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Istituto Superiore per la Protezione
e la Ricerca Ambientale

RAPPORTI

Quality Assurance/Quality Control Plan for the Italian Emission Inventory. Year 2012

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Rapporti 160/2012

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Prepared by: Daniela Romano, Riccardo De Lauretis

April, 2012

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 of the latest review process together with the actions undertaken by the inventory team.

Further improvements and planned QA activities identified during the preparation of the National Inventory and National Inventory Report 2011 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 a public review of the Italian inventory are not implemented yet. Financial resources have been made available by the Ministry of the Environment, Land and Sea this year and different proposals are under examination. So the activity is expected to be implemented within the Kyoto period, starting as soon as the tendering procedure is finalized.

However, the review process 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. Comments also derive 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 among experts.

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/2010/arr/ita2.pdf (UNFCCC, 2010). The report of the last year inventory review process has not been finalized yet but the main issues raised during the process have been already taken into account by the inventory team during the last inventory compilation.

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 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 was 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 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 and IPCC Guidelines (IPCC, 2000; IPCC, 2006).

Quantitative estimates of the uncertainties for the Italian GHG inventory are calculated using Approach 1 as defined in the IPCC 2006 Guidelines (IPCC, 2006), which provides a calculation based on the error propagation equations. In addition, Approach 2, 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 Approach 1 does not make a significant difference in figures. The results of the study, 'Evaluating uncertainty in the Italian GHG inventory', were presented at an 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).

In the last two years, Monte Carlo analysis has been applied to some key categories of the Italian inventory and it is planned to extend progressively the study to other inventory categories.

III. Documentation, archiving and reporting

All the material and documents used for the inventory preparation are stored at the Institute.

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 2011, the Italian inventory was submitted to a centralised review but the process has not been finalised yet. Notwithstanding, the main critical points raised during the review process were addressed in the current inventory compilation, and different improvements have been carried out. Specific issues are described in the relevant sectoral chapters and there were no important problems concerning the general and cross cutting activities.

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. 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 (in particular IUTI, inventory of land use) have been completed, resulting in land use classification, for all national territory, for the years 1990, 2000 and 2008. A process of validation and verification of IUTI data has been put in place and is expected to supply data useful to update and improve the estimations.

General priority will concern the improvement of the transparency in the NIR.

Other sector specific improvements are identified in the relevant chapters; 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 annually updated. 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 provide data to improve estimate of emissions by biomass burning and the final results from the

Inventory of forests and carbon pools related to the soil surveys will definitely constitute a robust database for forest fires, allowing for refined estimates and lower related uncertainty.

Additional studies will regard the comparison between local inventories and national inventory and exchange of information with the 'local inventories' national expert group.

Further analyses will concern the collection of statistical data and information to estimate uncertainty in specific sectors by implementing Approach 2 of the IPCC guidelines.

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 Release and Transfer Register (E-PRTR).* 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
2011 ACTIVITIES AND FUTURE IMPROVEMENTS

Prepared by: Riccardo De Lauretis

April, 2012

NATIONAL AIR EMISSION INVENTORY: ENERGY

I. Objective

The improvements carried out during the preparation of the 2012 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 improvements implemented during the compilation of the inventory as follows the exchange of information related to the energy sector with the expert review team of the last review process is presented.

Further improvements and planned QA activities identified during the preparation of the National Inventory and National Inventory Report 2012 are also presented.

