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Technical Assessment of Romania's National GHG Inventory: Analysis and Recommendations

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ABBREVIATIONS AND ACRONYMS

CC	Climate Change
CCS	Carbon Capture and Storage
CO ₂	Carbon Dioxide
CO ₂ eq	Carbon Dioxide equivalent
CRF	Common Reporting Format
DPSIR	Driving Forces-Pressures-State-Impacts- Responses
EEA	European Environment Agency
EFs	Emission Factors
EPA/APM	Environment Protection Agency/Agentie de Protectia Mediului
ERU	Emission Reduction Unit
EUR	Euro currency
ETS	Emission Trading Scheme
EU	European Union
EUA	European Union emission Allowances
ESIF	European Structural and Investment Funds
FDES	Framework for the Development of Environmental Statistics
FMP	Forest Management Plan
GD	Government Decision
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GIES	General Inspectorate for Emergency Situations
GoR	Government of Romania
GPG	Good Practice Guidance
IB	International Body
ICAS	National Forest Research Institute
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
ISPE	Institute for Studies and Power Engineering
IWT	Inland Waterway Transport
JI	Joint Implementation
KM	Kilometer
KP	Kyoto Protocol
LULUCF	Land use, Land use change and Forestry
MA	Managing Authority
MARD	Ministry of Agriculture and Rural Development
MECC	Ministry of Environment and Climate Change

MEF	Ministry of Environment and Forests
MF	Ministry of Forests
MoU	Memorandum of Understanding
MRDPA	Ministry of Regional Development and Public Administration
MT	Ministry of Transport
MW	Megawatt
NAER	National Authority for Energy Regulation
NCCC	National Commission on Climate Change
NEEAP	National Energy Efficiency Action Plan
NEPA	National Environmental Protection Agency
NGHGI	National Green House Gases Inventory
NRDP	National Rural Development Program
NS	National Statistics
NSO/NIS	National Statistical Office/National Institute of Statistics
NSP	National Strategic Plan
OP	Operational Program
PA	Partnership Agreement
PIU	Program Implementation Unit
RAS	Reimbursable Advisory Services
SFM	Sustainable Forest Management
TA	Technical Assistance
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

Background

This report is a technical assessment of Romania's National Greenhouse Gas (GHG) inventory. It provides a detailed analysis of the current processes and procedures used for undertaking the GHG inventory in the country and offers ideas and recommendations to enhance the coherence, consistency, and efficiency of the GHG Inventory system.

Romania was the first country in Annex 1 of the UNFCCC to have ratified the Kyoto Protocol (Law nr.3/2001). Following Romania's accession to the European Union (EU) in 2007, the EU-Emission Trading Scheme (ETS) was fully implemented. As a Party to the United Nations Framework Convention on Climate Change (UNFCCC), and its Kyoto Protocol, Romania is required to elaborate, regularly update and submit the national GHG Inventory. Romania has fulfilled this requirement for all past years and the inventory data may be found in the websites of UNFCCC and Eurostat. The country has a national Register of GHG emissions connected to the EU and to the UNFCCC and has transposed all relevant EU legislation.

Since the GHG inventory data is subject to the verification of UNFCCC and Eurostat, this analysis does not assess the quality of the emissions inventories that Romania has already produced, nor does it question the data that has been used in the past. The objective is not to try to change the entire process nor to question past results, but rather to analyze the procedures used and the system of data gathering and processing with a view to finding ways to ensure better data consistency and coherence and improve efficiency. The recommendations are also intended to:

- (i) find ways for improved cooperation and coordination among the involved institutional entities in order to eliminate inefficiencies and barriers;
- (ii) identify opportunities to clarify and simplify the legal requirements and framework;
- (iii) improve preparation for the coming changes in the evaluation methodology, i.e. Intergovernmental Panel on Climate Change (IPCC) 2006;
- (iv) increase the reliability and the efficiency of the information flow for data processing; and
- (v) recommend further institutional support for post-project use of the economic model and other methods developed in the Climate Change RAS in order to ensure project sustainability.

The overwhelming conclusion drawn from the evidence available to the Report is that there is a clear need for deeper cooperation between the Ministry of Environment and Climate Change (MECC) and the National Statistical Office (NSO) in emission inventory compilation.

Addressing data discrepancy through enhanced cooperation between EPA and NSO

Present status: Presently the GHG emissions inventory is undertaken using the framework established by the IPCC. This framework is evolving and Romania is preparing for the application of the required IPCC 2006 methodology. The sectors considered within the reporting of GHG emissions are the Energy sector, Industrial processes, Solvents and other products use, Agriculture, Land Use, Land Use Change and Forestry (LULUCF), Waste management and other sectors. In most countries including Romania, the process of gathering and processing the data for the GHG emissions inventory is the responsibility of the Ministry of Environment and the system of Environmental Protection Agencies, with the cooperation of the National Statistical Office (NSO) in particular on aspects related to Eurostat.

An important finding is that there are differences/discrepancies between the definition of the energy sector in the IPCC methodology and the definition in the national statistical data reported to International Energy Agency (IEA). This creates differences in values and poses challenges to energy sector data integration. In addition, the final data verification is done by the National Environmental Protection Agency (NEPA) and associated EPAs at the local level. This situation omits some of the experience of the national statistics operator and its local system NSOs.

Recommendations: The potential data inconsistencies created by differences in the definition of energy sector can be corrected during the final verification stage of the process. Nevertheless the elimination of any discrepancy earlier in the process would help increase overall efficiency. Furthermore the introduction of an intermediate verification stage of the data done by the NSO may help ensure better data consistency. Therefore, it is suggested that a protocol for cooperation is established between the NSO and EPA. There are existing protocols of cooperation between other entities involved in the GHG inventory process detailed in section 4 of this Report which may serve as a useful model. Two important aspects of this protocol of cooperation would be 1) to ensure an early check on the potential discrepancy in energy data and 2) to ensure full use of the experience of the NSO in data processing.

In the long term Romania's statistical system will require significant improvements. In light of the increase in importance of climate change adaptation and mitigation and growing evidence of socio-economic impacts of climate change, it is clear that Romania needs to continue to improve its statistical systems, particularly data gathering and analysis of climate change-related risks, adaptation, and health data. More studies will be needed to help further recommend on how to improve the collection and analysis of national statistical data for better responding the requirements for improvement of the GHG inventory.

The sections below further provide an overview of the main elements of the inventory process, the role of the participating entities, the legal documents and the institutional arrangements and the flow of information.

Validation of data collected

Present status: In Romania the primary responsibility for the national GHG inventory belongs to the Ministry of Environment and Climate Change (MECC). MECC is responsible for the annual reporting to UNFCCC and to the EU Commission, and works in cooperation with the National Institute for Statistics and its system of local offices, which are responsible for elements of data reporting to Eurostat. The official statistical system in the case of GHG emissions is comprised of several entities including the system of local environmental agencies, the National Statistics Offices (NSOs) and the reporting entities as defined and required by law. The spatial dimension is very important in the context of climate change. Official statistics include a link to geographic regions, and several statistical offices also record exact locations and co-ordinates through georeferencing. The primary sources of data are provided in the table below:

Sector	Data sources
Energy	National Institute for Statistics - Energy Balance Energy producers Ministry of Economy Romanian Civil Aviation Authority Transgaz SA National Authority on Regulating in Energy National Agency for Mineral Resources
Industrial Processes	National Institute for Statistics- Statistical Yearbook and other data sources Industrial operators through 42 Local/Regional Environmental Protection Agencies Direct information from industrial operators
Solvent and other product use	National Institute for Statistics Industrial operators through 42 Local/Regional Environmental Protection Agencies
Agriculture	National Institute for Statistics

ture	
LULU CF	National Institute for Statistics through Statistical Yearbook Ministry of Agriculture, Forests and Rural Development (MADR)-Forests General Directorate (2007-2008); Ministry of Environment and Forests-Forests General Directorate (2009-2011) National Forest Administration (RNP)
Waste	National Institute for Statistics National Environmental Protection Agency Public Health Institute National Administration “Romanian Waters” Food and Agriculture Organization Landfill operators through 42 Local/Regional Environmental Protection Agencies

Source: MECC

The data gathered by the EPA system comes from various reporting entities including commercial enterprises. However, there are sometimes disruptions to the flow of data from such entities for example when a company becomes insolvent, or the algorithms for data processing are not fully disseminated at the level of the local EPAs. There are a number of improvements possible including enhanced information flow from reporting companies to the EPA, improved data processing and enhanced human resource development and retention.

Recommendations: In order to have better data coherence an annual check with the Register of Commerce is necessary in order to determine the reporting entities that may be in special situations (e.g. are facing insolvency). In this case, even if the entities are still reporting, the verification of data will be important. The NSO and/or EPA must be able to ensure this follow up. Also, full dissemination of data gathering and processing algorithms should be undertaken to increase coherence within local EPAs. This should be correlated with the environmental authorization system of the Environmental Protection Agencies (EPAs) and with the General Inspectorate of Emergency Situations system of monitoring that is now partially responsible for ensuring the reliability of data.

Building capacity for emission projections

Present status: The EU's latest energy and climate change package released in January 2014 as well as decision 406/2009/EC require specific GHG emissions limits for ETS and non-ETS sectors. This requires new categories of data reporting sources within the GHG emissions inventory. These requirements apply only at the EU level. In addition EU membership requires the development of the capability to make projections of emissions by March 2015.

The legislation for the GHG inventory mandates the provision of data for each year but does not address past or future projections. To date there are no specific legal provisions for data gathering and processing related to projections of future GHG emissions despite the awareness that such capability must be developed by March 2015. In addition, the models and algorithms are not yet fully developed to meet this goal. Clear separation of the ETS and non-ETS emissions reporting requirements and especially of the forecasting capability in these two domains will also require further development of existing systems.

Recommendations: The deadline for having projection capabilities is rapidly approaching. It will be important to draft the legal documents required for implementing this projection capability as soon as possible. It is recommended to work with a specialized legal company to prepare the draft and to move the draft forward through the government decision making processes. It will also be important to implement the model developed within sectoral and macro-economic analysis and modeling work in the CC RAS in order to undertake assessments of the impact of the GHG emission projections on the Romanian economy.

Creating an environmental Codex of laws related to GHG inventory

Present status: The existing legal framework includes 16 Directives, 6 Decisions and 18 Regulations of EU legislation and 2 Governmental Decisions, 2 Orders of the Minister of MECC, 2 orders of the President of NEPA and 2 Protocols of cooperation between MECC and other ministries and entities involved in reporting GHG emissions data. The present legislative framework allows for a process of gradual learning and iteration in the development of the GHG inventory and for the development of new legislation to accommodate new requirements such as for forecasting as the GHG inventory evolves. Nevertheless the legislation is dispersed and hard to find in one place. This creates significant challenges for individuals and entities wishing to understand and follow the evolution of this system. In addition, there is no Protocol of cooperation with the NSO as there is with other entities, such as The Ministry of Forests (MF) and MECC

Recommendations: A thorough analysis should be undertaken by a specialized legal consultant, with the objective of creating a Codex of environmental laws that gathers all related legislation into one easy to read reference. Such a reference should be regularly updated to reflect changes and progress in relation to international negotiations. The development of an environmental

Codex of laws is not unique and such a codex can be found in a number of countries including for example Italy and France. Also, a protocol of cooperation should be drafted and signed with the NSO to ease data exchange and to better define and take advantage of the data verification capabilities of the NSO as mentioned above. This protocol would complete the existing legal documents applicable to the GHG inventory process.

Strengthening institutional and personnel arrangements

Present status: The Romanian Governmental Decision (GD) no. 668/2012 modified and completed decision no. 1570 adopted in 2007 for establishing the National System for the estimation of anthropogenic greenhouse gas emissions levels from sources and removals by sinks, as well as decision no. 48/2013 on the organization and functioning of MECC. Together these decisions regulate all the institutional, legal and procedural aspects for estimating greenhouse gas emissions/removals levels, as well as legislating the obligation to report and to archive the National Greenhouse Gas Inventory (NGHGI) information, including supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol. In this respect, the GD no. 48/2013 also modified the GD no. 1570/2007 which as modified and completed, aims to ensure the fulfillment of Romania's obligations under the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol (KP) and European Union legislation. The elements characterizing the institutional arrangements are detailed in chronological order within this Report.

