*Grassland (5C)*
In 2010 submission, forest definition adopted by Italy in the framework of application of elected 3.4 activity, under Kyoto Protocol, has been fully implemented also in the LULUCF sector of inventory under the Convention, in order to maintain coherence and congruity between the two forest-related reporting. As a consequence, shrublands, that don't fulfil national forest definition, have been moved from forest land category into grassland category.
In response to ERT remark in the last review, land use changes have been derived, by the way of LU matrices, smoothing the amount of changes over a 5 year period, harmonizing the whole time series, resulting in a constant amount of C stock change in the 5 year period.
Concerning land in transition to Grassland, further investigation will be made to obtain additional information about different types of management activities on Grassland, and the crop types of land converting to grassland, to obtain a more accurate estimate of the carbon stocks change. Activities planned in the framework of the National Registry for Forest Carbon Sinks should also provide data to improve estimate of carbon sequestration due to Afforestation/reforestation activities (with a special focus on soil organic content), and should allow to refine the estimate of soil organic content in grassland category.

*Wetlands (5D)*
The acquirement of data about flooded lands will allow, in next submission, to implement GPG method to estimate $CO_2$, $CH_4$ and $N_2O$ emissions from flooded lands.

*Settlements (5E)*
In 2010 submission *Settlements* time series has been developed through a linear interpolation between the 1990, 2000 and 2006 data, obtained by the Corine Land Cover[10] maps, relatively to the class "Artificial surfaces". By assuming that the defined trend may well represent the near future, it was possible to extrapolate data for the years 2007-2008. The average area of land undergoing a transition from non-settlements to settlements during each year, from 1990 to 2008, has been estimated with the land use change matrices that have also permitted to specify the initial and final land use.
Consequently changes in living biomass soil carbon stocks from land converting to settlements have been estimated in the latest submission; studies will be done to obtain additional statistics about *Settlements* and urban trees formation, in order to provide carbon stocks estimates. Moreover improvements will concern acquirement of data adequate to estimate carbon stocks changes in dead organic matter for land converting to *Settlements*.

*Carbon emissions from agricultural lime application (5(IV))*
In 2010 submission $CO_2$ emissions from application of carbonate containing lime and dolomite to agricultural soils have been estimated for the period 1998-2008, since data on agricultural lime application have been became available only for that period; moreover $CO_2$ emissions from agricultural dolomite application have been included in $CO_2$ emissions from limestone application, as national statistics on amount of lime applied don't allow to disaggregate the two components (limestone and dolomite). $CO_2$ emissions from agricultural lime application are reported in the Table5(IV) - $CO_2$ emissions from agricultural lime application.
Improvements will concern the acquirement of data about annual amount of lime applied in the period 1990-1997; consideration will be focussed onto the acquisition of disaggregated data on calcic limestome and dolomite agricultural application.

*Biomass Burning (5(V))*
The forest fires expert panel plan to obtain geographically reference data on burned area; the overlapping of land use map and georeferenced data should assure the estimates of burned areas in the different land uses. The fraction of $CO_2$ emissions due to forest fires, now included in the estimate of the forest land remaining forest land, will be pointed out in the next submission. Estimates on $CO_2$ release from *Grassland* fires will be also supplied. Activities planned in the framework of the National Registry for Forest Carbon Sinks should also provide data to improve estimate of estimate of emissions by biomass burning.

[10] Corine Land Cover Programme: http://www.clc2000.sinanet.apat.it/

## III. Individual review process recommendations

In Table 2, responses to the main questions raised during the last UNFCCC review process, related to the national inventory submitted in 2009, are described.

