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Quality Assurance/Quality Control Plan for the Italian Emission Inventory. Year 2011

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e la Ricerca Ambientale

Quality Assurance/Quality Control Plan for the Italian Emission Inventory. Year 2011

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Contents

QA/QC General
2010 activities and future improvements

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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 a public review of the Italian inventory are not implemented yet. Nevertheless, 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.

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 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).

During this year submission, Montecarlo has been applied to some of the key categories of the Italian inventory and it is planned to extend the analysis to the entire inventory.

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 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/2010/ITA, which should be considered for the 2010 submission, is presented; responses to each subject are also included.

Review report para	Subject	Description	Response
14	Overview – 2. A description of the institutional arrangements for inventory preparation	The present ERT reiterates and refines the recommendations of the previous ERT that Italy apply a full Tier 2 uncertainty analysis for at least one inventory year in one annual submission…	Montecarlo analysis has been applied to the main key categories of the Italian inventory to estimate uncertainty for the year 2009. The study will be extended to the whole inventory for the next year submission.
22	Overview - 3. Follow-up to previous reviews	However, recommendations concerning the prioritization of improvements to its uncertainty analysis, the enhancement of transparency with regard to net carbon stock changes in land converted to forest land, and the further justification of its approach of calculating changes in soil carbon stock in the year following land-use conversions have not been addressed by the Party in its 2010 annual submission.	The prioritization of improvements related to the results of uncertainty analysis lead to the following revision. The activity data related to litter and soil pools have been updated, increasing the number of sampling used and reducing notably the uncertainty related to these pools (litter pool passed from 161% to 101%, while soil pool passed 152% from to 113%).

24 (a)	Overview - 4. Areas for further improvement – Identified by the expert review team	The ERT recommends that Italy implement its planned reallocation of emissions using EU ETS data within the petroleum refining subcategory for the entire time series, ensuring time-series consistency, following the IPCC good practice guidance	The reallocation of emissions using EU ETS data within the petroleum refining subcategory for the entire time series has been implemented
24 (b)	Overview - 4. Areas for further improvement – Identified by the expert review team	The ERT also recommends that Italy report in its next submission the use of reductants in iron and steel production under the industrial processes sector instead of under the energy sector, ensuring that there is no double counting between the two sectors, and that in doing so the Party take account of the quantity of carbon stored in steel produced	The quantity of carbon stored in steel produced has been accounted for in the carbon balance of the iron and steel production ensuring no double counting occurs. The carbon balance methodology does not imply to separate off input between the energy and industrial sectors
24 (c)	Overview - 4. Areas for further improvement – Identified by the expert review team	The ERT recommends that Italy include more discussion in the NIR as to why the current approach to estimating PFC emissions from aluminium production is conservative	Additional information has been provided in the NIR (paragraph 4.4.2).
24 (d)	Overview - 4. Areas for further improvement - Identified by the expert review team	The ERT also strongly recommends that the Party explain the rationale behind and justify (theoretically and/or factually) its approach of accounting for all soil carbon stock changes as a result of a land-use conversion when the conversion takes place instead of spreading those changes across a number of years (20 years is the default period), as this approach might lead to a loss of soil carbon and thus an overestimation of CO_2 removals.	A detailed and transparent description of the rationale used in the estimation process of soil carbon stock changes is provided in NIR (par. 7.1, par. 7.3.4 for land converting to cropland, par. 7.4.4 for land converting to grassland).

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. 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; 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 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. 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 CO_2 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 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 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
2010 activities and future improvements

Prepared by: Riccardo De Lauretis

May, 2011

National Air Emission Inventory: Energy

I. Objective

The improvements carried out during the preparation of the 2011 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/2010/ITA, which should be considered for the 2011 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 2011 are also presented.