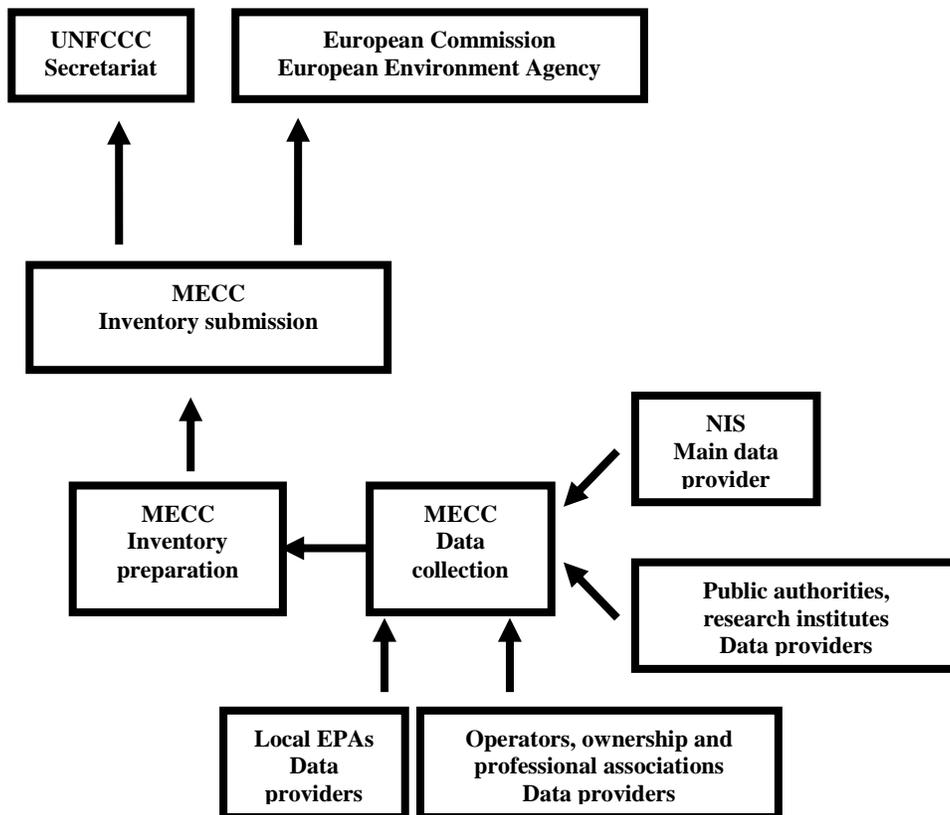
There is a need to extend institutional and personnel support in order to effectively address further requirements for projections of emissions as required by the EU by March 2015. The National Committee on Climate Change that until now has only played a limited role, i.e. approval of the Joint Implementation projects undertaken in the country, must be reactivated and have its role extended to provide the appropriate guidelines and to guarantee the implementation of CC requirements and policies in Romania. Moreover, there is potential for high turnover of experienced MECC staff who works on the GHG inventory.

Recommendations: Secure appropriate institutional support to implement the models for impact assessment and the evaluations of measures to reduce emissions that have been developed within this CC RAS and extend the projection data processing in association with these models. A solution would be to involve academia and dedicated technical NGOs together with the MECC, to set up the institutional support based on knowledge acquired and transferred during the CC RAS with the objective of developing a coherent system to evaluate ex-ante and ex-post the impacts of CC policies and the impact of the EU required 20% CC components for the allocation of ESIF funds. It will be important to explore options for the institutional design of such support systems as sources of financing. Those providing institutional support could also be responsible for preparing specific evaluation and reporting procedures for various types of entities that

according to the law are part of the GHG inventory system. It would also be valuable to accelerate the approval of legislation for the extended role of the National Committee on Climate Change. Lastly it will be important to create and maintain the competence and stability of MECC and local EPA personnel through the provision of structured training, compensation and a career development system.

Information flow and reporting

Present status: An analysis of information flows provides an opportunity to check that there are sufficient sources of information (reporting and data collection entities involved) and that there are effective means to transfer information and ensure its quality. It is important to assess whether the feedback for data quality verification is in place and whether it is ensuring the quality of information provided by key entities. The figure below shows the institutional arrangements currently in place in Romania for the development of the GHG inventory and the associated directions of information flow:



Source: prepared and provided by MECC during the study

The technical analysis concluded that there is inadequate control of the direction and quality of information. At present, the stages of data gathering and processing as well as the verification cycles in the process of GHG inventory reporting are not entirely clear and are difficult to represent diagrammatically. The relationship between different data sources (local/national, private/public, etc.) and institutions (namely, NSO, EPA, MECC, etc.) as well as the consistency of data produced is not clear. Systems to control the quality of information are currently limited and in need of improvement.

Recommendations: A diagram is provided in the Report to depict the process to help improve information transfer and flow. The involved parties in the inventory process are listed starting with the MECC and NSO, followed by the ministries and other reporting entities. The receivers of the inventory data such as the EU Commission, the UNFCCC and the Eurostat are included at the end of the list. The sequence of events is described in relation to the flow of information in a more elaborate representation including the verification cycles recommended to improve the data quality.

Conclusions

This report is expected to be useful for the improvement of data gathering, processing and analysis for the yearly greenhouse gas inventory as required by the United Nations Framework Convention on Climate Change (UNFCCC) and the EU. It also provides explicit recommendations to enhance the legal architecture and the capacity to forecast the evolution of GHG emissions in the Romanian economy. This forecasting is a new EU requirement that must be in place by March 2015. The estimation and reporting of GHG emission forecasts is a duty that is required both for the implementation of UNFCCC, and by the European Policy on Climate Change. The development of this inventory strongly relates to the development of analytical capability in Romania. The expected effects of implementing the recommendations in the technical assessment include reducing inefficiencies and extend resources required in inventory process; improving reliability of emission estimates; improving technical capacity of MECC and other agencies and external entities; and helping understand future emissions and any potential sector that might exceed EU emission limits.

1 INTRODUCTION

In order to integrate climate change into its development process, in 2013 the Government of Romania asked the World Bank to undertake a reimbursable advisory service (RAS) program on climate change and low-carbon green growth in Romania (refer to the CC RAS in the report). The CC RAS is aimed at helping the Romanian government develop and implement an ambitious climate change policy, in order to allow the emergence of a low carbon and climate resilient economy. The main goals of the RAS are to help update Romania's CC strategy adopted in July 2013 and to prepare an action plan, to facilitate the integration of climate actions into new national Operational Programs, to develop an analytical capacity in Romania to perform technical modeling activities, and to develop monitoring tools in order to ensure the efficient implementation of CC policies. This technical assessment of Romania's GHG inventory is one of the outputs of the World Bank Advisory Services.

The main objective of the Report is to analyze the current GHG inventory process in Romania, and provide recommendations for improving the system in order to increase the effectiveness and efficiency of inventory development in compliance with UNFCCC and EU requirements, including emissions forecasting provisions.¹ Specific findings and recommendations address data gathering processes, data consistency and coherence, and legal and institutional arrangements.

This Report describes the GHG inventory process and its history, analyzes the legal framework, documents and information provisions and flows related to making the inventory together with identifying the potential adjustments for improvement, assess reporting entities and correlation mechanisms to economic dynamics, in terms of completeness, coherence, response time constant to changes in the number of companies' impact on data reporting, and provides recommendations on the possibility to improve the inventory-making process in order to meet the requirements of emission projections.

The report is organized into seven sections as follows. Section 1 provides a general introduction to GHG inventories. Section 2 examines the processes and procedures used in the present GHG inventory system in Romania and the alignment of this system with international frameworks including the Framework for the Development of Environmental Statistics (FDES) and the IPCC Schematic Framework. Section 3 elaborates the challenges with the existing greenhouse inventory process including data gaps and weaknesses in the statistical infrastructure. Section 4

¹ This report does not address the quality of GHG emissions inventories developed by Romania nor data that has been reported and accepted by UNFCCC.

looks at the international and national legal requirements for greenhouse gas inventories. Section 5 provides analysis on the flow of information and the specific verification points to ensure data consistency and coherence. Section 6 provides a number of recommendations before the report concludes in section 7 with a summary of key recommendations. The annexes include a synthesis of the findings resulting from the discussions with MECC, a comparison of data quality requirements of EU statistical system and the IPCC, the application of the IPCC methodology (1996 methodology) in the case of Romania and the list of legal documents associated with undertaking the GHG inventory.

2 ROMANIA'S GHG INVENTORY PROCESS IN RELATION TO INTERNATIONAL REQUIREMENTS

Romania undertakes an annual GHG inventory in order to comply with international and European obligations. There is a need to comply both with the annual reporting obligations to UNFCCC and to the EU annual reporting needs applied to all member states. The MECC with its related agencies as well as the NSO have the responsibility for meeting these reporting requirements. The current chapter provides an overview of the national architecture and procedures related to these reporting requirements, identifying the main challenges, and proposing alternative frameworks for CC statistics in Romania.

2.1 The current institutional for Romania's GHG Inventory and the challenges to be addressed

Competencies

The MECC is responsible for Romania's national GHG inventory as well as for annual reporting to the UNFCCC and to the European Commission. The MECC works in collaboration with the National Institute for Statistics (to be further called National Statistical Office, NSO) which is responsible for components related to reporting to Eurostat. The national statistical systems² and official statistics³ are an important source of information on climate change and are particularly valued due to their adherence to international principles⁴. Given the sometimes controversial nature of climate change discourse, professional independence, commitment to well-defined quality standards, the use of sound and transparent methodologies, a focus on publishing data in consistent time series and a commitment to data accessibility are valued

² *National statistical systems* comprise the ensemble of statistical organizations and units within a country that jointly collect, process and disseminate official statistics on behalf of national government. They also include the mechanisms of interaction between suppliers, producers, users and other stakeholders. One agency has the coordination role of the national statistical system, usually the national statistical office. In addition, there are international statistical systems that focus on the production of official statistics at the regional or global level. The term "statistical system" used in this report refers generically to the ensemble of all national and international statistical systems.

³ *Official statistics* comprise any statistical activity carried out within a national statistical system, or under the statistical programme of an intergovernmental organization (definition from Statistical Data and Metadata eXchange 2009: www.sdmx.org/). They are by definition compiled in accordance with the Fundamental Principles for Official Statistics (unstats.un.org/unsd/methods/statorg/FP-English.htm), the European Statistics Code of Practice (epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-32-11-955/EN/KS-32-11-955-EN.PDF) or a similar authoritative international framework ensuring professional standards.

⁴ Namely the Fundamental Principles of Official Statistics and the European Statistics Code of Practice.

attributes of the NSO. Official statistics are an important source of reliable information because of the strict conditions and quality criteria under which they are produced.

The official statistical system in the case of GHG emissions is formed of several entities including the system of local environmental agencies, NSOs and the reporting entities as defined and required by law. This system for Romania will be further presented in the section 3 which further describes the GHG inventory development.

Official statistics include a link to the geographic region, and several statistical offices also record exact locations and co-ordinates through geo-referencing. The spatial dimension is very important in the context of climate change.

Challenges

Despite many competencies the statistical system needs to be enhanced to effectively address the issues of climate change and greenhouse gas emissions. Existing official statistics do not, in general, specifically focus on data that leads to the production of GHG emissions. One of the identified issues with the inventory system in Romania is related to the interface between the NSO and the local environmental agencies systems. This will be detailed later in the report in section 5 on institutional arrangement and information flow.

The Statistical systems do not put sufficient emphasis on providing cross-cutting data and measuring the interactions between subject areas. Identifying and modelling interactions is often the work of economists, academics, government ministries and others working outside of NSOs. This highlights the importance of having a comprehensive model to assess impacts related to Climate Change actions and decisions. Component C of the CC RAS is developing such a model and correlation with the GHG inventory is important.

In Romania, as in many countries, NSOs are not responsible for a big part of environmental statistics. For example, state of the environment reports and measures of biodiversity are typically the responsibilities of environment ministries or specialized agencies. One of the challenges of developing climate change related statistics is, therefore, to establish efficient coordination and division of work between various national bodies.

Recently, official statistics on environmental and climate issues have increased with many offices offering data on natural resource assets, energy, waste, water and air emissions as well as environmental protection expenditures. The United Nations Statistical Commission (UNSC) recently adopted the System of Environmental-Economic Accounting (SEEA)⁵ as an initial

⁵ The System of Environmental-Economic Accounting (SEEA): unstats.un.org/unsd/envaccounting/seea.asp

version of an international standard for environmental-economic accounts. It will support the development of climate change related statistics by enhancing the NSOs' work on environmental accounts. The SEEA contains internationally-agreed standard concepts, definitions, classifications, accounting rules and tables for producing internationally comparable statistics on the environment and its relationship with the economy. Similar efforts and standards will be needed for improving the linkage of climate change information with economic and social data, especially related to the capability to assess impacts of various measures.

Moreover, there is a need to identify new statistics that must be incorporated into statistical systems to support climate change analysis, such as monitoring the move towards greener consumption and production patterns, or data series to help make projections for GHG emissions.

2.2 Proposing alternative frameworks to structure climate-change related statistics in Romania

The GHG inventory is part of an extended statistical system that includes various data and specific frameworks aimed at preparing Romania to more effectively meet the requirements of the EU and UNFCCC. Several frameworks are mentioned in the literature that could lead to an improved structure of climate change related statistics for the GHG inventory and beyond. The report does not intend to identify which is the “best”, or most suitable framework for structuring climate-change related statistics as each framework has its own purpose and advantages⁶. The following frameworks are listed: (i) Driving forces – Pressure – State – Impacts – Response Framework (DPSIR Framework); (ii) Framework for the Development of Environmental Statistics (FDES, 2013); (iii) UN System of Environmental-Economic Accounting (SEEA, 2013); (iv) Natural capital approach; and (v) Impact, mitigation and adaptation. Only the Framework for the Development of Environmental Statistics (FDES) – IPCC Schematic Framework will be detailed in the present report:

The primary objective of the Framework for the Development of Environmental Statistics (FDES) is to guide the formulation of environment statistics programs (see FDES 2013⁷). The concepts, terms and definitions used in the FDES are largely consistent with SEEA. FDES also allows the description of climate-change related statistics in all of its six main components: environmental conditions and quality; environmental resources and their use; residuals' values; extreme events and disasters; human settlements and environmental health; and environment

⁶ Scope of Climate Change Related Statistics, note prepared by the Conference of European Statisticians' Task Force on Climate Change Related Statistics 23 September 2013.

⁷ www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.33/2012/mtg3/Scope_of_Climate_Change_Related_Statistics.pdf
[Framework for the Development of Environment Statistics \(FDES\) 2013: unstats.un.org/unsd/statcom/doc13/BG-FDES-Environment.pdf](http://unstats.un.org/unsd/statcom/doc13/BG-FDES-Environment.pdf)

protection, management and engagement. These components are explained in more detail below. The Romanian statistic framework that uses these components now should better take them into account in order to approach international standards and to facilitate reporting, monitoring and comparability.