| Review report para | Subject | Description | Response |
|---|---|---|---|
| 86 | Land use, land-use change and forestry - Forest land remaining forest land - $CO_2$ - Accuracy | The ERT noted that the uncertainty of the five forest carbon pools was estimated to be 84.9 per cent. The present ERT reiterates the identification of the previous ERT that this uncertainty estimate has changed little since 1990, and recommends that Italy prioritize, within this sector, the improvement of the uncertainty analysis for the forest carbon pools | The uncertainty of LULUCF estimates will not change in a relevant way until the work planned in the sector finishes. Because emission update will regard the whole time series, it is not expected that different uncertainties result for the last years of the time series with respect to 1990. |
| 87 | Land use, land-use change and forestry - Forest land remaining forest land - $CO_2$ - Transparency | Given the importance of forestry in Italy's LULUCF sector, and the role of the modelling system in estimating the annual pool-based carbon stock changes, the ER recommends that the Party provide in its next annual submission a transparent validation of this system's ability to estimate these annual carbon stock changes. | A detailed and transparent description of the modelling system will be provided in the NIR. |
| 88 | Land use, land-use change and forestry - Land converted to forest land - $CO_2$ - Transparency | The Party has described in general terms in its NIR how the carbon stock changes in living biomass in young forests were estimated. The ERT recommends that the Party provide in its next annual submission a more transparent description of this estimation. | A detailed and transparent description of the estimation of carbon stock changes will be provided in the NIR. |
| 89 | Land use, land-use change and forestry - Land converted to grassland - $CO_2$ - Consistency | A perturbation to the trend in the time series for CO2 emissions/removals from cropland converted to grassland occurred in 2003. In response to a question raised by the ERT on this matter, the Party stated that it was investigating how to smooth out this perturbation in order to harmonize the whole time series without compromising the integrity of the annual land-use matrices. The ERT recommends that the time series be harmonized for the Party's next annual submission. | In response to the ERT remark, land use changes have been derived, by the way of LU matrices, smoothing the amount of changes over a 5 year period, harmonizing the whole time series. |
| 90 | Land use, land-use change and | The present ERT noted that the previous ERT had welcomed the Party's efforts to improve its land-use | Concerning land-use conversions to settlements, data from CORINE LAND COVER |

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| | forestry - Land converted to settlements - $CO_2$ - Consistency | tracking system so that it could be more definitive about which land types were converted to settlements on an annual basis. The ERT recommends that Italy further develop its capacity to identify land-use conversions to settlements and report thereon in its next annual submission. | 2006 (artificial surfaces) have been used to derive the increment of settlement's surface. More accurate and resolute data will outcome from the activities, in progress, related to the Kyoto reporting system (National registry for carbon sinks). |

# QA/QC Waste
# 2009 activities and future improvements

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# National Air Emission Inventory: Waste

## I. Objective

This report summarises the improvements, which have been identified during the preparation of the 2010 inventory submission for the waste sector.

## II. Review process recommendations and improvements in 2010 submission

In the following table, the list of recommendations from the latest review process related to the waste sector, as reported in the document FCCC/ARR/2009/ITA, and which should be considered for the 2010 submission is presented; responses to each subject are also included.

| Review report para | Subject | Description | Response |
|---|---|---|---|
| 92 | Waste – Sector overview - Transparency | …The ERT welcomes the above-mentioned planned improvements and recommends that Italy incorporate these revised data into its inventory for the waste sector, and report thereon, in its next annual submission. This reporting should include the transparent documentation of the new data, and a description of the impact of subsequent recalculations on the emission trend and on time-series consistency. | A single database was constructed from the 30 local databases containing information about landfilled waste. The large amount of data requires further analysis with the experts on waste management in order to provide valid results. Subsequently, additional information will be provided in the NIR. |
| 93 | Waste - Sector overview – Consistency | …some key parameters, such as the fraction of anaerobically treated industrial wastewater (15 per cent) and domestic and commercial wastewater (5 per cent), and the fraction of domestic and commercial wastewater treated in Imhoff tanks (2.4 per cent), were assumed to be constant between 1990 and 2007. The ERT encourages Italy to consider updating these key parameters. | Italy will consider this suggestion. |
| 95 | Waste - Solid waste disposal on land – $CH_4$ - Transparency | …In response to a question raised by the ERT, Italy explained that the amount of $CH_4$ recovered was estimated from the amount of energy produced, the energy efficiency of the $CH_4$ recovered, the capitation efficiency, and the efficiency in recovering $CH_4$ for energy use. The ERT recommends that Italy include | Additional information has been provided in the NIR. |