Subject	Improvement
Energy – comparison with international data	Additional information on the comparison has been included in Annex 4
Energy – international marine bunkers	The inconsistency has been resolved
Energy – feedstock and non-energy use of fuels	In order to enhance transparency and consistency, a detailed description related to quantity stored for each fuel has been included in the NIR (§par. 3.8.2).
Energy – CO_2 – stationary combustion: petroleum refining liquid and solid fuels	A detailed description related to trend and drivers of CO_2 emissions has been included in the NIR (§par. 3.1).
Energy – CO_2 – stationary combustion: solid fuel - iron and steel	Additional information related to the decreasing trend in CO_2 implied emission factors has been included in the NIR (§par. 3.1, Annex 3).
Energy – CO_2 – Road transportation: liquid fuels	Further information has been included in the NIR to better detail on the trend of CO_2 emission factors used in the estimation process (§par. 3.5.3.2.1, Annex 6).
Energy – CH_4 – Navigation: gasoline	The composition of the fleet of gasoline fuelled recreational craft has been updated from 2001 revising the two strokes and four strokes engine distribution. (§par. 3.5.4.5).
Energy - CH_4, CO_2 - Fugitive emissions	Information on average chemical composition and main parameters of national mix of natural gas has been added in order to improve the transparency of the NIR (§par. 3.9.2)
Energy - CH_4 - Fugitive emissions - Oil and natural gas: liquid fuels	The notation key for fugitive emissions from oil transport was NA instead of IE. The error has been corrected and a description has been provided in the NIR to clarify how the refining/storage sub-category includes emissions from oil transportation (§par. 3.9.2).

III. Planned improvements and QA activities

Documentation collected in the framework of the different European Directives, and Regulations (E-PRTR, Large Combustion plants and the Emissions Trading scheme) is being completely integrated in a unique informative system, 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 further use of this database will regard the calculation at plant level of emission estimates of other pollutants than greenhouse gases. This activity will be implemented also in view of the next year submission of national emission figures of other pollutants which have to be communicated in the framework of the EMEP-CLRTAP Convention at 50*50 grid scale every five years. Emissions at point source level will be therefore derived for the energy and industrial sectors, refining figures previously attributed at local level by a top-down approach.

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. Specifically, for aviation, data by aircraft type and origin destination matrix are under investigation and relevant emission factors will be updated consequently. For the maritime sector, a verification of activity data on ship movements and emission estimates will be carried out together with regional environmental agencies.

Generally, off-road basic activity data are planned to be checked and updated especially concerning technological information. The launch of the project is under finalization.

Other improvements will consider the verification of figures reported in the energy balance for some sector. In particular, data on energy consumption communicated to ISPRA by the relevant industries in the framework of the ETS will be provided to the Ministry of Economic Development Activities for a comparison and verification with the final consumption reported in the BEN for the Industry sector. An additional verification will regard the comparison of ETS data with figures of energy consumption for electricity production reported by the Italian Independent System Operator (TERNA) to the Ministry of Economic Development Activities for publication in the BEN. The previous activities will improve the robustness and accuracy of data reported in the national balance thus of the emission inventory estimates.

QA/QC INDUSTRIAL PROCESSES
2011 ACTIVITIES AND FUTURE IMPROVEMENTS

Prepared by: Andrea Gagna, Barbara Gonella, Ernesto Taurino

April, 2012

NATIONAL AIR EMISSION INVENTORY: INDUSTRIAL PROCESSES

I. Objective

The improvements carried out during the preparation of the 2012 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, issues raised during the review process and related to the industrial processes sector are reported; improvements implemented for each subject are also included.

Further improvements and planned QA activities identified during the preparation of the National Inventory and National Inventory Report 2012 are also presented.

Subject	Improvement
Industrial processes – CO_2 – Cement production	In order to enhance transparency on the verification of the EU-ETS as well as the EPRTR registry, clarifications have been included in the NIR (§par. 4.2.2). A more detailed description of the monitoring and reporting procedure of emissions and verification activities in the framework of EU-ETS have been included in NIR (§par. 1.4).
Industrial processes – N_2O - Adipic acid	In order to enhance transparency on abatement technology installed in adipic acid production additional information has been provided in the NIR (§par. 4.3.2).
Industrial processes – N_2O – Adipic acid	The formula used to estimate emissions from adipic acid production has been included in the NIR (§par. 4.3.2) to provide a more transparent description of the estimation process.
Industrial processes – CO_2, PFCs – Aluminium production	In order to clarify the methodological approaches used in the emissions estimation process, additional information has been included in the NIR (§par. 4.4.2), concerning time series consistency and conservativeness of the applied approach. In addition, a number of attempts have been tried for the last years by inventory team to retrieve the same information related to 1990-1999, those data cannot be retrieved.
Industrial processes – SF6, Substitutes for ODS – Electrical equipment	In order to enhance transparency, additional information has been added in the NIR (§par. 4.7.2).