Review report para	Subject	Description	Response
27	Energy - Sector overview-Transparency	Transparency in the reporting on oil and natural gas (fugitive emissions) could be improved, as methods have not been clearly described at the activity level; the frequent use of the notation key IE.(included elsewhere), such as for the aggregation of oil and gas exploration and venting under oil and gas production (fugitive emissions), makes it difficult to understand the methods applied.	Additional information has been provided in the NIR as regards the methodology. In order to improve transparency, fugitive emissions from oil extraction have been disaggregated among venting, flaring and production, while emissions from gas extraction have been disaggregated between flaring and production.
32	Energy - Sector overview-CO_2	The ERT noted that the use of EU ETS data for fugitive emissions from oil flaring activities has not resulted in a consistent time series as required by the IPCC good practice guidance. The CO2 implied emission factor (IEF) jumps sharply from 2007 to 2008 from 2,541,500 to 6,338,800 kg CO_2/Mm^3… The ERT recommend that Italy implement its planned reallocation of emissions…	The whole time series has been updated. The reallocation of emissions using EU ETS data within the petroleum refining subcategory for the entire time series has been implemented.
36	Energy-International bunker fuels	Discrepancies exist between CRF tables 1.C and 1.A(b) in relation to residual fuel oil (international marine bunkers) for all years of the time series. … the ERT recommends that it does so in the next submission	The issue of discrepancy has been solved

37	Energy-Feedstock and non-energy use of fuels	The ERT encourages Italy to further clarify its explanation of how it determines the final carbon storage factors that are used in CRF table 1.A(d), in order to improve understanding	Additional information has been provided in the NIR.
38	Energy – Key categories-Stationary combustion: solid fuels-CO_2	The ERT recommends that Italy report in its next annual submission the use of reductants in iron and steel production under the industrial processes sector instead of under the energy sector, ensuring that there is no double-counting between the two sectors.	The quantity of carbon stored in steel produced has been accounted for in the carbon balance of the iron and steel production ensuring no double counting occurs. The carbon balance methodology does not imply to separate off input between the energy and industrial sectors.
39	Energy – Key categories-Stationary combustion: solid fuels-CO_2	The ERT recommends that, as a part of reallocating the emissions from the use of reductants in iron and steel production to the industrial processes sector, the Party amend its methodology to take account of the quantity of carbon stored in steel produced, in order to avoid a subsequent overestimate of CO_2 in the industrial processes sector.	See previous para
40	Energy – Key categories- Oil and natural gas: liquid fuels . CH_4 and CO_2	The methods used for estimating fugitive emissions from petroleum refining (process emissions resulting from restoration of the catalyst and flaring emissions) are not well documented in the NIR …. The ERT recommends Italy include this information in the category specific section of fugitive emissions in the NIR …	Additional information has been provided in the NIR.
41	Energy – Key categories- Oil and natural gas: gaseous fuels. CH_4 and CO_2	The CH_4 IEF for natural gas production and processing declined from 2,911.93 kg/Mm^3 gas produced in 1990 to 1,611.10 kg/Mm^3 in 2008, while the CO_2 IEF stayed constant. … The ERT recommends that Italy include this information in the NIR and also provides a discussion on the drivers behind this trend	Additional information has been provided in the NIR.

III.   Planned improvements and QA activities

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. A further use of this database will regard the calculation 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 project is waiting for being funded.

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
2010 activities and future improvements

Prepared by: Andrea Gagna, Barbara Gonella, Ernesto Taurino

May, 2011

National Air Emission Inventory: Industrial Processes

I.   Objective

The improvements carried out during the preparation of the 2011 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/2010/ITA, and which should be considered for the 2011 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 2011 are also presented.

Review report para	Subject	Description	Response
45	Industrial processes – Adipic acid production – N_2O	…the ERT recommends that Italy further improve transparency by correcting the formula that is reported in the NIR and explaining how this formula is used to check Efs provided by the production plant, and include a description of the emission estimation methodology applied by the production plant that was used by Italy for its 2010 annual submission.	Additional information has been provided in the NIR (paragraph 4.3.2).
46	Industrial processes – Aluminium production – PFCs	…In the case that such data are not available, the previous ERT recommended that Italy enhance the transparency of its inventory by adding more discussion on why the current approach to estimating these emissions is conservative, including a comparison of the IPCC default EFs and the EFs used by Italy for 1990. In addition, if Italy wishes to show that its time series is conservative by comparing it with a time series using another approach, the previous ERT recommended that Italy use default EFs from the IPCC good	Additional information has been provided in the NIR (paragraph 4.4.2).