To improve Romania's CC statistical framework and adhere to EU and international requirements and standards, the structure of the 6 components from FDES is proposed as specified above: (i) environmental conditions and quality, (ii) environmental resources and their use, (iii) residuals, (iv) extreme events and disasters, (v) human settlements and environmental health, and (vi) environment protection, management and engagement. Some details of the content of each of the 6 components are provided below.

Environmental conditions and quality. This component organizes information on environmental conditions and processes describing the foundations of ecosystems. It relates to the state element of the DPSIR Framework. The data relevant to climate change includes data on physical conditions (state of atmosphere, temperature, precipitation, sea level and sea ice, water system and desertification), soil and land cover, biodiversity, state of and changes in ecosystems, flora, fauna and terrestrial and marine biodiversity, as well as trends and vulnerabilities of ecosystems and climate quality.

The main sources for this data are meteorological and atmospheric monitoring networks and hydrological, geographical and geological institutions. Data on biodiversity and ecosystems are often collected and maintained by national environmental authorities.

Environmental resources and their use. Environmental resources or assets comprise the biophysical environment that provides benefits to people. This component is closely related to the asset and physical flow accounts of the SEEA Central Framework⁸ and to both state and pressure elements of DPSIR. It comprises data on energy resources, land, biological and water resources that may be linked with climate change. Some of these statistics are available from the national statistical system, for example statistics on population, energy, agriculture, forestry, mining and land use.

Residuals. This component contains statistical information on emissions of greenhouse gases and consumption of ozone depleting substances. This component mainly relates to the pressure element in the DPSIR and to the physical flow accounts of SEEA. This information is usually produced as emission inventories, for which statistical systems provide activity data. Statistical offices often produce air emission accounts which enable users to distinguish emissions due to production (by economic activity) and consumption.

⁸ The System of Environmental-Economic Accounting (SEEA): unstats.un.org/unsd/envaccounting/seea.asp

Extreme Events and Disasters. The occurrence of climate related extreme events and disasters, the impacts of the changing climate on people, economic and physical losses and effects on ecosystems belong to this component. These elements can be found in many parts of the DPSIR Framework, and they relate to the asset accounts of SEEA.

Data on natural extreme events are generally not supplied by the statistical system; the assessment of economic impact is often carried out by research institutions or insurance companies. Statistical offices are a limited source of information for example via their supply of data on causes of death.

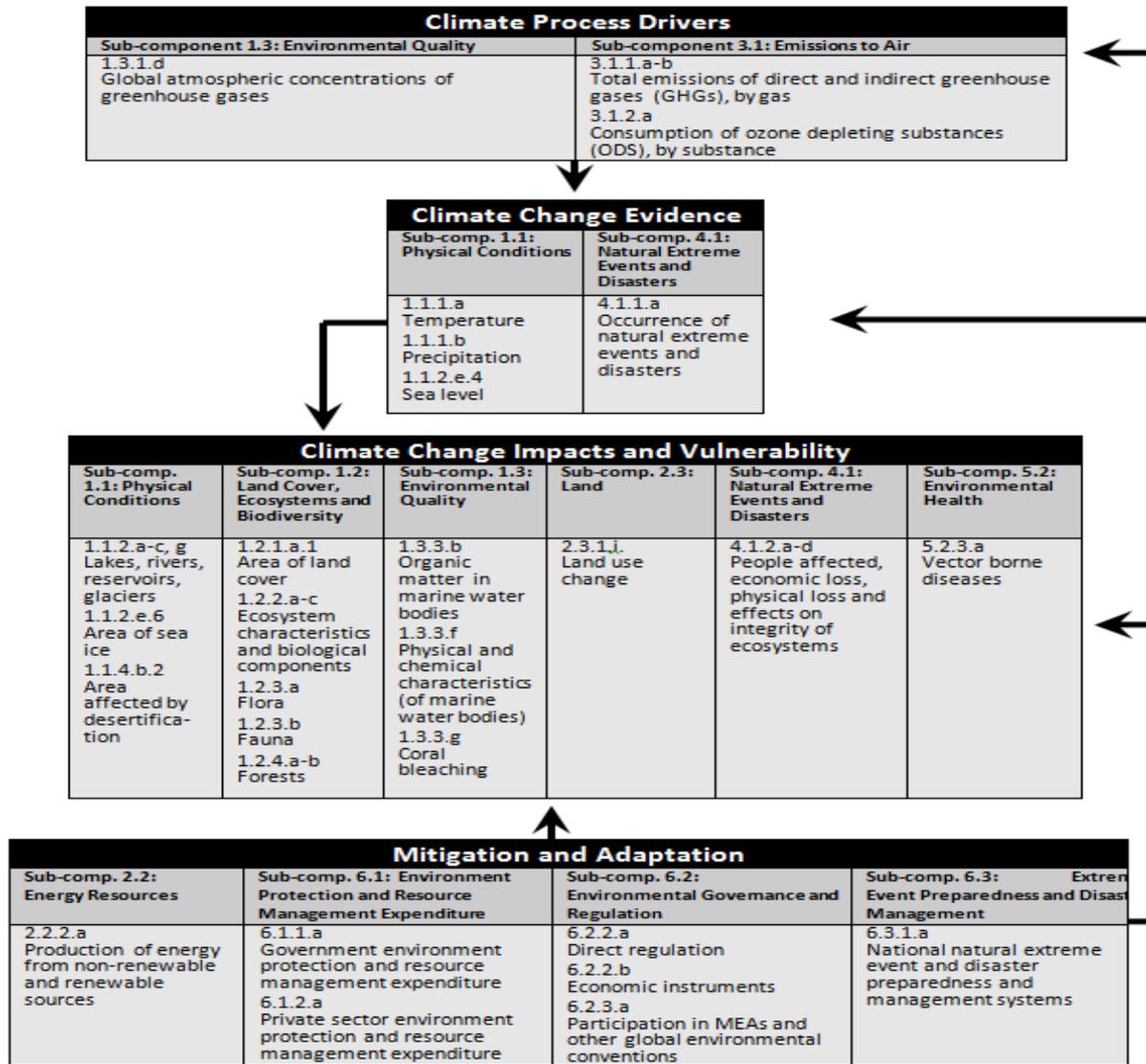
Human Settlements and Environmental Health. Data on the environment in which humans live and work, living conditions and environmental health, are part of this component. It includes data on housing vulnerable to natural disasters or extreme events; population exposed to air pollution; epidemic changes (vector borne diseases) and incidences, morbidity and mortality related to climate change.

Housing authorities, administrative records, census data and surveys are likely sources of information on human habitat. The World Health Organization (WHO) is the global institution assessing the relationship between health and the environment, including climate change. Statistical systems typically provide useful data as part of statistics on population, health and mortality.

Environment Protection, Management and Engagement. Information on protection, regulation and management of various climate change issues and concerns belongs to this component. It contains data on economic instruments, costs of mitigation and adaptation; governance and regulation, climate conventions; management systems to cope with extreme events; education and perception. Part of this information consists of qualitative data on projects and norms related to protection of the climate system and to the management of related extreme events. Some quantitative data, however, on costs of mitigation and adaptation measures, taxes and subsidies may be available from the statistical system.

The FDES report includes a section on topics in the FDES that relate to climate change. Figure 1 presents topics in the FDES that relate to climate change using the elements of the IPCC schematic framework. The IPCC framework represents anthropogenic drivers, impacts of and responses to climate change, and their linkages. An important difference between the IPCC schematic framework and the FDES is that “Socio-Economic Development” in FDES focuses on issues related to the environment, whereas the IPCC framework includes all socio-economic factors that are linked to climate change. The FDES also provides a list of concrete climate change statistics available in environment statistics (see FDES 2013, pages 183-185).

Figure 1 Topics in the FDES that relate to climate change – organized by the IPCC framework



Source: FDES 2013; Figure 5.8, page 182.

3 METHODOLOGY AND CHALLENGES OF ROMANIA'S GHG INVENTORY

Since Romania ratified the Kyoto Protocol in 2001. Romania, like all Annex I countries to the United Nations Framework Convention on Climate Change (UNFCCC), is required to compile a national greenhouse gas emissions inventory and submit it to the UNFCCC annually.⁹ Moreover the EU commission and Eurostat requirements also mandate inventory reporting. This chapter considers the current and potential role of EPAs and NSO in the *national systems*¹⁰ that produce these inventories.

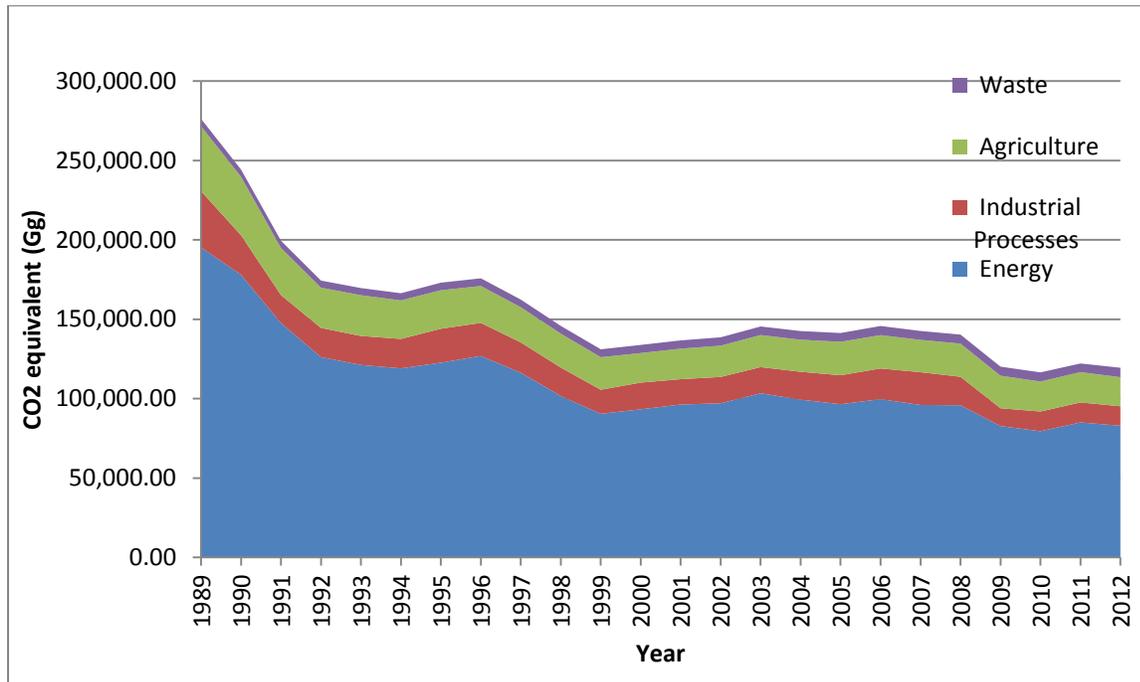
Romania has produced a GHG inventory in line with UNFCCC requirements. For illustration the figure below gives the history of GHG emissions in Romania as reported to the UNFCCC, for the period from 1989 (the reference year for Romania in the Kyoto Protocol) to 2012. The Kyoto commitment is -8% while the difference in 2012 is -56.81% as seen below.

Year	2012	1989	difference %
ktCO2	119,562	276,856	-56.81

⁹ Annex I countries include the industrialized countries that are members of OECD and countries with economies in transition, such as the Baltic States, and several Central and Eastern European States such as Romania. For example, most European countries, Australia, Canada, Japan, Russian Federation, New Zealand and United States are part of Annex I countries. In addition to Annex I countries, a number of other countries compile greenhouse gas inventories for their own purposes. Furthermore, the 17th UNFCCC Conference of the Parties in Durban (in November 2011) agreed to put in place by 2015 a global protocol to be implemented from 2020 which will require all countries (not only Annex I) to submit annual inventories.

¹⁰ Article 5.1 of the Kyoto Protocol (Read: [Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol](http://www.ciesin.columbia.edu/repository/entri/docs/cop/Kyoto_COP001_019.pdf)) requires that Annex I Parties to the Convention have a National System in place for estimating anthropogenic GHG emissions and removals and for reporting and archiving the results. Guidelines for national systems define the national system as includes all institutional, legal and procedural arrangements made for estimating anthropogenic emissions and removals, and for reporting and archiving inventory information: www.ciesin.columbia.edu/repository/entri/docs/cop/Kyoto_COP001_019.pdf

Figure 2 Romania GHG emissions in CO₂e



Source MECC/UNFCCC data prepared by the authors

As noted above, this analysis of the history of Romania’s GHG Inventory is aimed at improving this GHG inventory process in terms of efficiency, and data consistency. The acceptance of prior GHG inventory reports by the UNFCCC gives no reason to question the data as such.

This section sets out the role of the systems of EPAs at the national and local levels and the role of the national statistical offices (NSOs) in support of compiling the national GHG inventory. In the country’s Inventory Review Report for 2012 it is specified that Romania has performed a tier 1 uncertainty analysis for the reported emissions for 2010 and for the trend for the period 1989–2010, in accordance with the IPCC good practice guidance. The Party has reported the uncertainty estimates in the NIR in accordance with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories (hereinafter referred to as UNFCCC reporting guidelines.”

The level of disaggregation per category is the same as that used for the key category analysis, except for the following two categories in the waste sector: CH₄ emissions from solid waste disposal on land, divided into managed and unmanaged landfills; and CH₄ emissions from wastewater handling, divided into industrial, and domestic and commercial. The total uncertainty for the 2010 inventory was estimated at 18.1 per cent excluding LULUCF and 14.9 per cent

including LULUCF. The trend uncertainty was estimated at 1.9 per cent excluding LULUCF and 2.2 per cent including LULUCF.