Other improvements not identified during the review process have been carried out.

CO_2 emissions have been checked with the relevant industrial associations.

Activity data and emissions reported under EU-ETS and EPER/EPRTR are compared with the information provided by the industrial associations. In particular, comparisons have been carried out for cement, lime, limestone and dolomite, and glass sectors.

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. We integrate the documentation collected in the framework of the different European Directives (EPER-E PRTR, Large Combustion Plants and Emission Trading Scheme) 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.

CO_2 emissions have been checked with the relevant industrial associations.

Both activity data and average emission factors are also compared every year with data reported in the national EPER/E-PRTR registry and in the European emissions trading scheme.

Under the EU-ETS, operators are requested to report activity data and CO_2 emissions as information verified and certified by auditors who check for consistency to the reporting criteria.

Activity data and emissions reported under EU-ETS and EPER/EPRTR are compared to the information provided by the industrial associations. The general outcome of this verification step shows consistency among the information collected under different pieces of legislations and the information provided by the relevant industrial associations.

The outcome of further investigations concerning the production of soda ash and chlorine at facility level will be accounted for in the next submission.

Further investigations regarding completeness of CO_2 emissions sources from the activities of this sector are planned.

Further additional checks regarding emissions for 2005-2009 will be carried out on account of information from new entrance installations that will be included in the ETS from 2013.

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.

The average emission factor of CO_2 from electric arc furnaces will be checked with ETS data communicated in the next years.

QA/QC SOLVENT AND OTHER PRODUCT USE
2011 ACTIVITIES AND FUTURE IMPROVEMENTS

Prepared by: Daniela Romano

April, 2012

NATIONAL AIR EMISSION INVENTORY: SOLVENT AND OTHER PRODUCT USE

I. Objective

The improvements carried out during the preparation of the 2012 national inventory submission for the solvent sector and those expected for the next future are summarised in the following.

II. Planned improvements and QA activities

In the following table, the specific actual and 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 main improvements carried out during the 2012 submission regarded emissions from paint application, specifically considering data communicated from the industries in the framework of the EU Directive 2004/42, implemented by the Italian Legislative Decree 161/2006, on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products. These data refer to the composition of the total amount of paints and varnishes (water and solvent contents) in different subcategories for interior and exterior use and the total amount of products used for vehicle refinishing; available from the year 2007, they have been used as in the estimation process also as a verification of emission estimates.

Specifically, in category 3A with respect to CO_2 and NMVOC emissions, there has been an update, from 2005, of emission factors for paint application in boat building, wood and other industrial paint application and, from 2007, a change of emission factors for car repairing on account of information communicated within the Legislative Decree 161/2006. In addition, in 2009, there has been an update of the apparent consumption of cosmetics in domestic solvent use in category 3D, affecting CO_2 and NMVOC emissions.

	Sub-category	NMVOC Emission	Emission factor
Degreasing, dry cleaning and electronics	Metal degreasing	4%	Update information, from the national chemical industrial association (Federchimica), on activity data and emission factor (these values have been found in literature, but should be reconsidered for new plants).

QA/QC AGRICULTURE
2011 ACTIVITIES AND FUTURE IMPROVEMENTS

Prepared by: Rocío Dánica Cóndor

April, 2012

NATIONAL EMISSION INVENTORY: AGRICULTURE

I. Objective

This report describes activities and improvements carried out during the preparation of the national agriculture emission inventory - *submission 2012* (section II). Moreover, improvements implemented on account of the main issues raised during the last review process are reported in section III.

II. Review process recommendations

This section provides the list of improvements carried out during the last year estimation process in consideration of the main findings raised from the review process in 2011. Information is summarized in the following table.