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| | | this information in its next annual submission. | |
| 96 | Waste - Solid waste disposal on land – $CH_4$ - Transparency | Oxidation factors for managed and unmanaged landfill sites have not been reported in the Party's NIR. The ERT recommends that Italy explain its use of oxidation factors in its next NIR. | Additional information has been provided in the NIR. |
| 97 | Waste - Wastewater handling – $CH_4$ and $N_2O$ - Transparency | No information has been provided by the Party in its NIR on the estimation of $CH_4$ emissions from domestic and commercial wastewater treatment, $N_2O$ emissions from industrial wastewater treatment and $CH_4$ recovery from domestic and commercial sludge treatment. However, this information was provided by the Party in response to questions of the ERT during the course of the review. The ERT recommends that Italy improve the transparency of its reporting by providing this information in its next annual submission. | Additional information has been provided in the NIR. |
| 98 | Waste - Waste incineration – $CO_2$, $CH_4$ and $N_2O$ - Transparency | Italy has reported emissions from waste incineration with energy recovery under the energy sector. However, the amount or fraction of incinerated industrial waste with and without energy recovery and the corresponding sources of information have not been reported by the Party. The ERT recommends that Italy provide information on the amount of incinerated industrial waste both with and without energy recovery, and provide sufficient relevant documentation, including references, in its next annual submission. | Additional information has been provided in the NIR. |

The preparation of National Communications helps to check and improve emission estimates. A complete scheme of waste management has been reconstructed on the basis of national regulations and policies planned for the future, for the waste sector as well energy sector. Energy production data from waste, such as biogas from landfills and wastewater treatment plants and energy from waste incinerators, coming from different sources of information and reported in different units, have been compared and checked.

## III. Planned improvements and QA activities

With the aim to share methodologies and improve the knowledge at national and local level, an expert panel on waste is planned.
ISPRA experts on waste management have developed a study having as its object the technical-economic analysis of the integrated management of urban waste. This study adds useful information to the process of validation of estimates from the sector (see para 93).

*Solid waste disposal on land*

Other improvements are expected due to the entering in force of the Landfill Directive 1999/31/EC. The application of the Directive could implement the availability of data regarding the main parameters influencing the estimation of emission from landfills:

- waste composition;
- fraction of methane in the landfill gas;
- amount of landfill gas collected and treated.

The Landfill Directive has been transposed in the national legislation by the Legislative Decree 13 January 2003, n° 36. From July 2005 all the landfills should be in compliance with the new legislation: thus, it is expected that every year, starting at least from July 2006, all the Regions will receive from each landfill the information reported above. These parameters could be available thanks to the Ministry for the Environment, Land and Sea that has the authority to ask the Regions to provide this information.
A single database was constructed from the 30 local databases containing information about landfilled waste. The large amount of data requires further analysis with the experts on waste management in order to provide valid results.
Moreover, ISPRA is involved in an in depth environmental study of Malagrotta area, where is located the biggest European non hazardous waste landfill. The study has been assigned to the Institute by the Minister of the Environment, Land and Sea, in order to verify the real status of the environment, afterwards several complaints from local inhabitants. The results of this study could improve the national inventory and could be used as quality control procedure.

*Wastewater handling*

Since 1951, periodically (1951, 1963, 1975, 1987, 1993, 1999 and 2005) the National Institute of Statistics (ISTAT) carries out census analysis on urban water, regarding water supplying, aqueducts, sewer systems and wastewater treatment plants: next surveys are expected for 2008 and 2012.
Possible improvements in future submissions could come from the share of information with the Office of the Ministry of the Environment, Territory and Sea which is responsible for water activities.
Some improvements could also come from the analysis of EPER/E-PRTR data.

*Waste incineration*

As reported for solid waste disposal on land, the waste composition is very important to improve $CO_2$ emission factor on the basis of carbon content. As reported above, in order to update the government's strategy to achieve Italy's emissions reduction target under the Kyoto Protocol, the GHG emission projections for 2010 and 2020, specific to waste management, have been prepared. As a consequence, a focus on waste management and how this could influence the waste composition is expected. These improvements are linked with those regarding solid waste disposal on land and the collection of new information on waste composition.

*Compost production*

In 2008, the attendance at national Conferences and Workshops on waste sector has helped contacts with experts in composting plants: a comparison between data reported in the National GHG Inventory and data carried out by these experts is planned for the next submission, especially for $CH_4$ emission factor and the input percentage of waste treated as compost in mechanical-biological treatment plants.