3.1 Data gaps and other challenges of GHG inventories

EPAs and NSOs have significant amounts of data that can be useful for compiling GHG inventories. The challenge is that these data were collected for different purposes and may be organized in a way, which makes it difficult to extract relevant data for the purpose of GHG inventories. Inventory compilers need to use these data in new ways and for new purposes. A screening of existing data could be helpful to judge their appropriateness to these new purposes.

Some activity data are readily available from current official statistics, whereas some closely related variables are not available even if they could sometimes be easily added to existing data collection. For example, agriculture activity data include the number of animals by type and age, but not information regarding how farmers manage the manure from the animals. The calculation of emissions from animal waste in the agriculture sector requires such information. Similar cases exist for other inventory sectors. Improved data are also needed in the energy sector on the production of heat and electricity for use by households and enterprises and on renewable energy sources (e.g., solar energy, fuel wood, biogas, animal dung, wind, heat pumps/geothermal sources).

The surveys of data reporting entities revealed that access to disaggregated source data continues to be a challenge (in terms of both the level of detail in published data and access to micro-data). A question has also arisen about whether the level of detail required for inventory compilation is too excessive, and whether it would be possible to achieve a better balance between costs of data collection and accuracy of results. Examples of practical data gaps that are applicable to Romania include:

- Economic information that could be connected to policies and measures;
- More disaggregated information, higher level of detail both with regard to economic sectors and geographic breakdown and finer scale of demographic and socio-economic data;
- Geo-referenced annual parcel level data on land use and management as well as soil carbon parameters;
- Emissions of non-carbon dioxide gases;

The new EU policy on energy and climate change as well as other regulations require the capacity to develop time series data for making projections of future GHG emissions by March 2015. In some cases, the length of time series data is not sufficient, for example for analyzing the drivers of emissions. The NSO in correlation with the EPA should plan to develop statistics

on material flow accounts, environmental goods and services, taxes, protection expenditure and energy accounts.

The challenges of GHG inventories are reflected in the *Inventory Review Reports*. Analysis of these reports helps identify areas where NSOs could contribute to GHG inventory processes e.g., by improving availability and usefulness of source data for emission inventories. Amongst other things, inventory reviews consider the accuracy of estimates, and frequently conclude that there is a need for quality improvements in particular sectors of inventories. The reports note that countries – Romania included – have made major improvements in the quality of emission inventories in recent years: better time series consistency, use of higher-tier estimation methods, use of country-specific estimation factors and more accurate activity data. Several reports refer to deficiencies in waste data, such as in the types of waste disposed, waste-water output and handling. The quality and availability of time series data on land use and forestry requires further improvements in many countries including Romania. Timeliness of activity data was also mentioned as a problem in several countries.

Recommendations of the Inventory Review Report of the UNFCCC for Romania's 2012 inventory

Line 175. "Romania's inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, the Expert Review Team considers that some aspects need to be enhanced, such as strengthening the QC procedures, and increasing the transparency of and moving to higher-tier methods for specific categories."

The UNFCCC expert review team made recommendations for improvement:

- General : Inventory improvement plans - Continue efforts to implement the planned studies and increase the quality of the inventory; QA/QC – Strengthen QC procedures
- Energy: Comparison of international statistics - Provide explanations for the differences between the inventory data and the International Energy Agency data
- Industrial processes: General - Strengthen the capacity to collect data from individual installations and implement the necessary QA/QC procedures
- Agriculture: Enteric fermentation, manure management – CH₄ and N₂O - Review the country-specific parameters and EFs used in order to ensure accuracy
- National Registry: Publicly available information - Update the reports posted on the public website with complete and up-to-date data and remove duplicate or outdated links.

Various other recommendations are specified at a detailed technical level, but no integrated view of the system is provided since the Inventory is considered acceptable.

This technical analysis addresses this gap by providing an integrated view of the basic elements

of the inventory system in terms of legal and institutional as well as the overall flow of information, finding recommendations that target the system function improvement not just detailed topics that may be found in UNFCCC documents and IPCC calculation Tiers.

Source: Inventory Review Report, 2012

The general areas of improvement for emissions inventories can be summarized into five main categories:

- i. Source data: availability, access to data, accuracy and timeliness of source data, scale;
- ii. Quality of results: completeness, level of detail, accuracy of results and consistency;
- iii. Communication: transparency of methods used, documentation and archiving;
- iv. Methodology: use of comparable methods, time series consistency and quality assurance procedures;
- v. Organization and capacity: descriptions of institutional arrangements and capacity of the national system.

Furthermore, NSOs are often not aware of the data needs of emission inventories and thus are not prepared for responding to the data requirements stemming from reporting obligations under UNFCCC or the Kyoto Protocol. Data requirements for producing inventories should be made clear to NSOs. To assist with this, the Report has provided a table for Romania, which sets out the key datasets against each of the inventory sectors (see Annex 3). This table can be used as a tool to identify the data EPAs and NSOs could provide for emission inventories.

From the perspective of inventory compilers, the most obvious role of NSOs relates to national energy balances, which fall within the remit of a large number of NSOs. In Romania about 70 per cent of all GHG emissions are accounted for by energy combustion activities, and energy balances are, therefore, the most important input to the inventory. As noted above, it is particularly important to improve the cooperation among EPAs, NSOs, energy agencies and inventory compilers to improve energy data and add clarity about which energy data feed into the inventory calculations and how. A Protocol of cooperation is recommended between the MECC and the NSO similar to the ones already in operation between the MECC and other entities (see Annex 4).

3.2 Challenges with statistical infrastructure

Filling the above statistical gaps will challenge the infrastructure of statistical offices and require reviewing and partly changing the way EPAs and NSOs work. On the other hand, it will allow current strengths of official statistics to better benefit the compilation of emission inventories.

There are several challenges related to the shortcomings of statistical infrastructure with regard to supporting the production of GHG inventories. According to the UNECE survey, such challenges include confidentiality issues, lack of capacity and knowledge of data needs, database management resources, data coherence and challenges in cooperation between involved agencies.

Following is the analysis of the parts of the Romanian GHG inventory process that are weakest or missing, and also highlights some important strength. It aims to identify the key adaptations needed in the current statistical systems to improve the ability to respond to the information needs of emission inventories.

3.3 Legislative Challenges

Legislation is a critical component of Romania's GHG emission inventory system. Without unambiguous legislation, unclear division of work between organizations may complicate and compromise the compilation of GHG inventories.

Legislation should facilitate effective cooperation between agencies and ensure the exchange of required data. The legislation dealing with GHG inventories should be in line with national statistical law(s) and related articles on confidentiality. The quality of emission inventories could be enhanced if those outside the statistical system responsible for the calculations were permitted access to official statistics at the unit level. In Romania there is an issue between the EPA that gathers data for the inventory according to specific legislation (as listed in the appendix) and the NSO responsible for the management of official statistics. As highlighted above, access to data should be facilitated by a protocol of confidentiality shared between the two state agencies. This is further detailed below. This is often not possible because of access restrictions established in national statistical laws. Therefore some countries assign responsibility for part of the calculations directly to the NSOs. In Romania this responsibility is assigned to the EPA within the MECC. Given the creation of the capability to analyze climate change impacts it may be useful to facilitate ad-hoc, access to the required data by a dedicated institutional support entity this would obviously require their adherence to the legal requirements of the national statistical law.

Ideally, national legislation providing for the right to collect and access data needed for emission inventory compilation would exist in all countries. Though in most states, legislation does exist for the production of official statistics (national statistical laws), it does not always exist for

emission inventories. In the EU, the recently adopted Monitoring Mechanism Regulation¹¹ stipulates that "Member States shall ensure that their competent inventory authorities have access to":

- data and methods reported for activities and installations;
- where relevant, data collected through reporting systems on fluorinated gases;
- where relevant, emissions, underlying data and methodologies.

Romania is in full compliance with this requirement regarding the GHG inventory in light of dedicated legislation. More needs to be done though related to the data gathering for projections of GHG emissions.

3.4 Challenges with Standards and Classification

One of the most common problems encountered by many countries (Romania included) is the mismatch between the reporting classifications for GHG inventories as defined by the Intergovernmental Panel on Climate Change (IPCC) compared with international statistical classifications. This represents a major obstacle for analyzing and linking inventory data with official statistics for example, to facilitate better use of energy statistics in the compilation of GHG inventories. This mismatch complicates both the use of NSO data for GHG compilation and for NSOs to reuse the GHG inventory results in combination with other related data. In some areas, this leads to duplication of efforts and parallel data collection.

GHG inventory data are reported to the UNFCCC according to the Common Reporting Format (CRF) framework, which uses a classification developed by the IPCC. The CRF framework encompasses the different sources and sinks of greenhouse gas emissions arising from human activity, grouping them in sectors. Each sector generally reflects a certain type of emission source or sink from a technological viewpoint; for example, combustion of fossil fuels, regardless of where this combustion occurs (on the national territory) falls under the sector "energy", which includes combustion in industry, transport, agriculture, energy transformation, refineries, etc. From the viewpoint of national statistics, the IPCC sectors are, in fact, a combination of what are normally considered industries (e.g., electric power generation) and what are considered activities based on both economic processes (e.g., transportation) and on products (e.g., solvents).

The current source/sink sectors¹² in the IPCC Common Reporting Format (CRF) are the following:¹³

¹¹ Monitoring Mechanism Regulation¹¹ (Regulation (EU) 525/3013), Article 5(2):
eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:165:0013:0040:EN:PDF

1	Energy sector
2	Industrial processes
3	Solvents and other products use
4	Agriculture
5	Land use, land use change and forestry (LULUCF)
6	Waste management

In GHG inventories, the meaning of energy sector is different from the ISIC-class D (electricity, gas, steam and air conditioning supply) that is used in official statistics, even though they are both called the “energy sector” in everyday speech.

In GHG inventories, the sector agriculture includes emissions connected to agricultural processes: enteric fermentation, manure management, rice cultivation, cultivation and management of agricultural soils etc., but not emissions of the energy use in agriculture, like in NSO classification.

The sector on land use, land use change and forestry contains the emissions caused by changes in land cover and CO₂ -emissions from soil, including agricultural soil. Other greenhouse gases from agricultural soil are included in the agriculture sector.

The above differences in data definitions require careful attention particularly in the verification processes in the final stages of inventory development. This additional burden on verification processes could be avoided through an improved in-depth dissemination of the methodology that would allow the verifications to be done earlier in the data processing stages.

3.5 Challenges with Statistical Methods

The UNFCCC and IPCC reporting guidelines form an information framework for the GHG inventory data. The quality of source data for emission inventories in Romania could benefit from statisticians having a better understanding of the concepts and methods used in inventory compilation. This would help ensure that statistics can be easily used for emission inventories.

The Conference of Parties (COP) has developed standardized requirements for reporting national inventories. The UNFCCC inventory reporting guidelines are currently based on the

¹² The source/sink sectors as defined by the Intergovernmental Panel on Climate Change (IPCC) in the *Revised 1996 Guidelines for national greenhouse gas inventories*
www.ipcc-nggip.iges.or.jp/public/gl/invs1.html

¹³ The manual for Air Emissions Accounts:
epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-09-004/EN/KS-RA-09-004-EN.PDF

methodologies and reporting formats of *the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*¹⁴ which is complimented by *the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. In 2004, separate *IPCC Good Practice Guidance for Land Use, Land Use Change and Forestry* was developed.

At the moment, IPCC is working to develop and maintain the methodological guidelines for emission inventories. The first draft of *the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*¹⁵ has been reviewed by experts. This new version of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*¹⁶ will start to be applied as of 2015. These may require changes in the inventory source data and Romania should follow these potential changes closely. Recent seminars and workshops are aimed at making the experts of member states aware of the specific changes in methodology and data requirements. It might be beneficial to involve Romanian experts in capacity building activities e.g. to assess data availability and the feasibility of meeting the new requirements with existing data, in order to enable EPAs and NSOs to prepare themselves for the new or changed requirements.

Furthermore, Romanian EPAs and NSOs should establish collaborative systems for following and sharing information on IPCC processes and data requirements stemming from the Kyoto Protocol. For example, the new *2006 IPCC Guidelines* noted above, may change some of the statistical needs behind inventories. Ideally, NSOs would be informed of such upcoming statistical needs through cooperation with the national entity responsible for inventories. As already mentioned above, a clear Protocol of cooperation is required between these two important entities for the GHG inventory activity. Annex 1 presents some of the findings resulting from the talks with MECC on this topic.

3.6 Challenges with Organizational Structures and Production Resources

The activity data for GHG inventories is normally distributed across several organizational units within EPAs and NSOs. Those offices that take part in the calculations of emission inventories have a specific organizational unit that has been assigned tasks related to emission inventories. In other offices, the counterpart for inventory compilers is often missing.

¹⁴ The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories:
www.ipcc-nggip.iges.or.jp/public/gl/invs6.html

¹⁵ The 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol:
www.ipcc-nggip.iges.or.jp/home/2013KPSupplementaryGuidance_inv.html

¹⁶ The 2006 IPCC Guidelines for National Greenhouse Gas Inventories:
www.ipcc-nggip.iges.or.jp/public/2006gl/

As mentioned earlier, existing official statistics are not used to their full potential for emission inventories. Parallel and sometimes duplicate reporting exists; for example, energy data are reported both in energy statistics and in emission inventories. This leads to unnecessarily high costs of data collection and additional burdens for respondents.