Subject	Improvement
Agriculture – general	Inconsistency between the NIR and CRF, on the reporting of the methodologies used, has been corrected.
Agriculture - CH_4 - Manure management	Additional information on the comparison of country specific and IPCC default emission factors focusing on the share of different population species for each climate region has been added in the NIR (§par. 6.3.2).

III. Planned improvements and QA activities

III.1 General aspects

Improvements for the Agriculture sector developed in the last years are described in the following.

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 *2011 submission* and scenario emissions for 2015 and 2020 [1].

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 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 was completed[2].

III.2 National statistics

The Italian National Statistical System (SISTAN) revises every year the National Statistical Plan that covers a three years period. In this framework, the Agriculture, Forestry and Fishing Quality Panel (*Circolo*

[1] Cóndor R.D. 2012. *Procedura per la preparazione, caricamento e reporting dell'inventario nazionale delle emissioni 1990-2010, le emissioni provvisorie del 2010 e gli scenari emissivi del 2015 e 2020: settore agricoltura. Rapporto interno AMB-MPA/ISPRA.* Roma – Italia.
[2] 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.

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, ISPRA has established a direct contact with a network of sectoral experts useful for the verification of the time series.

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 was carried out during the 2010 General Agricultural Census in Italy. Detailed data such as animal grazing information, animal housing and storage systems characteristics, and use of manure/slurry for land application information were collected. Already, initial efforts had 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 participated 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; final data will be available in April 2012.

III.3 Estimation improvements

In the following table, a list with the different activities developed for the *2012 submission* and future improvements are described. Further specific improvements are addressed in this section.

During 2010 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*) continued. 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. Different research groups that are working on soil emission measurements have been contacted (University of Naples, University of Turin, University of Udine).

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 with what normally 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[3,4]. Still further efforts on theoretical assessment of nitrogen excretion data will be done base on N balance methodology[5]. An ad-hoc agro-environmental indicator group coordinated by the Ministry of Agriculture is working to determine gross nitrogen balances; therefore, N coefficients will be revised.

For the agricultural emission inventory a new source has been estimated: the use of sewage sludge applied to soils for agriculture (direct and indirect N_2O emissions). Activity data, amount of sewage sludge and % N content, was provided by the Ministry for the Environment, Land and Sea, which is in charge of collecting and reporting data under the EU Sewage Sludge Directive 86/278/EEC.

Regarding, uncertainty analysis applied to GHG estimates, Monte Carlo analysis has been extended to other key categories of the sector, the estimation of uncertainties are shown in the *NIR submission 2012*.

In the following table, improvements for the Agriculture emission inventory (GHG/CLRTAP) are reported.

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

[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] 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	Gas	Year		Activities
				2012	2013	
General	Activity data	Population	NH_3/GHG	√		Data for 2010 and provisional data for 2011 have been uploaded
	Activity data	Surface/production	NH_3/GHG	√		Data for 2010 and provisional data for 2011 have been uploaded (ISTAT new database on-line)
	Activity data	Milk production	NH_3/GHG	√		Milk production data for 2010 have been collected and provisional data for 2011 have been uploaded
	Activity data	Fertilizer	NH_3/GHG	√		Data for 2010 have been collected (ISTAT new database on-line).
Enteric fermentation	Dairy cattle	Fat content	GHG	√		Data for 2010 fat parameter have been collected (ISTAT new database on-line).
	Dairy cattle	Portion cow giving birth	GHG	√		Data for 2010 have been collected (AIA, 2011)
	Dairy cattle/buffalo	Milk production	GHG	√		Data for 2010 milk production have been collected (ISTAT new database on-line).
Manure management	Dairy cattle	N excretion	GHG		√	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	NH_3/GHG		√	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	NH_3/GHG		√	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. Validation will be executed with data coming from the 2010 Agricultural census (final data are expected by April 2012).
	Livestock categories	Production methods	NH_3/GHG		√	Different queries have been incorporated in a specific section of the 2010 Agricultural Census. Grazing, housing, storage systems and land spreading information will be collected.
	Livestock categories	Biogas		√		Data on biogas for 2010 have been collected (web site TERNA).
Rice cultivation	Activity data	Days of cultivation and cultivars	GHG	√		Data for 2010 and provisional data for 2011 have been uploaded.
	Rice	Emission factor	GHG	√	√	We have contacted DG Joint Research Centre Institute for Environment and Sustainability - Climate Change Unit, in charge of measuring rice paddy fields in Italy. New measurements have been done since 2007. Data is still not available. We expect to obtain updated information on EFs for future submissions.
Agricultural soils	Activity data	Fertilizer	NH_3/GHG	√		Results obtained from the research study on land spreading have been compared with those obtained with the inventory process (CRPA, 2009).