		practice guidance for this alternate approach. According to its latest annual submission, Italy plans to follow these recommendations for its next submission. The ERT strongly recommends that Italy include the results in its next annual submission.	
47	Industrial processes - Limestone and dolomite use – CO_2	Italy recalculated the emissions from this category to account for the emissions from paper production. However, the ERT noted that recalculations have only been performed for the period 2000-2008. The ERT recommends that Italy apply the recalculation also to the earlier years of the time series (1990-1999) to ensure consistency across the entire time series and the completeness of the coverage of the emission estimate.	The recalculation has been applied also to the earlier years of the time series (1990-1999)
48	Industrial processes - Aluminium production – CO_2	Italy has reported a recalculation of the emissions from this category resulting from an update of the EFs for aluminium production for the period 2002-2008 and the use of a tier 2 method to estimate the emissions in this time period. ... For the period 1990-2001, an EF of 1.55 t CO2/t primary aluminium production was assumed (tier 1); this EF is the average of the EF contained in the Revised 1996 IPCC Guidelines (1.5 t CO2/t primary aluminium production) and the corresponding EF from the 2003 Aluminium Sector Greenhouse Gas Protocol (1.6 t CO2/t primary aluminium production) for the pre-baked anode process. … The ERT recommends that Italy recalculate emissions for the earlier years of the inventory time series, using the tier 2 method and plant-specific data to ensure time-series consistency, and report thereon in its next annual submission, including the impact of the recalculation on the earlier years of the time series. The ERT also recommends that Italy provide improved information relating to	Additional information has been provided in the NIR (paragraph 4.4.2) to explain the rationale of using the same emission factor for the period 1990-2001. No detailed information is available from the plant to apply the tier 2 method to this time period.

		the justification of the approach used by the Party in the NIR and a discussion on the conservativeness of the time series.	

Other improvements not identified during the review process have been carried out. Additional data supplied by the integrated iron and steel plants allowed to improve 2008 estimates. Activity data relative to early nineties have been compared and checked with old database CORINAIR recovering useful data which have resulted to a decrease of CO_2 emissions by 0.04% in 1991 and 0.02% in 1995.

Regarding F-gas, recalculations in primary aluminium sector have been done because ALCOA has provided certificated emissions from 2005, calculated under Emission Trading Scheme.

CO_2 emissions from primary aluminium have been updated from 2000 on the basis of activity data derived from ETS.

Activity data from ferroalloys production have been updated since 2002 on the basis of new information derived from ETS and personal communication. Finally, HFC 245fa emissions from foam blowing have been estimated for the whole time series on the basis of updated information on gas consumption from the relevant industrial industry. Moreover, HFC 152a potential emissions have been added considering the information under the reporting of fluorinated gases (EC, 2006), of some companies resubmitting data on production, import or export, for the years 2007 and 2008. Minor modifications have been made because of update of activity data in estimating emissions from semiconductor manufacturing and from mobile air conditioning.

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

The average emission factor of CO2 from electric arc furnaces will be checked with ETS data communicated in the next years.

CO2 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 CO2 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. In particular, comparisons can be carried out for cement, lime, limestone and dolomite, and glass sectors

QA/QC Solvent and other product use
2010 activities and future improvements

Prepared by: Daniela Romano

May, 2011

National Air Emission Inventory: Solvent and other product use

I.   Objective

The improvements carried out during the preparation of the 2011 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 2011 submission occurred in category 3D with respect to CO_2 and NMVOC emissions from both domestic solvent use and fat edible and non edible oil extraction. Specifically, the time series from 1994 to 1998 and from 2005 to 2008 has been revised considering an updating of the apparent consumption of cosmetics and from 2006 also modifications of fat edible and non edible oil activity data. For NMVOC emissions from category 3C, the only change regarded an update of polystyrene foam processing for 2008 on account of new information provided by the relevant industry.

Further investigation will regard 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 and they are available from the year 2007 and they have been already used as a verification of emission estimates.

	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 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
2010 activities and future improvements

Prepared by: Rocío Dánica Cóndor

April, 2011

National Emission Inventory: Agriculture

I.   Objective

This report describes activities and improvements carried out during the preparation of the national agriculture emission inventory - *submission 2011* (section II). Moreover, responses to the review process recommendations are reported in section III.

II.   Review process recommendations

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 2010" -* FCCC/ARR/2010/ITA; 22 November 2010 [1]). In Table 1, recommendations and response are provided.