3.7 Section Summary

The statistical system and associated tools need to be continuously adapted to provide relevant information to evolving national and international requirements. The statistics used as the basis for the GHG inventories need to be examined to determine if the statistical data which is currently available adequately covers the data needs or whether there are missing areas to be incorporated into the regular statistical production systems. In Romania it is currently not clear to all NSOs what data is required for the compilation of greenhouse gas inventories, and specifically which datasets are likely to be sourced from official statistics. The Report has, therefore, put together a table that NSOs can use to track which data could be sourced from the national statistical system (see Annex 3). Information on what data are needed will ideally help NSOs better organize their work and optimize the data for the purposes of emission inventories.

Legislation has a crucial role in supporting production of emission inventories and promoting effective cooperation among agencies. Romanian's current legislation is to some extent facilitating effective cooperation between agencies belonging to the national emission inventory system and provides a comprehensive legal basis for the exchange of data as required for the inventories. One issue mentioned above related to energy sector GHG emission data and the need for greater cooperation between the EPA system and the NSO. This is dealt with in more detail below. Moreover the future requirements for projections of GHG emissions ask for new legislation, to cope with the increased complexity of the process, as required by the EU requirement for forecasting capacity. A specific study is recommended for this new legislation done by a specialized entity in legal matters.

The MECC needs to develop and implement necessary legislation and norms to also support the analysis of emission trends by having NSO provide background socio-economic data. Some examples of such data include population, fuel prices, GDP and gross value added (GVA) by sector, national energy balances, and heating/cooling degree-days. In particular, capacity needs to be developed to analysing emissions by economic sectors in order to discern between ETS and non-ETS GHG emission dynamics. National legislation should be reviewed to ensure that it facilitates effective cooperation between agencies belonging to the national emission inventory system and to ensure that it provides a legal basis for clear division of work and exchange of data as required for the inventories. The legislation should be in accordance with the national statistical law.

The statistical system should be more engaged in methodology development led by the IPCC so that the new methods take into account existing statistics and underlying methodologies. Experts from the MECC and from the NSO can be helpful in evaluating if the needed source data in a proposed methodology are available and/or whether it might be possible to develop new with reasonable costs. Methodology development needs to be based on what is realistically available and should not impose unreasonably high costs on inventory compilers, statistical systems nor respondents.

The MECC and the NSO could also work with inventory compilers to make activity data available at an earlier stage to help develop timelier emission estimates as opposed to the current two year lag, or they could develop early estimates of GHG emissions using monthly and quarterly data sources. Such data would not be comprehensive enough for actual GHG inventories but would help more effectively inform climate change mitigation policies in a timelier manner.

The overwhelming conclusion drawn from the evidence available to the Report is that there is a clear need for deeper cooperation between the MECC and the NSO in emission inventory compilation. This would help reduce parallel and sometimes duplicating reporting systems and unnecessarily high costs of data collection as well as reduce the burden on respondents. For this purpose, the NSO should have a contact person who would be in charge of coordinating GHG inventory source data with the dedicated team in the MECC, collaborating with the inventory compilers and keeping up with the outcomes of the UNFCCC Conferences of the Parties (CoP) to better understand and prepare for the associated data requirements. Moreover, the modifications of the Eurostat provisions on inventory should be shared with MECC.

It is acknowledged in the report that human resources require significant capacity building particularly to ensure the fast and accurate implementation of future methodologies which are expected to have more complex requirements regarding projections of GHG emissions and MRV elements. The quality of the personnel is critical to a good GHG inventory process and the existing staff turnover and migration of trained staff to private companies is weakening the data processing capacity of the MECC. A carefully designed HR policy of compensation and career development will contribute to overcoming this gap.

4 KEY LEGAL DOCUMENTS AND INSTITUTIONAL ARRANGEMENTS FOR ROMANIA'S GHG INVENTORY

4.1 The Overall Legal Framework

In addition to the comments above on legislation, the WB team completed an overview of the existing legal architecture identifying 16 Directives, 6 Decisions and 18 Regulations of EU legislation and 2 Governmental Decisions, 2 Orders of the Minister of MECC, 2 orders of the President of NEPA and 2 Protocols of cooperation between MECC and other ministries and entities involved in reporting GHG emissions data. Under the guidance of the present legislation the GHG inventory process mandates a long learning curve of the present legislation by the reporting entities involved. New entrant reporting entities of the GHG inventory data will require significant time to become familiar with all the dispersed legislation. In addition there is new legislation to be prepared to address the expected evolution of the GHG inventory and projection data gathering and processing.

The evolution of the climate change sector and associated GHG inventories has led to cumulated changes that make the legislation hard to follow and, consequently, to apply. For this technical assessment the WB completed a first screening of the legislation and concluded that a thorough analysis by a legal consultant would be an asset and it is recommended to use such a legislative review to create an environmental Codex of laws that gathers all related legislation into one easy to read reference, that can be easily updated to accommodate the continuing evolution in the international negotiations on the Kyoto Protocol and EU-ETS. The practice of an environmental Codex of laws is not unique and can be found in a number of countries including Italy and France.

A list of legal and procedural documents is provided in Annex 4 covering the fields under discussion. It should not be regarded as an exhaustive list but as an example of the content for the proposed Codex. In light of the existing requirements for legislation governing the projection of GHG activities and further expected obligations resulting from the Conferences of the Parties in the next years, it is important to organize the climate change related legislation in Romania to foster a better and more efficient flow of information.

4.2 Two Major Legal Documents for the GHG Inventory

Romanian's Greenhouse gas inventory is supported by a set of institutional arrangements which are designed to facilitate close coordination between key agencies in the compilation of the inventory, efficient data management, broad based quality assurance processes and secure and reliable data collections. The two major legal documents are the Governmental Decision (GD) no. 668/2012, which modifies and expands decision no. 1570, and decision no. 48/2013. Decision no. 1570 taken in 2007 relates to establishing the National System for the estimation of anthropogenic greenhouse gas emissions levels from sources and removals by sinks and is complemented by legislation on the organization and functioning of the Ministry of Environment and Climate Change (MECC). The main objective of Governmental Decision no. 1570/2007, as modified and completed, is to ensure the fulfillment of the relevant provisions and obligations of Romania under the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol (KP) and European Union (EU) legislation. The decision 48/2013 also modified some environment protection and climate change related legal acts regulating all the institutional, legal and procedural aspects for supporting the estimation of greenhouse gas emissions/removals levels, and to report and archive the National Greenhouse Gas Inventory (NGHGI) information, including supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol. In this respect, the GD no. 48/2013 also modified the GD no. 1570/2007.

Improvements of these legal documents have already started. In 2011, NEPA performed an analysis on improving the institutional and legal arrangements of the National Statistics (NS). The results of previously two specified activities were corroborated and were also used for updating the GD no. 1570/2007. The Ministry of Environment and Climate Change officially considers, approves and submits the National GHGI to the UNFCCC Secretariat, the European Commission and the European Environment Agency taking into account the specific deadlines.

4.3 Main Institutional Arrangements in Romania for the IPCC Sectors

The main institutional arrangements in Romania for the IPCC sectors are governed by the two legal documents described above. According to the Governmental Decision no. 1570/2007 as modified and completed, the single national entity with overall responsibility for the national inventory, including the responsibilities of administrating the NSs and of preparation and management of the NGHGI, is the MECC. Before April 1, 2013, the competent authority was the National Environmental Protection Agency (NEPA), under the subordination of the MECC. Based on the GD no. 48/2013, all NEPA climate change related structures, personnel, attributions and responsibilities were transferred to the MECC, in order to improve the institutional arrangements and capacity within the climate change domain, thus increasing efficiency in the implementation of activities also in respect to the NS/NGHGI administration.

Central and territorial public authorities, research and development institutes and other public organizations under the authority, in the subordination or in the coordination of central public authorities, owners and professional associations, economic operators and other relevant organizations are required to provide the MECC with the necessary activity data, emission factors and associated uncertainty data.

The main activity data supplier is the National Institute for Statistics through yearly-publications such as the National Statistical Yearbook, the Energy Balance and other documents;

The institutional arrangements are characterized by a centralized approach. The MECC maintains a large degree of control and decision making authority over the inventory preparation process. In addition an in-sourced approach is used with the major part of the inventory prepared by the MECC itself.

- single agency – the single national entity is housed within a single governmental organization;
- separate approach – the NGHGI related work is not integrated with other air pollutant inventories work; however, cross checking activities are periodically undertaken.

The IPCC sectors

LULUCF

In 2011, the NGHGI's Land Use, Land-Use Change and Forestry (LULUCF) Sector, both under the UNFCCC and KP, was administrated by the National Forest Research Institute (ICAS), based on a contract with Ministry of Environment and Forests (MEF), in the context of the study "NGHGI LULUCF both under the UNFCCC and KP obligations". In the 2012-2014 period, the NGHGI LULUCF Sector, both under the UNFCCC and KP, is administrated by ICAS, based on the Protocol of collaboration no. 3029/MMP-RP/3.07.2012 between the MEF, NEPA and ICAS; ICAS also contributed by developing the following studies: (i) in 2012, "Determination of emission/removal factors for the forest and for conversions from/to forest land associated pools both under UNFCCC and KP obligations" and "Compilation of the 2013 National Greenhouse Gas Inventory Land Use, Land-Use Change and Forestry Sector both under the UNFCCC and KP obligations" based on contracts with MEF; (ii) in 2013, "Determination of emission-removal factors for the pools in forest areas and in areas in conversion from and to forest according with the obligations assumed as a Party to the UNFCCC and to the KP, for the 2014 year reporting" and "Compilation of the National Greenhouse Gas Inventory Land Use, Land-Use Change and Forestry Sector for the 2014 year associated reporting, according with the obligations assumed as a Party to the UNFCCC and to the KP".

Transport

The preparation of Road transport category estimates using the COPERT 4 model is based on the Protocol of collaboration no. 3136/MMP/9.07.2012 between the MEF, NEPA, Romanian Automobile Register and the Directorate on Driving Licenses and Vehicles Registration in the Ministry of Administration and the Interior.

Energy and Waste

Development of country-specific values associated with several NGHGI sectors has been supported by the Institute for Studies and Power Engineering (ISPE) through the development of the following studies:

- in 2011, “Elaboration/documentation of national emission factors/other parameters relevant to NGHGI Sectors Energy, Industrial Processes, Agriculture and Waste, values to allow for the higher tier calculation methods of implementation”;
- in 2013, “Determination of the biodegradable content industrial wastes amount and of sludge amount from wastewater treatment, deposited in managed landfills (for the period 1989-2012) and in unmanaged landfills (for the period 1950-2012). Determination of incinerated wastes type/amount and of parameters specific to their incineration, for the period 1989-2012. Wastes incineration N₂O emissions estimation”.

Industrial Processes

Based on the study on elaboration and documentation of the parameters values relevant to the NGHGI's Industrial Processes Sector values to allow for the greenhouse gas emissions calculation methods, higher tier methods, for the categories: Production of halocarbons and Sulfur hexafluoride (HFCs, PFCs and SF₆), Consumption of halocarbons and sulfur hexafluoride (actual emissions), Consumption of halocarbons and sulfur hexafluoride (potential emissions), Denkstat improved the system of administrating the HFCs, PFCs and SF₆ data and information.

Integrated information system, monitoring and reporting

In 2012, the Environment Agency of the Austria-University of Graz consortium, in the context of the study “Environmental Integrated Informational System”, implemented by the SC Asesoft International SA-SC Team Net International SA-SC Star Storage SRL consortium, supported the improvement of key category analysis and of uncertainty analysis.

The “Support for the implementation of the European Union requirements on the monitoring and reporting of the carbon dioxide (CO₂) and other greenhouse gas emissions” study was carried out in 2011 by the Institute for Studies and Power Engineering (ISPE); specific elements comprise:

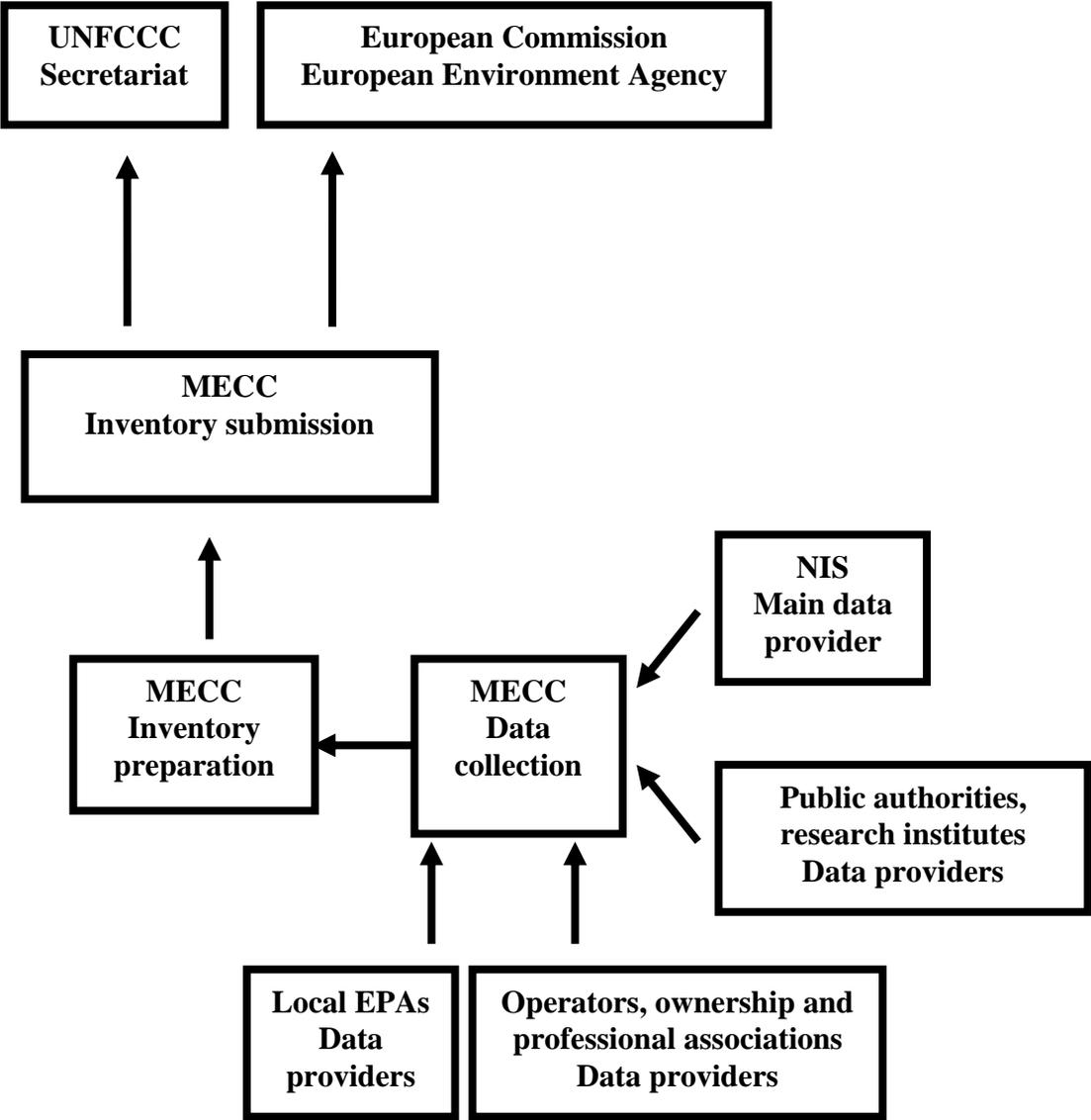
- Package 1 activities – improving NS:
 - evaluation of NS and of the relevant technical assistance projects previously implemented;
 - establishing the measures necessary for improving the institutional capacity and structure for implementing the NS. The contractor identified the institutional, legal and procedural measures for assuring the compliance of the NGHGI with the applicable standards, including solutions for improving the sectorial databases;
 - elaboration of draft legal proposals for an efficient administration of the NGHGI. The GD no. 1570/2007 was updated accordingly;
 - general training session for improving the expertise of the personnel working in the climate change field, at the central administration and subsequent level.
- Package 2 activities – developing the institutional capacity for reporting GHG emissions/removals:
 - evaluation of the Romanian capacity to report the GHG emissions according to the European Union requirements;
 - improving the reporting capacity of the authorities in Romania;
 - specific training session for improving the expertise of NEPA team on the attributions/responsibilities of administrating the NS/NGHGI.
- Package 3 activities-establishing the programs and measures necessary for determining the emission factors and other national relevant parameters.

5 ANALYSIS OF THE FLOW OF INFORMATION AND REPORTING

5.1 Present Information flow

The figure below shows the institutional arrangements currently used in Romania for the the development of the NGHGI.

Figure 3 Institutional arrangements currently used in Romania



Source: as provided in the discussions with MECC

In the framework of the above approach to the GHG inventory the specific flow of information for the GHG inventory is represented in Figure 4 above in a standard format used in quality assurance systems. There are features in this flow of information that make it more efficient in terms of ensuring the consistency and coherence of data.

The entities involved in the inventory development are listed starting with the MECC and NSO, followed by key ministries in the Administration and other reporting entities in various sectors (Industry, Energy, Transport, Agriculture). Those entities that receive the completed inventory i.e., the European Commission, the UNFCCC and the Eurostat, appear at the end of the list.

It is important for the data reporting entities to have clear procedures for data evaluation disseminated at their level and this represents an important recommendation of this technical assessment to be completed possibly in connection with the implementation of IPCC 2006 methodology.

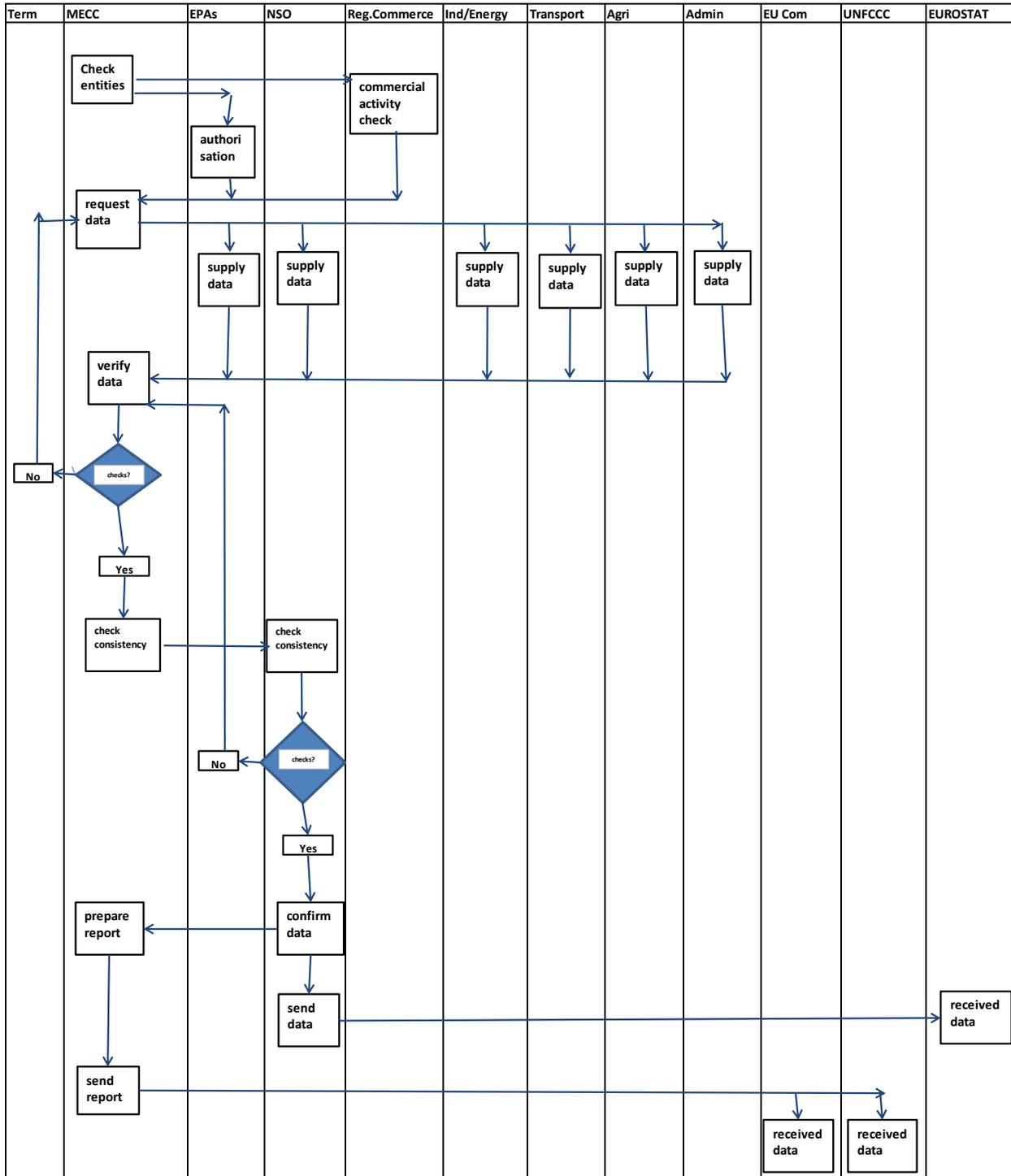
The data verification cycles provision and the dissemination of standard procedures are designed to ensure that data is coherent and consistent at the reporting source and that it is delivered efficiently without creating accumulation of processing needs that may cause delay in analysis or reporting.

As shown in Figure 4, the sequence of events starts with verification by the MECC that the reporting entities are still commercially operational and are continuing to fulfill the request for data from the ministries and other entities. In addition there is verification that the involved entities are preparing and delivering the data according to the disseminated procedures mentioned above. There are two data quality verification cycles, one done in the MECC and the other undertaken in cooperation with the NSO to ensure that the final report of the GHG inventory is consistent and comprehensive according to the requirements of the applicable guidelines. Finally, the last stage is about sending the GHG inventory to the receiving entities. The responsibility of the MECC is to send it to UNFCCC and to the European Commission while the NSO sends it to Eurostat. Although, as mentioned in the Report, there is feedback from UNFCCC on the GHG emissions inventory in the form of a review report, this is not represented in the diagram that describes the process as this diagram only addresses the national framework which ends with sending the inventory to the international bodies.

More detail on activity data and emission factors collection and processing, including data sources is presented in a diagram below:

Figure 4 Data flow for the GHG inventory

Data flow for the GHG inventory



Source: compiled by the authors

5.2 Proposed Logical Steps for Data Collection and Checking

The data flow diagram above represents the entities involved and the temporal sequence of activities. The sequencing of actions follows a logical succession of steps that serves to better organize the process and identify the needs for verification stages.

Specific elements related to the flow of data include the following steps of data collection:

- i. identification of data requirements;
- ii. identification of potential data suppliers;
- iii. preparation of specific templates;
- iv. submitting the requests and templates to the potential suppliers of data;
- v. data collection;
- vi. data verification: activity data received are examined (time series discrepancies, large changes in values from the previous to the current inventory year), and double-checked against similar databases.

Data Collection in Romania: Entities and Information

The main activity data provider in Romania is the National Institute for Statistics; while other sources of emission factors/increment rates include national studies, IPCC 1996, IPCC GPG 2000, IPCC GPG 2003, national research institutes and plants, in a limited number;

Data processing is performed according to the GD no. 1570/2007, as amended and completed, and in accordance with the MoEO no. 1474/2008 for approving the Procedure on processing, archiving and storage of data specific to the NGHGI. Primary data processing is mostly carried out by the MECC; while emission factors (EFs) selection is performed according to the provisions in the NEPA's President Decision no. 23/2009 for approving the Procedure on selection of the estimation methods and of the emission factors needed for the estimation of the GHG levels;

For energy, industrial processes, agriculture and waste a significant amount of activity data and emission factors have been collected, processed and developed, enabling the development of higher estimates and tier estimates and the significant decrease of the number of key categories have been obtained due to: (i) NEPA's/MECC's work; and (ii) the implementation of dedicated studies covering different types of data and GHGs as specified below:

- in 2011, "Elaboration/ documentation of national emission factors/other parameters relevant to NGHGI Sectors Energy, Industrial Processes, Agriculture and Waste, values to allow for the higher Tier calculation methods implementation";
- in 2013, "Elaboration and documentation of the parameters values relevant to the National Greenhouse Gas Inventory Industrial Processes Sector values to allow for the

greenhouse gas emissions calculation methods, higher Tier methods, for the categories: Production of halocarbons and sulfur hexafluoride (HFCs, PFCs and SF₆), Consumption of halocarbons and sulfur hexafluoride (actual emissions), Consumption of halocarbons and sulfur hexafluoride (potential emissions)” and “Determination of the biodegradable content industrial wastes amount and of sludge amount from wastewater treatment, deposited in managed landfills (for the period 1989-2012) and in unmanaged landfills (for the period 1950-2012). Determination of incinerated wastes type/amount and of parameters specific to their incineration, for the period 1989-2012. Wastes incineration N₂O emissions estimation”.

- the implementation of the Protocol of collaboration no. 3136/MMP/9.07.2012 between Ministry of Environment and Forests, NEPA, Romanian Automobile Register and Directorate on Driving Licenses and Vehicles Registration in the Ministry of Administration and Interior.

Optimizing the informational fluxes on data collection from the entities for the Energy Industries, Manufacturing Industries and Construction categories in the Energy Sector and for the Solid Waste Disposal within Land and Waste Water Handling categories in the Waste Sector was implemented subject to the “Environmental Integrated Informational System” study by the SC Asesoft International SA-SC Team Net International SA-SC Star Storage SRL consortium, based on a contract with NEPA;

In addition, in the LULUCF sector significant activity data and emission factors have been collected, processed and developed, enabling the development of higher estimates/tier estimates and a significant decrease of the number of categories, both under the UNFCCC and KP, through the implementation of studies that have been mentioned above

The main data sources used for activity data are presented within the following table. Also, a comparison of data from the EU statistics and IPCC is given in Annex 2 and the IPCC methodology as it is applied in Romania is synthesized in Annex 3.

One more thing to underline here is the fact that data flow also depends on the level of learning of the personnel involved and the depth of dissemination of the methodology. The MECC has a high rate of staff turnover and often personnel with key capacities leave to pursue work in private companies reducing the MECC’s human resource knowledge. In addition to limitations in experience and knowledge due to staff mobility there is imperfect knowledge of the methodology among some key staff pointing to a need to better disseminate the methodology to all involved reporting entities. This will improve the efficiency of the process and the quality of the data.