QA/QC LULUCF
2011 ACTIVITIES AND FUTURE IMPROVEMENTS

Prepared by: Marina Vitullo

April, 2012

NATIONAL AIR EMISSION INVENTORY: LULUCF

I. Objective

The report summarizes the improvements and remarks, which have been identified during the preparation of the 2012 inventory submission for the LULUCF sector.

II. Review process recommendations

In Table 1, responses to the main questions raised during the last UNFCCC review process, related to the national inventory submitted in 2011, are described.

Table 1. *Response to the review process recommendations*

Subject	Improvement
LULUCF – carbon stock changes in mineral soils for land use conversion categories	Italy has decided to use the IPCC default land use transition period of 20 years, in the estimation process of carbon stock changes in mineral soils related to land use changes. In particular the 20-years transition period has been applied to estimate carbon stock changes from the following land use changes: Land converted to Forest land, Land converted to Cropland, Land converted to Grassland and for Art. 3.3 activities (Afforestation/Reforestation). Once a land has converted to a land use category, the annual changes in carbon stocks in mineral soils have been reported for 20 years subsequent the conversion. For the remaining land use change (Land converted to Settlements and Art. 3.3 - Deforestation) Italy has decided to use a land use transition period equal to 1 year, taking into account the nature of final land use category (Settlements) and assuming that soils organic matter content of previous land use category is lost in the conversion year. SOC reference value, for Settlements category, has been assumed to be zero. (§par. 7.1.1, 7.2.4, 7.3.4, 7.4.4, 7.6.4).
LULUCF – carbon stock changes in mineral soils for land use categories	Italy has decided to apply the IPCC Tier1, assuming that, for forest land remaining forest land, the carbon stock in soil organic matter does not change, regardless of changes in forest management, types, and disturbance regimes; in other words it has to be assumed that the carbon stock in mineral soil remains constant so long as the land remains forest. Therefore carbon stock changes in soils pool, for forest land remaining forest land, have been not reported. (§par. 7.2.4, 7.3.4, 7.4.4).
LULUCF – cropland - plantations	Additional information related to plantations management system has been included in NIR (§par. 7.3.2), in order to better details reasons of the inclusion of plantations into cropland category.
KP-LULUCF – CO_2 - Afforestation/reforestation: carbon stock changes in mineral soils	Italy has decided to use the IPCC default land use transition period of 20 years, to estimate carbon stock changes in soils pools for afforestation/reforestation activities under art. 3.3 of the Kyoto Protocol (§par. 10.3.1.1, 10.3.1.4).
KP-LULUCF – CO_2 – Forest Management: carbon stock changes in mineral soils	Italy has decided to apply the IPCC Tier1, assuming that, for land under Forest Management activities, the carbon stock in soil organic matter does not change, regardless of changes in forest management, types, and disturbance regimes. Therefore carbon stock changes in soils pool, for land subject to Forest Management, have been not reported, and transparent and verifiable information that the pool is not a net source for Italy is provided in NIR. (§par. 10.3.1.1, 10.3.1.2, 10.3.1.4).

III. Planned improvements and QA activities

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. A general improvement is related to the application of a full Approach 2 uncertainty analysis for 2009 inventory year; Montecarlo has been applied to following LULUCF categories. Most of the results prove that both approaches (Approach 1 and 2) produce comparable results. In Table 2 the outcomes of the Approach 1 (error propagation) and Approach 2 (Montecarlo analysis) are shown.