In general, the agriculture emission inventory (*2010 submission*) has a positive balance. Questions formulated during the review process were solved promptly during the review week and all recommendations provided have been incorporated in the 2011 submission.

Par.	Subject	Description	Response
53	Agricultural soils N_2O	53. Italy uses a tier 1 method and a combination of IPCC default and country-specific EFs to estimate direct and indirect N2O emissions from agricultural soils, which is in line with the IPCC good practice guidance. The ERT reiterates the recommendation made by the previous ERT that Italy **report** the method used as .T1. instead of .D. in CRF summary table 3.	Italy has incorporated this change in the CRF Reporter for the 2011 submission.
55	Agricultural soils N_2O	55. The ERT noted that Italy has reported N2O emissions from **sewage sludge** under the waste sector. In response to a question raised by the ERT during the review week, Italy explained that there is no reliable information available to enable it to separate off the amount of sewage sludge that is applied to agricultural soils. However, the Party indicated that it was verifying the results of a recent study that will allow it to report a consistent time series of N2O emissions from sewage sludge applied to agricultural soils, and that these results are likely to be included in its next annual submission. The ERT recommends that Italy provide in its next NIR sufficient information on the results of this study and the resulting estimation method, and that it	Italy has collected a complete and consistent time series of the activity data (sewage sludge applied to soils) and has estimated nitrous oxide emissions for this source (direct and indirect emissions).

[1] http://unfccc.int/resource/docs/2010/arr/ita.pdf

		provide information on any recalculations undertaken and their impact on the emission trend.	

Table 1. Response to the review process recommendations

III.   Planned improvements and QA activities

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 *2011 submission* 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 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

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[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.

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.

2.3 Estimation improvements

In Table 2, a list with the different activities developed for the *2011 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 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[4],[5]. Still further efforts on theoretical assessment of nitrogen excretion data will be done base on N balance methodology[6]. 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, ISPRA team is planning to implement a Monte Carlo analysis for key sources. For the agriculture sector, an initial assessment has involved the estimation of uncertainties with Monte Carlo for the '4B enteric fermentation' source, results are shown in the *NIR submission 2011*.

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

[5] 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.

[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	Gas	Year		Activities
				2011	2012	
General	Activity data	Population	NH₃/GHG			Data from 2009 and provisional data from 2010 has been uploaded.
	Activity data	Surface/production	NH₃/GHG			Data from 2009 and provisional data from 2010 has been uploaded. Updated information from tobacco surface and production was provided by ISTAT for 2007 and 2008.
	Activity data	Milk production	NH₃/GHG			Milk production data 2009 has been collected (ISTAT new database on-line) and provisional data for 2010 has been uploaded.
	Activity data	Fertilizer	NH₃/GHG			Data from 2009 has been collected (ISTAT new database on-line)
Enteric fermentation	Dairy cattle	Fat content	GHG			Data from 2009 fat parameter has been collected (ISTAT new database on-line)
	Dairy cattle	Portion cow giving birth	GHG			Data from 2009 has been collected (AIA, 2010)
	Dairy cattle/buffalo	Milk production	GHG			Data from 2009 on milk production has 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	NH₃/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	NH₃/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.
	Livestock categories	Production methods	NH₃/GHG			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 2009 has been collected (web site TERNA)
Rice cultivation	Activity data	Days of cultivation and cultivars	GHG			Data from 2009 and provisional data from 2010 has been uploaded. Cultivation dates for rice varieties have been updated from 2005-2008.
	Rice	Emission factor	GHG			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 since 2007. Data is still not available. Probably during 2011 a publication will be available.
Agricultural soils	Direct emissions	Sewage sludge	GHG			Italy has reconstructed a complete and consistent time series for the amount of sewage sludge applied to soils. Estimations have been provided in the 2011 submission according to

					GPG IPCC guidelines.
	Activity data					Results obtained from the research study on land spreading have been compared with those obtained with the inventory process (CRPA, 2009).
		Fertilizer	NH$_3$/GHG			

Table 2. Improvements for the Agriculture emission inventory (GHG/CLRTAP)

QA/QC LULUCF
2010 activities and future improvements

Prepared by: Marina Vitullo

May, 2011

National Air Emission Inventory: LULUCF

I.   Objective

The report summarizes the improvements and remarks, which have been identified during the preparation of the 2011 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 2010, are described.