Table 1. Main activity data sources

Sector	Data sources
Energy	National Institute for Statistics - Energy Balance Energy producers Ministry of Economy Romanian Civil Aviation Authority Transgaz SA National Authority on Regulating in Energy National Agency for Mineral Resources
Industrial Processes	National Institute for Statistics- Statistical Yearbook and other data sources Industrial operators through 42 Local/Regional Environmental Protection Agencies Direct information from industrial operators
Solvent and other product use	National Institute for Statistics Industrial operators through 42 Local/Regional Environmental Protection Agencies
Agriculture	National Institute for Statistics
LU LUCF	National Institute for Statistics through Statistical Yearbook Ministry of Agriculture, Forests and Rural Development (MADR)-Forests General Directorate (2007-2008); Ministry of Environment and Forests-Forests General Directorate (2009-2011) National Forest Administration (RNP)
Waste	National Institute for Statistics National Environmental Protection Agency Public Health Institute National Administration “Romanian Waters” Food and Agriculture Organization

	Landfill operators through 42 Local/Regional Environmental Protection Agencies
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Source: MECC

6 RECOMMENDATIONS

The primary recommendations for improving Romania's GHG Inventory are summarized below:

Improving data consistency through inter-agency collaboration

Issue – Close and effective collaboration between the MECC and the NSO (National Institute of Statistics) is very important for ensuring data consistency. The discussions with MECC and NSO experts have revealed that there are discrepancies in data gathering especially related to the energy balance. Also waste related data and manure data from agriculture should have improved gathering methods. As shown above these discrepancies may also result from the difference in the definition of 'energy' between IPCC and IEA or Eurostat. Moreover recent EU decisions have imposed additional future requirements that will oblige the NSO to make monthly reports of GHG emissions, and the MECC to develop the capability to make projections of GHG emissions. These short-term actions and prospective future obligations require improved cooperation between the MECC and the NSO.

Recommendation – It is important to create a mechanism (documented by a procedure) to ensure data consistency, comparability and manage the problem of basic data confidentiality between the MECC and the NSO. To catalyze the development of such a mechanism it would be valuable to initiate a workshop meeting between the NSO and the MECC representatives on the matter with a view to developing a MoU leading to the required procedure to be approved by the Government. Cooperation between these two entities must be based on a thorough analysis aimed at keeping things simple and efficient.

Improving data sources reliability

Issue – Data reporting is done by entities which are required by law to report GHG emissions as part of the EU-ETS as well as by entities outside the EU-ETS. The non-ETS reporting entities do not have a clear mechanism for verification and monitoring that for example ensures that they are still commercially active in the reporting year, or that they have correctly implemented the evaluation methods. Although there are data quality verification cycles at the level of the MECC and the NSO that ensures the reliability of the reported final data, there is not yet a clear procedure for separating ETS and non-ETS entities in a consistent and continuous way. The Directive 2009/406/EC requires the levels of emission evolutions to be separated for ETS and non-ETS. In order to be able to monitor and report on these levels there is a need to improve the reporting system not necessarily in terms of basic data but related to how the data is separated and grouped for monitoring and reporting the two categories mentioned above.

Recommendation – Analyze the possibility of improving the existing mechanism for ensuring data quality by for example mandating a yearly check with the Register of Commerce on the commercial status of reporting entities to ensure they are still in operation. This should be correlated with the environmental authorization system of the Environmental Protection Agencies (EPA) and with the General Inspectorate of Emergency Situations system of monitoring that is currently responsible for partially ensuring the reliability of data. The study should also include components on non-ETS monitoring, verification and reporting procedures, as well as methods to separate the basic data between ETS and non-ETS taking into consideration the recent inclusion into ETS of aviation emissions.

Improving human resources (continuity)

Issue – There is high staff turnover within the Government entities responsible for inventory reporting, monitoring and verification meaning that many staff with specialized training are migrating to private companies. In addition to staff retention, there is a strong need for training on the new IPCC 2006 methodology to be implemented soon at the international level.

Recommendation – There is a need to improve Human Resources management to create and maintain competence by structured training, compensation and career development systems. Related to the preparation for the implementation of the IPCC 2006 methodology the interaction with specialized experts must be intensified both by participating in dedicated meetings and workshops and by direct exchange of information through presentation and training. These actions should be done as soon as possible given the need for fast implementation of the IPCC 2006 methodology.

Being prepared for future GHG emissions inventory requirements

Issue – By March 2015 MECC is required by the EU to have a system for GHG emissions projections. The absence of such a system may result in an infringement procedure applied to Romania. It is anticipated that the capacity to undertake emissions projections may result in profound change in the way reporting entities – both ETS and non-ETS – are able to plan their future development. Forecasting capacity will result in earlier and upstream planning of economic activity taking into account the carbon budget of such activities potentially resulting in significant changes in the planned activities of key actors. This capability to plan ahead is also important to the credibility of the overall economic activity.

Recommendation – Given the urgency of having a system for GHG emissions projection by March 2015, a dedicated study should be soon initiated with a view to drafting the legal documents needed to initiate a forecasting system. The aim to have the study result in a

consensus draft of the legislation that can be put forward to the Government for future approval in line with the process followed for the existing legal documents for the inventory of GHG emissions. The study should include the time horizon of the data, the type of data to report as well as other needed indicators that may help verify the quality of the evaluation.

Facilitating access to legislation

Issue – The analysis of the Romanian legislation shows that there have been significant changes in issued legislation together with a multiplication of related Government decisions and acts. This complexity of the legal framework and the current lack of a centralized source for all relevant legislation make the application of the legal provisions difficult and cumbersome.

Recommendation – It would be valuable to have a legal specialist complete a comprehensive dedicated study to compile all relevant legislation and associated changes and updates into a Codex as has been done in for example Italy and France. The existence of the whole legal provision related to the GHG inventory in a single ‘place’ is likely to ease the application of the legal provisions by the involved entities. Also, the future extensions of the legislation, required for example by the need to implement a system for GHG emissions projections (EU legislation) and, in the longer-term by expected new or extended international agreements under for example the UNFCCC need to be incorporated into this Codex and disseminated rapidly.

Strengthening Institutional arrangements post CC RAS

Issue – The deliverables of the CC RAS include models and other basic support methods to enhance decision-making and evaluations related to climate change and GHG emissions. These tools should continue to be useful to the client once the CC RAS is concluded. At present there is a lack of an institutional support for the continual use of these instruments in the future. The sustainability of this project may be in jeopardy if there is no institutional support created in due time to support capacity development and the continued use of the models and methods provided.

Recommendation – It is recommended that the Government of Romania involve academia and dedicated technical NGOs working in cooperation with the MECC to create a system of institutional support based on knowledge acquired and transferred during the CC RAS, in order to have among other benefits, a coherent system to evaluate ex/ante and ex/post the impact of CC policies and the impact of the EU requirement of 20% CC components in every investment. It is also necessary for the Government to explore sources of potential financing for this institutional structure to be created. This system could serve also to support the preparation of specific evaluation and reporting procedures for various types of entities that according to the law are part of the GHG inventory system.

7 CONCLUSIONS

This report presents an analysis of Romania's Greenhouse Gas Inventory process and provides explicit and detailed action based recommendations for improvement related to each stage of the inventory process as well as on the process as a whole.

The report makes process recommendations in six key areas: (i) legislation; (ii) data consistency; (iii) reliability of data sources; (iv) human resources; (v) legal documents for GHG emission projections and (vi) potential institutional support for the post CC RAS Program period to support the continued use of the model and methods to be produced and delivered to the client

Moreover, several follow up actions were identified such as the need for an exchange of information with experts who have extensive knowledge of the IPCC 2006 methodology as well as the establishment of career development plans to maintain high quality personnel, and/or the creation of a center for policy support and impact evaluation, in cooperation with academic entities that will manage and extend the modeling capabilities created within the CC RAS. Another important follow up action is the correlation of the MECC EPA data processing system with the NSO one, by means of a protocol of cooperation, in order to increase the efficiency of the GHG inventory process.

Finally, it should be stressed that the GHG inventory process should be viewed as complimentary to other components of the CC RAS. Together these components of the CC RAS provide a comprehensive and integrated approach to developing the country's environmental strategy and operational plans and to create the modeling and impact assessment capability of MECC as an extended decision support tool.

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ANNEXES

Annex 1. Findings on Climate Change related Statistics from meetings with the Ministry of Environment and Climate Change (MECC) - Romania GHG inventory compiler: Synthesis of discussion findings¹⁷

I. Overlapping mandates, imperfect communication and unclear procedures may create some inconsistencies and duplication of effort in data collection for the GHG Inventory. The Romanian EPAs and NSOs should establish collaborative systems for following and sharing information on IPCC processes. Example of challenges and areas for cooperation are highlighted below. The recommendations contained below have resulted from the discussion with the MECC and have been included in the Report grouped under different topics: 1- the need for better correlation on energy data with NSO is included in the proposed Protocol of Cooperation, the more detailed reporting of waste data is covered by the recommendation to better disseminate the methodology at the local level while the IPCC 2006 methodology implementation is proposed as such; 2 - The data on Agriculture will also be improved by better dissemination of data gathering procedures; 3 – is included in the request for a verification done jointly by NSO and EPA at years end for the data. Also, II – is included in the recommendations to prepare the personnel, improve the projection capability and III – is contained in the need to have extended legislation for the new requirements of 2015.

1. GHG Inventory Energy Sector versus Energy Statistics:

- At the EU level, in respect of the energy sector, in the next period the EU Member States will report to the Commission under the MMR (Monitoring and Reporting Mechanism Regulation), and also on Effort Sharing Decision. This means that at the national level, it is necessary to take the EU-ETS data into consideration in the inventory,. Also, in the Energy Statistics Regulation it is stipulated that “every reasonable effort shall be undertaken to ensure coherence with the energy data” (art.6.2) reported in accordance with MMR. These two data sets (energy statistics and energy ETS data) could be inconsistent due to the different reporting methodologies, different operators/ departments charged with the reporting activity. In addition the classified nature of some of the data and the issue of confidentiality may limit the exchange of information, both from part of NSO and from institution collecting EU-ETS data.

¹⁷ The contribution is acknowledged of Gherghița NICODIM, Greenhouse gas expert, Climate Change Directorate, Ministry of Environment and Climate Change, Libertatii Boulevard, No. 12, District No. 5, Bucharest - ROMANIA , Tel. 0040 214 089 551, Tel. 0040 721 275 595; 0040 743 083 505

A recommendation could be provided in the report on how the ETS energy data could be harmonized with the energy statistics data and integrated in the Energy Balances.

- The different types of waste used as fuels, sometimes in the statistics are treated as one single type (in the Energy Balance). Also there are problems with the collected data in respect of the different type of waste used as fuel in combination with a per cent of biomass.

A recommendation could be to collect data taking into account the different types of waste incinerated, with energy recovery: municipal solid waste, industrial waste, dangerous waste, etc. and also report the biomass fraction separated from the waste, in combination with it is used as fuel.

- Regarding the reporting of the GHG Inventory following the IPCC 2006 Guidelines provisions, the current energy statistics collecting data activity is not totally in line with the IPCC (for example in the agriculture energy sub-sector, is necessary that the activities to be disaggregated in stationary and mobile).

A recommendation could be made to harmonize data collecting activities as well as possible with the new reporting obligations in respect of all GHG inventory activity categories (being used starting with 2015 year).

- Regarding the consistency of the data on the entire GHG inventory time-series and also reported in different statistics frameworks – could be found the situation when for example to EUROSTAT, on a sum of years, in aviation, are reported a number of flight cycles (take-off and landing) and the energy Balance do not provide kerosene consumption on the same years. The problem with the double accounting is not only the extra costs and supplementary burden on respondents; also there are in many cases inconsistencies when the same data, from the same sources are collected in different frameworks and by different departments of the institutions.

In this case also a review of the statistical data could be recommended to ensure consistency over time despite different reporting frameworks.

2. GHG Inventory - Agriculture Sector versus Agriculture Statistics:

The lack of data regarding the amount of manure from animal farms and details about the manure management systems makes the estimates from the Agriculture Sector less accurate and complete than it could be.

This data gap could be addressed through a recommendation to collect these data on manure when collecting other farm data for national statistical purposes. This will improve the GHG Inventories in this area.

3. At the European level the NSOs must report early energy GHG emissions based on monthly data (to be confirmed by EUROSTAT). At the end of the year, these estimates could match or not the ones for the Inventory. Some discrepancies were found during a comparison made for some national GHG reporting.

It is recommended that at the end of the year, NSOs compare their emissions with the GHG inventory emissions and address possible inconsistencies.

II. In regards to climate change related statistics that fall outside of the requirements of the GHG inventory, it is critical to have good explanations related to the trends of emissions estimates. For each fluctuation in the emissions trend, a wide variety of climate change related factors could be involved. The institution responsible for compiling the inventory currently needs to look examine a wide variety of sources including different portals and climate change national sites to determine what was happening in that year to explain the trend fluctuation.

In addition under the National Communications of Annex I Parties and Biennial Reports various data related to climate change are requested: policies and measures, projections and the total effect of policies and measures, vulnerability assessments, climate change impacts and adaptation measures financial resources and transfer of technology, education, training and public awareness, research and systematic observation.

It is recommended where possible to collate existing data under the same umbrella, using standardized definitions and methodologies, related to for example meteorological conditions, prices of fuels or raw materials, data about precipitation, droughts, renewable sources, economic policy in domains like energy, population migration, etc.