Table 2 *Comparison between uncertainty assessment by Approach 1 and Approach 2*

Sector	*Categories*	*Key*	*Approach 1 %*	*Approach 2 (Montecarlo) %*
LULUCF	CO_2 Forest land remaining Forest land	L, T	49.0	42.9
LULUCF	CO_2 Land converted to Forest land	T2	106.1	-147.6; 192.3
LULUCF	CO_2 Cropland remaining Cropland	L, T	106.1	-108.5; 210.2
LULUCF	CO_2 Land converted to Cropland	T2	106.1	-408.2; 178.5
LULUCF	CO_2 Grassland remaining Grassland	L2, T	106.1	-67.7; 75.0
LULUCF	CO_2 Land converted to Grassland	L, T	106.1	-119.3; 194.5
LULUCF	CO_2 Land converted to Settlements	L, T2	106.1	-100.3; 49.2

III.1 Forest land (5A)

In 2012 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. Coherently with the previous 2010 and 2011 submissions, plantations and shrublands, that don't fulfil national forest definition, have been reported into cropland category (plantations) and in grassland category (shrublands).

To estimate litter carbon amount from the aboveground carbon amount, linear relations were used, on the basis of the results of the European project Biosoil[6] (for litter and soil organic content) and a Life+ project FutMon[7] (Further Development and Implementation of an EU-level Forest Monitoring System), for the aboveground biomass. In response to ERT recommendation regarding soils pool, Italy has decided to apply the IPCC Tier1, assuming that, for forest land remaining forest land, the carbon stock in soil organic matter does not change, regardless of changes in forest management, types, and disturbance regimes; in other words it has to be assumed that the carbon stock in mineral soil remains constant so long as the land remains forest. Therefore carbon stock changes in soils pool, for forest land remaining forest land, have been not reported

The INFC data related to the soils survey 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, 2011 [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

[6] BioSoil project – http://biosoil.jrc.ec.europa.eu/; http://forest.jrc.ec.europa.eu/contracts/biosoil

[7] FutMon: Life+ project for the "Further Development and Implementation of an EU-level Forest Monitoring System"; http://www.futmon.org/;

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 (in particular IUTI, inventory of land use, see Annex 10) has been completed, resulting in land use classification, for all national territory, for the years 1990, 2000 and 2008. A process of validation and verification of IUTI data has been put in place and is 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 2012 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 aim, an interregional project, named INEMAR[8], 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. The module has been applied, at local scale with local data, in Lombardia region, for the different pools and for the year 1990, 2000, 2005, 2008, showing a general good agreement between the two different data sources, as shown in Table 3:

Table 3 *Carbon stocks estimates by the National Inventory (ISPRA) and the INEMAR project for Lombardia.*

	INEMAR - Lombardia	ISPRA	Differences
	Gg CO_2	Gg CO_2	
1990	311,370	319,203	-2.45%
2000	345,886	353,326	-2.11%
2005	367,537	375,275	-2.06%
2008	379,742	387,673	-2.05%

A comparison of the model results versus data measured in the framework of Italian National Forest Inventory (INFC) has been conducted, relating to the year 2005 (Tabacchi[9] et al., 2010).

Regarding both soil and litter, a validation of the applied methodology has been done in Piemonte region, comparing results of a regional soil inventory with data obtained with the abovementioned methodology. Results show a good agreement between the two dataset either in litter and soil (Petrella[10], 2006).

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.

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

[9] Tabacchi G., De Natale F. and Gasperini P. Coerenza ed entità delle statistiche forestali - Stime degli assorbimenti netti di carbonio nelle foreste italiane, Sherwood n.165/2010.

[10] Petrella F., Piazzi M. 2006 – Carbonio nei suoli degli ecosistemi semi-naturali piemontesi. Sherwood N.123, June 2006.

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.

The upgrade of the used model has been postponed, in order to implement INFC data related to the soils survey and the IUTI results, 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. The upgrading of the model will also allow the use of the INFC biomass data, actually not utilized, as classification system, and consequent categories list, has changed from the first forest inventory to INFC. A transition matrix, between the INFC and first forest inventory classification systems, has been planned order to be elaborated in order to use all information acquired with INFC.