Review report para.	Subject	Description	Response
22	Overview - 3. Follow-up to previous reviews	However, recommendations concerning the prioritization of improvements to its uncertainty analysis, the enhancement of transparency with regard to net carbon stock changes in land converted to forest land, and the further justification of its approach of calculating changes in soil carbon stock in the year following land-use conversions have not been addressed by the Party in its 2010 annual submission.	The activity data related to litter and soils pools have been updated, increasing the number of sampling used and reducing notably the uncertainty related to these pools (litter pool passed from 161% to 101%, while soils pool passed 152% from to 113%).
24	Overview - 4. Areas for further improvement - Identified by the expert review team	The ERT identifies the following cross-cutting issues for improvement: (d) The ERT also strongly recommends that the Party explain the rationale behind and justify (theoretically and/or factually) its approach of accounting for all soil carbon stock changes as a result of a land-use conversion when the conversion takes place instead of spreading those changes across a number of years (20 years is the default period), as this approach might lead to a loss of soil carbon and thus an overestimation of CO_2 removals.	A detailed description of the rational used in the approach used in the estimation process of soil carbon stock changes is provided in NIR (par. 7.1, par. 7.3.4 for land converting to cropland, par. 7.4.4 for land converting to grassland).
58	Land use, land-use change and forestry - Sector	...The ERT encourages the Party to further improve the QA of its LULUCF inventory and to report	A detailed description of the improvement carried out is provided in the relevant

	overview	thereon in its next annual submission.	paragraphs of NIR (i.e. par. 7.2.6 for forest land).
59	Land use, land-use change and forestry - Sector overview	...The ERT noted that the default method of the IPCC good practice guidance for LULUCF assumes that the carbon stock change in soils, following land-use conversion, occurs over the subsequent 20 years. Italy has also mentioned this default value in the NIR but has explained that, based on the above-mentioned scientific studies, it is more relevant to allocate all the emissions or removals to the year following the year in which the land-use conversion took place. The ERT recommends that the Party provide more data and information to support this assumption.	A detailed and transparent description of the rational used in the approach used in the estimation process of soil carbon stock changes is provided in NIR (par. 7.1, par. 7.3.4 for land converting to cropland, par. 7.4.4 for land converting to grassland).
62	Land use, land-use change and forestry - Sector overview	The overall uncertainty of the five forest carbon pools was estimated to be 84.9 per cent. The ERT recommends that Italy prioritize, within this sector, the improvement of the uncertainty analysis for the forest carbon biomass pools. The ERT also recommends that the Party reconsider the mathematical approach used to compute the association between carbon stock in living biomass and litter, because the uncertainty values associated with the models currently used are rather large.	The activity data related to litter and soils pools have been updated, increasing the number of sampling used and reducing notably the uncertainty related to these pools (litter pool passed from 161% to 101%, while soils pool passed 152% from to 113%). Therefore there was a remarkable reduction in the overall uncertainty that, in 2011, was estimated to be 68.2%.
66	Land use, land-use change and forestry - Forest land remaining forest land - CO_2	The Party has provided a satisfactory validation of the modelling system used for estimation of carbon stock changes. However, the ERT recommends that Italy improve its documentation on the underlying model, including information on equations used (e.g. yearly increase of growing stock per ha).	A detailed and transparent description of modelling system is provided in NIR (par. 7.2.4 for forest land, par. 7.3.4 for plantation and par. 7.4.4 for other wooded land).
67	Land use, land-use change and forestry – Cropland remaining cropland - CO_2	Tier 1 and tier 3 methods were used to calculate carbon stock changes for this category. Changes in litter and soil carbon in mineral soils in plantations were estimated using linear regression with above-	The regressions applied to estimate changes in litter and soil carbon in mineral soils have been modified on the basis of the availability of new activity data. A detailed and transparent