III.2 Cropland (5B)

Coherently with forest definition adopted by Italy in the framework of application of elected 3.4 activity, under Kyoto Protocol, plantations, that don't fulfil national forest definition, have been reported into cropland category.

Following 2011 review finding, Italy has decided to use the IPCC default land use transition period of 20 years, in the estimation process of carbon stock changes in mineral soils related to land converting to cropland; once a land has converted to a land use category, the annual changes in carbon stocks in mineral soils have been reported for 20 years subsequent the conversion. Furthermore land use changes have been derived, by the way of land use change 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, following a previous review remark.

To estimate litter carbon amount from the aboveground carbon amount, linear relations were used, on the basis of the results of the European project Biosoil[11] (for litter and soil organic content) and a Life+ project FutMon[12] (Further Development and Implementation of an EU-level Forest Monitoring System), for the aboveground biomass.

CO_2 emissions from urea application have been estimated; it has to be noticed that CRF Reporter doesn't allow inputting such a contribution to overall emissions, and therefore these emissions are not included in the 2012 submission.

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.

Further investigation will be made to obtain ancillary information about the final crop types, concerning the areas in transition to cropland, in order 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.

III.3 Grassland (5C)

Coherently with forest definition adopted by Italy in the framework of application of elected 3.4 activity, under Kyoto Protocol, shrublands, that don't fulfil national forest definition, have been reported into grassland category.

Following 2011 review finding, Italy has decided to use the IPCC default land use transition period of 20 years, in the estimation process of carbon stock changes in mineral soils related to land converting to cropland; once a land has converted to a land use category, the annual changes in carbon stocks in mineral soils have been reported for 20 years subsequent the conversion. Furthermore land use changes have been derived, by the way of land use change 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, following a previous review remark.

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[11] BioSoil project – http://biosoil.jrc.ec.europa.eu/; http://forest.jrc.ec.europa.eu/contracts/biosoil

[12] FutMon: Life+ project for the "Further Development and Implementation of an EU-level Forest Monitoring System"; http://www.futmon.org/;

To estimate litter carbon amount from the aboveground carbon amount, linear relations were used, on the basis of the results of the European project Biosoil[13] (for litter and soil organic content) and a Life+ project FutMon[14] (Further Development and Implementation of an EU-level Forest Monitoring System), for the aboveground biomass.

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.

III.4 Wetlands (5D)

Improvements will concern the acquirement of data about flooded lands and the implementation of the GPG method to estimate CO_2, CH_4 and N_2O emissions from flooded lands.

III.5 Settlements (5E)

Settlements time series has been developed through a linear interpolation between the 1990, 2000 and 2006 data, obtained by the Corine Land Cover 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 2007-2010. The average area of land undergoing a transition from non-settlements to settlements during each year, from 1990 to 2010, has been estimated with the land use change matrices that have also permitted to specify the initial and final land use.

Land use changes have been derived, by the way of land use change 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, following a previous review remark.

Further investigation will be made to obtain additional statistics about settlements, comparing the added information to the time series developed from Corine Land Cover data. More accurate and resolute data will outcome from the activities, in progress, related to the Kyoto reporting system (National registry for carbon sinks). Urban tree formations will be probed for information, in order to estimate carbon stocks. Moreover improvements will concern acquirement of data sufficient to give estimates of carbon stocks changes in dead organic matter for land in transition to settlements.

III.6 Carbon emissions from agricultural lime application (5(IV))

[13] BioSoil project – http://biosoil.jrc.ec.europa.eu/; http://forest.jrc.ec.europa.eu/contracts/biosoil

[14] FutMon: Life+ project for the "Further Development and Implementation of an EU-level Forest Monitoring System"; http://www.futmon.org/; http://www3.corpoforestale.it/flex/cm/pages/ServeAttachment.php/L/IT/D/D.e54313ecaf7ae893e249/P/BLOB%3AID%3D397

In 2012 submission CO_2 emissions from application of carbonate containing lime and dolomite to agricultural soils have been estimated for the period 1998-2010, 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 limestone and dolomite agricultural application.

III.7 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 geo referenced 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.

QA/QC WASTE
2011 ACTIVITIES AND FUTURE IMPROVEMENTS

Prepared by: Barbara Gonella, Ernesto Taurino

April, 2012

NATIONAL AIR EMISSION INVENTORY: WASTE

I. Objective

This report summarises the improvements, which have been identified during the preparation of the 2012 inventory submission for the waste sector.

II. Review process recommendations

In the following table, issues raised during the review process and related to the waste sector are reported; 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 2011 are also presented.

Subject	Improvement
Waste - CH4 - Solid waste disposal on land	Further information is added about the methane generation rate constant (k), the method used to estimate the amount of CH4 recovered using the energy conversion efficiency factor and the procedure used to establish the time series for the amount of waste disposed in managed and unmanaged landfill sites ((§par. 8.2)
Waste - CH4 - Wastewater handling	Further information is added about collected and uncollected, treated and untreated wastewater (§par. 8.3)
Waste - CO2 , N2O - Incineration	Activity data for industrial waste are reported in Table 8.27 distinguishing those with or without energy recovery (§par. 8.4)

Other improvements not identified during the review process have been carried out.

The LCV used for biogas derives from national experts and it has been verified with energy and quantitative data about biogas production from waste supplied by TERNA (National Independent System Operator).

Where information is available, wastewater flows and COD concentrations are checked with those reported yearly by the industrial sectoral reports or technical documentation developed in the framework of the Integrated Pollution and Prevention Control (IPPC) Directive of the European Union (http://eippcb.jrc.es).

A thesis on GHG emissions from wastewater handling has been carried out at Environmental, Hydraulic, Infrastructures and Surveying Engineering Department (DIIAR) of Politecnico di Milano, where national methodology has been compared with that reported in 2006 IPCC Guidelines and with a methodology developed in the framework of a previous thesis for the estimation of emissions from wastewater treatment plants located in Regione Lombardia.

As planned in the previous submission a rearrangement of incinerators database has been made. During this process an in depth analysis about all incineration plants has been carried out with the target to eliminate double counting and to add eventual no counted plants. Once the list of plants was updated, a new and unique database has been developed to manage activity data, emissions of greenhouse gases and other pollutants, and spatial disaggregation, supporting QA / QC processes.

Moreover, mortal remains have been added to cremation of corpses.

III. Planned improvements and QA activities

III.1 Solid waste disposal on land

Investigation on industrial sludge disposed into landfills is planned for the future.

Regarding the energy conversion efficiency of biogas engine, actually assumed equal to 0.3, as the technological evolution is probably leading to increase efficiency to around 40%, further investigations are planned.

The National Waste cadastre is managed by ISPRA and is formed by a national branch hosted by ISPRA and regional and provincial branches hosted respectively by the Regional Agencies for the Protection of the Environment. So the system requires continuous and systematic knowledge exchange and QA/QC checks in order to ensure homogeneity of information concerning waste production and management throughout the entire Italian territory.

Moreover, ISPRA was involved in an in depth environmental study of Malagrotta area, where the biggest European non hazardous waste landfill is located. The study was 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 improved the national inventory and were used as quality control procedure.

III.2 Wastewater handling

Possible improvements in future submissions could come from the share of information with the Office of the Ministry of the Environment, Territory and Sea who is responsible for water activities.

Some improvements could also come from the analysis of E-PRTR data.

Methane conversion factor from domestic and commercial wastewater will be investigated in the future. Moreover the served population equivalent figures supplied by the National Institute of Statistics will be verified with the results of the next national survey.

III.3 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. In order to update the government's strategy to achieve Italy's emissions reduction target under the Kyoto Protocol, the GHG emission projections for 2020, specific to waste management, have been updated with a focus on how this could influence the waste composition. The new information on waste composition will improve also waste incineration emission estimates.