		ground biomass. The ERT recommends that the Party enhance transparency by providing statistical information about the applied model, in particular coefficients of determination, standard error of the estimate, number of samples, etc., in tables 7.18, 7.19 and 7.20 of the NIR. The ERT appreciates that the Party provided some of this information during the review week upon request, and recommends that the Party include this information in its next annual submission.	description of modelling system is provided in NIR (par. 7.2.4 for forest land, par. 7.3.4 for plantation and par. 7.4.4 for other wooded land).
68	Land use, land-use change and forestry – Cropland remaining cropland - CO_2	The ERT noted examples of the use of the notation key "NO" in the reporting of this category in the relevant CRF tables, in particular for net carbon stock changes in organic soils, whereas the NIR includes a description of the relevant estimation methodology. The ERT recommends that the Party check consistency between the NIR and the CRF tables in this regard.	As in the 2010 submission also in 2011 submission activity data and emissions from organic soils have been reported in table 5.B, while methodological issues are described in par. 7.3.4 of NIR.
72	Land use, land-use change and forestry – Cropland remaining cropland - CO_2	The Party has not reported emissions from wildfires or biomass burning on grassland remaining grassland. It is not clear to the ERT whether these activities are indeed "NO", given that wildfires are affecting forest land in the country and could spread to grassland, particularly shrubland. The ERT recommends, if emissions from wildfires on grassland, cropland and wetlands are already included in the estimates of emissions from forest fires, that the notation keys in the CRF tables be updated. If this is not the case, the ERT recommends that the Party provide further evidence to support the justification that fires are not occurring on land under these other land-use categories.	A description of the improvement carried out is provided in the par. 7.12.2 of NIR.
75	Land use, land-use change and forestry –Land converted to grassland - CO_2	The Party assumes that changes in carbon stocks occur in the first year after the land-use conversion, rather than considering them over the time period specified by the	A detailed description of the rational used in the approach used in the estimation process of soil carbon stock changes is provided par.7.4.4 of NIR.

IPCC good practice guidance for LULUCF (20 years as default). As a result of this assumption, carbon stock changes in mineral soils were estimated as high as 14.12 t C ha^{-1} yearly, which is far higher than biological values and might lead to considerable overestimations of removals in the case of conversion from cropland to grassland. The ERT recommends that the Party revise or further justify this assumption to avoid the possible overestimation of removals.

Table 1. Response to the review process recommendations

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.

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	-	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	L, 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, T	106.1	-100.3; 49.2

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

Forest land (5A)
In 2011 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 2010 submission, plantations and shrublands, that don't fulfil national forest definition, have been reported into cropland category (plantations) and in grassland category (shrublands).
Considering that national statistics on total commercial harvested wood, for construction and energy purposes, have been considered underestimated,

particularly concerning fuelwood consumption[7], 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.

To estimate litter and soils carbon amount from the aboveground carbon amount, linear relations were used, on the basis of the results of the European project Biosoil[8] (for litter and soil organic content) and a Life+ project FutMon[9] (Further Development and Implementation of an EU-level Forest Monitoring System), for the aboveground biomass.

The INFC data related to the soils survey, expected in 2011, 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 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 2011 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.

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[7] - APAT - ARPA Lombardia, 2007. Stima dei consumi di legna da ardere per riscaldamento ed uso domestico in Italia, Rapporto Finale;

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

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

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 INEMAR10, 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:

	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%

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

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 (Tabacchi11 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.

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.

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

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

[11] 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.

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.

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.
In response to ERT remark in the previous review, 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.
To estimate litter and soils carbon amount from the aboveground carbon amount, linear relations were used, on the basis of the results of the European project Biosoil[12] (for litter and soil organic content) and a Life+ project FutMon[13] (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 2011 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.

Grassland (5C)

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[12] BioSoil project – http://biosoil.jrc.ec.europa.eu/; http://forest.jrc.ec.europa.eu/contracts/biosoil
[13] FutMon: Life+ project for the "Further Development and Implementation of an EU-level Forest Monitoring System"; http://www.futmon.org/;

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.

In response to ERT remark in the previous review, 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.

To estimate litter and soils carbon amount from the aboveground carbon amount, linear relations were used, on the basis of the results of the European project Biosoil[14] (for litter and soil organic content) and a Life+ project FutMon[15] (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.

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.

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 2007-2009. The average area of land undergoing a transition from non-settlements to settlements during each year, from 1990 to 2009, has been estimated with the land use change matrices that have also permitted to specify the initial and final land use.

In response to ERT remark in the 2009 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.

Further investigation will be made to obtain additional statistics about settlements, comparing the added information to the time series developed from Corine Land

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

[15] 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

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.

Carbon emissions from agricultural lime application (5(IV))
In 2011 submission CO_2 emissions from application of carbonate containing lime and dolomite to agricultural soils have been estimated for the period 1998-2009, 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.

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
2010 activities and future improvements

Prepared by: Barbara Gonella, Ernesto Taurino

May, 2011

National Air Emission Inventory: Waste

I.   Objective

This report summarises the improvements, which have been identified during the preparation of the 2011 inventory submission for the waste sector.

II.   Review process recommendations

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/2010/ITA, and which should be considered for the 2011 submission is presented; responses to each subject are also included.

Para.	Subject	Description	Response
78	Waste – Sector overview - Transparency	The ERT noted from the Party's 2010 annual submission that Italy is undertaking an investigation on waste composition with a view to providing improved information on waste composition, the fraction of CH_4 in landfill gas and the amount of landfill gas collected and treated. Italy has also established a central database that contains information on waste sent to landfill. The ERT welcomes these ongoing improvements and encourages the Party to report on developments in this investigation in its next annual submission.	Emission estimates have been updated on the basis of the results of the study. Detailed descriptions of the improvements concerning activity data and waste composition have been provided in the NIR (paragraph 8.2.2).
80	Waste - Solid waste disposal on land – CH_4 - Transparency	Italy uses the tier 2 method to estimate CH_4 emissions from solid waste disposal on land, using country-specific AD and a combination of country-specific EFs and IPCC default values. The ERT commends Italy for its implementation of the recommendation of the previous ERT in relation to including in the NIR information on how the amount of CH_4 recovered was estimated from the amount of energy produced. The ERT encourages Italy to include an explanation of the finding of the energy conversion efficiency factor used to calculate the CH4 recovered in the NIR of its next annual submission.	Additional explanation has been provided in the NIR (paragraph 8.2.2 – Landfill gas recovered).
81	Waste - Solid	The ERT noted that tables with	Tables reporting methane and

waste disposal on land – CH₄ - Transparency	emissions data for solid waste disposal on land have been included in the uncertainty and time-series consistency chapter of the NIR. The ERT recommends that these tables be moved to before the uncertainty and time-series consistency chapter in order to improve transparency.	NMVOC emissions have been moved to paragraph 8.2.2

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

Ministry for the Environment, Land and Sea has supplied a complete summary of sewage sludge production in each region of Italy, as well as sewage sludge used for agricultural purposes, in the framework of the reporting commitments fixed by the European Sewage Sludge Directive (EC, 1986) transposed into the national Legislative Decree 27 January 1992, n. 99. Data are available from 1995. The analysis of these time series has convinced the Party to update the entire time series from 1990, because the published values already available for 1987, 1991 and 1993 but not used in previous submissions.

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).

Moreover, in the framework of EPER/E-PRTR registry the methodology used to estimate emissions from wastewater handling will be available to the operators of wastewater treatment plants for their data reporting.

Finally, 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.

Activity data regarding equivalent inhabitants served by treatment systems have been updated from 2000. Moreover, N_2O emissions from human sewage have been recalculated because FAO has updated protein intake time series.

For the year 2008, activity data from the two incineration plants, which treat industrial waste, have been updated. The main differences are related to cremation of human bodies. Finally, for the incineration plants reported in the national EPER/E-PRTR registry, verification on emissions has been carried out.

III.   Planned improvements and QA activities

Solid waste disposal on land

A big effort has been done for this submission in order to update and improve waste composition and waste typology disposed into municipal landfills. Actually, more

recent data on fraction of CH_4 in landfill gas and on the amount of landfill gas collected and treated are not available. 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. Moreover, a check of biogas Lower Calorific Value is planned, because of the availability of information from the national energy transmission grid operator (TERNA).

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 be improve the national inventory and could be used as quality control procedure.

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 EPER/E-PRTR data.

Waste incineration

As reported for solid waste disposal on land, the waste composition is very important to improve CO2 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.

In order to improve QA/QC activity, a rearrangement of incinerators database is planned.

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, especially for CH_4 emission factor and the input percentage of waste treated as compost in mechanical-biological treatment plants.