III. In respect of the legislation linking the cooperation between institutions – *a recommendation on the specific legislation at the national level will help the NSOs and the National GHG Inventory compilers to initiate the process to improve the actual laws with new accounts and appropriate infrastructure. The issue is important due to the fact that a law in place could release funds for human resources and appropriate infrastructure.*

Annex 2. European Statistical System (ESS) quality criteria for statistical output compared to the criteria for greenhouse gas inventories

ESS criteria¹⁸	IPCC guidelines
<p><i>Relevance</i> is the degree to which statistics meet current and potential users' needs. It refers to whether all statistics that are needed are produced and the extent to which concepts used (definitions, classifications etc.) reflects user needs.</p>	<p>The EU requirement to report ETS as well as non ETS data will have a definite impact on the IPCC GHG inventory,</p>
<p><i>Accuracy and reliability:</i> In a statistical sense, refers to the closeness of the statistical data to the (in general) unknown true or exact value of the measured phenomena. Usually this closeness can be measured by using statistical indicators such as bias and variability of the statistical data.</p>	<p><i>Accuracy</i> is a relative measure of the exactness of an emission or removal estimate. Estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, as far as can be judged, and that uncertainties are reduced as far as practicable. Appropriate methodologies should be used, in accordance with the IPCC good practice guidance, to promote accuracy in inventories</p>
<p style="text-align: center;"><i>Timeliness and punctuality</i></p> <p>Punctuality refers to the time lag between the release date of data and the target date when it should have been delivered, for instance, with reference to dates announced in some official release calendar, laid down by Regulations or previously agreed among partners.</p> <p>Timeliness of information reflects the length of time between its availability and the event or phenomenon it describes</p>	<p>With the EU requirement to report GHG emission data on a monthly basis timelines and punctuality start to apply to IPCC too.</p>
<p><i>Accessibility and clarity</i></p>	<p><i>Transparency</i> means that the</p>

¹⁸ Quality Assurance Framework of the European Statistical System: epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/QAF_2012/EN/QAF_2012-EN.PDF

<p>Accessibility refers to the physical conditions in which users can obtain data: where to go, how to order, delivery time, clear pricing policy, convenient marketing conditions (copyright, etc.), availability of micro or macro data, various formats (paper, files, CD-ROM, Internet...), etc.</p> <p>Clarity refers to the data's information environment whether data are accompanied with appropriate metadata, illustrations such as graphs and maps, whether information on their quality also available (including limitation in use...) and the extent to which additional assistance is provided by the NSO.</p>	<p>assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information. The transparency of inventories is fundamental to the success of the process for the communication and consideration of information</p>
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<p><i>Coherence and comparability</i></p> <p>Coherence of statistics is their adequacy to be reliably combined in different ways and for various uses. It is, however, generally easier to show cases of incoherence than to prove coherence.</p> <p>Comparability aims at measuring the impact of differences in applied statistical concepts and measurement tools/procedures when statistics are compared between geographical areas, non-geographical domains, or over time. One can say it is the extent to which differences between statistics are attributed to differences between the true values of the statistical characteristic. There are three main approaches under which comparability of statistics is normally addressed: comparability over time, between geographical areas, and between domains.</p>	<p><i>Consistency</i> means that an inventory should be internally consistent in all its elements with inventories of other years. An inventory is consistent if the same methodologies are used for the base and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. Under certain circumstances, an inventory using different methodologies for different years can be considered to be consistent if it has been recalculated in a transparent manner, in accordance with the IPCC Good Practice</p> <p><i>Comparability</i> means that estimates of emissions and removals reported by Annex I Parties in inventories should be comparable among Annex I Parties. For this purpose, this Annex should use the methodologies and formats agreed by the COP for estimating and reporting inventories. The allocation of different</p>
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	<p>source/sink categories should follow the split of <i>the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories</i>, and the IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry, at the level of its summary and sectorial tables</p>
-	<p><i>Completeness</i> means that an inventory covers all sources and sinks, as well as all gases, included in the IPCC Guidelines as well as other existing relevant source/sink categories which are specific to individual Annex I Parties and, therefore, may not be included in the IPCC Guidelines. Completeness also means full geographic coverage of sources and sinks of an Annex I Party</p>

Annex 3. Applicable IPCC methodology for GHG inventory data

The table is giving the structure of the GHG inventory by category (e.g. energy supply) mentioning the name of the component sources and the associated IPCC (1996) methodology. For each activity and data source is given for each component. The underlying data status is given in the last six columns in order to clearly identify where to find the data i.e. in the official statistical system, or outside it having various level of confidentiality or stemming from research activity.

Data categories			Methodology	Summary of activity/ emissions data sources	Status of underlying data							
National Communication		IPCC			Category	Name	Published as Official Statistics	Official Statistics, but with further disaggregation needed	Publicly available, but not as Official Statistics	Based on non-public data which is specifically requested	Commercially confidential	Based on other published research
Energy Supply	Power Stations	1A1a	Emission factor * activity	ANRE and INS data on energy balance, plant operator and EU Emissions Trading System (EU-ETS) data	Partly	Partly		Partly	Partly			

	Refineries	1A1b	Emission factor * activity	Register of emissions, plant operator and EUETS data	Partly	Partly			Partly	
	Manufacture of solid fuels and other energy industries	1A1c	Emission factor * activity	Register of emissions, plant operator and EUETS data	Yes					
	Coal mining and handling	1B1a	Emission factor * activity	Register of emissions, plant operator and EUETS data	Yes					
		1B1c	Modelled	WSP-consultancy						Yes
	Solid fuel transformation	1B1b	Carbon balance approach	ANRE and INS data on energy balance, plant operator and EU Emissions Trading System (EUETS) data	Yes					

	Exploration, production and transport of oils	1B2a	Emission factor * activity; operator reported emissions	ANRE and INS data on energy balance, plant operator and EU Emissions Trading System (EUETS) data	Partly	Partly				Partly	
	Offshore oil and gas - Flaring	1B2cii	Operator reported emissions	MECC						Yes	
	Offshore oil and gas - Venting	1B2ci	Operator reported emissions	MECC						Yes	
	Power stations - FGD	2A3	Emission factor * activity	ANRE and INS data on energy ballance, plant operator and EU Emissions Trading System (EUETS) data				Yes			
	Exploration, production and transport of gas	1B2b	Modelled (natural gas leakage); operator reported emissions (offshore activities)	Gas operators, ANRE					Yes		
Business	Iron and steel - combustion and electricity	1A2a	Emission factor * activity	DUKES	Yes						

	Other industrial combustion and electricity	1A2b	Emission factor * activity	Register and ANRE	Yes					
		1A2c	Emission factor * activity	Register and ANRE	Yes					
		1A2d	Emission factor * activity	Register and ANRE	Yes					
		1A2e	Emission factor * activity	Register and ANRE	Yes					
		1A2f	Emission factor * activity (stationary sources);estimated (mobile sources)	ANRE, Plant operators and industry data,	Partly					Partly
	Miscellaneous industrial and commercial combustion and electricity	1A4a	Emission factor * activity	ANRE	Yes					
	Energy recovery from waste fuels	2B5	Emission factor * activity	Register; Romanian Cement Association			Partly		Partly	
	Refrigeration and air conditioning	2F1	Estimated	MECC					Partly	Partly
	Foams	2F2	Estimated	MECC						Yes
	Firefighting	2F3	Estimated	MECC						Yes
	Solvents	2F5	Estimated	MECC						Yes

	One Component Foams	2F9	Estimated	MECC						Yes
	Electronics, electrical insulation and sporting goods	2F9	Estimated	MECC					Partly	Partly
Transport	Civil aviation (Domestic, Cruise)	1A3a	Estimated based on CAA data and MECC	Civil Aviation Authority, MECC		Yes				
	Civil aviation (Domestic, Landing and take off)	1A3a	Estimated based on CAA data and MECC	Civil Aviation Authority, MECC		Yes				
	Passenger cars	1A3b	Estimated	MECC, Department for Transport		Yes				
	Light duty vehicles	1A3b	Estimated	MECC, Department for Transport		Yes				
	Buses	1A3b	Estimated	MECC, Department for Transport		Yes				
	HGVs	1A3b	Estimated	MECC, Department for Transport		Yes				
	Mopeds & motorcycles	1A3b	Estimated	MECC, Department for Transport		Yes				
	LPG emissions (all vehicles)	1A3b	Estimated	MECC, Department for Transport		Yes				

	Other (road vehicle engines)	1A3b	Estimated	MECC, Department for Transport		Yes				
	Railways	1A3c	Emission factor * activity	MECC, Department for Transport			Partly	Partly		
	Railways - stationary combustion	1A4a	Emission factor * activity	MECC, Department for Transport	Yes					
	National navigation	1A3d	Emission factor * activity	MECC, Department for Transport	Partly					Yes
	Fishing vessels	1A4c	Emission factor * activity	MECC, Department for Transport						Yes
	Military Aircraft and shipping	1A5b	Emission factor * activity	Civil Aviation Authority (CAA), Ministry of Defense (MOD)				Yes		
	Aircraft Support Vehicles	1A3e	Estimated	MECC, Department for Transport						Yes
Public	Public	1A4a	Emission factor * activity	MECC INS	Yes					
Residential	Residential combustion	1A4b	Emission factor * activity	MECC INS	Yes					
	Use of non-aerosol consumer products	2B5	Emission factor * activity	MECC INS			Yes			

	Accidental vehicle fires	6C	Emission factor * activity	MECC, Department for Transport	Yes						
	Aerosols and metered dose inhalers	2F4	Estimated	MECC				Yes			
Agriculture	Stationary and mobile combustion	1A4c	Emission factor * activity (stationary sources); modelled (mobile sources)	MECC , Min Agro	Part ly						Part ly
	Breakdown of pesticides	2B5	Emission factor * activity	MECC , Min Agro			Yes				
	Enteric Fermentation - Cattle	4A1	Tier 2 Emission factor * activity	MECC , Min Agro	Yes						
	Enteric Fermentation - Sheep	4A3	Tier 2 Emission factor * activity	MECC , Min Agro	Yes						
	Enteric Fermentation - Goats	4A4	Emission factor * activity	MECC , Min Agro	Yes						
	Enteric Fermentation - Horses	4A6	Emission factor * activity	MECC , Min Agro	Yes						
	Enteric Fermentation - Swine	4A8	Emission factor * activity	MECC , Min Agro	Yes						
	Enteric Fermentation - Deer	4A10	Tier 2 Emission factor * activity	MECC , Min Agro	Yes						

	Wastes - Cattle	4B1	Tier 2 Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Sheep	4B3	Tier 2 Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Goats	4B4	Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Horses	4B6	Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Swine	4B8	Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Poultry	4B9	Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Deer	4B10	Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Manure Liquid Systems	4B12	Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Solid Storage and Dry Lot	4B13	Emission factor * activity	MECC , Min Agro	Yes						
	Wastes - Other manure management (N2O)	4B14	Emission factor * activity	MECC , Min Agro	Yes						
	Direct Soil Emission	4D	Emission factor * activity	MECC , Min Agro	Yes						
	Field burning of agricultural wastes	4F1	Emission factor * activity	MECC , Min Agro	Yes						
		4F5	Emission factor * activity	MECC , Min Agro	Yes						

Industrial Process	Sinter production	1A2a	Carbon balance approach	MECC	Yes					
	Cement production	2A1	Emission factor * activity	MECC, Romanian Cement Association, Register			Partly		Partly	
	Lime production	2A2	Emission factor * activity	MECC Register			Partly		Partly	
	Limestone and dolomite use	2A3	Emission factor * activity	MECC				Yes		
		2A7	Emission factor * activity	MECC				Yes		
	Soda ash production and use	2A7	Emission factor * activity	MECC				Yes		
	Fletton bricks	2A7	Calculated, based on operator reported emissions data and brick production statistics	MECC	Partly		Partly			
	Ammonia production	2B1	Calculated, based on operator reported data on CO ₂ produced, emitted and sold.	Plant Operators data, Register				Yes		
	Iron and steel production	2C1	Carbon balance approach	MECC, INS	Partly		Partly			

	Aluminium production	2C3	Emission factor * activity; operator reported data	MECC, INS			Yes			
	Nitric acid production	2B2	Operator reported data	Plant Operators data, Register				Yes		
	Adipic acid production	2B3	Operator reported data	Industry data, via communication					Yes	
	Other - Chemical industry	2B5	Calculated, based on operator reported emissions and plant capacity data.	MECC			Yes			
	Halocarbon production	2.00E+01	Operator reported data	MECC			Partly		Partly	
		2.00E+02	Operator reported data	Data reported via the Register and MECC			Partly		Partly	
	Magnesium cover gas	2C5	Modelled; Operator reported data	Data reported via the Register and MECC			Partly	Partly		
Land Use Change	Forest Land remaining Forest Land	5A1	Estimated							Yes

	Biomass burning (Forest Land)	5A	Estimated							Yes
	Land converted to forest land	5A2	Estimated							Yes
	Direct N ₂ O emission from N fertilisation of forest land	5A2	Estimated							Yes
	Drainage of Organic Soils (Forest Land)	5A	Estimated							Yes
	Biomass burning (Cropland)	5B	Estimated							Yes
	Liming (Cropland)	5B1	Estimated							Yes
	Cropland remaining cropland	5B1	Estimated							Yes
	Land converted to cropland	5B2	Estimated							Yes
	N ₂ O emissions from disturbance associated with land-use conversion to cropland	5B2	Estimated							Yes

	Biomass burning (Grassland)	5C	Estimated							Yes
	Liming (Grassland)	5C1	Estimated							Yes
	Grassland remaining grassland	5C1	Estimated							Yes
	Land converted to grassland	5C2	Estimated							Yes
	Wetlands remaining Wetland	5D1	Estimated							Yes
	Non-CO2 emissions from drainage of soils and wetlands	5D2	Estimated							Yes
	Land converted to Wetland	5D2	Estimated							Yes
	Settlements remaining settlements	5.00E+01	Estimated							Yes
	Biomass burning (Settlements)	5E	Estimated							Yes
	Land converted to settlements	5.00E+02	Estimated							Yes
	Harvested wood	5G	Estimated							Yes
Waste Management	Landfill	6A1	Estimated	MECC						Yes

	Waste-water handling	6B1	Emission factor * activity	ANAR, IPCC Defaults	Yes					
		6B2	Estimated	INS, MECC, ANAR	Partly		Partly	Partly		
	Waste Incineration	6C	Emission factor * activity	MECC			Yes			

Annex 4 - Legislation

Legislation specific to National Statistics

- GD no. 48/2013 on the organization and functioning of the Ministry of Environment and Climate Change and for modifying some environment protection and climate change domain related legal acts; it modified also the GD no. 1570/2007;
- GD no. 668/2012 for modifying and completing the GD no. 1570/2007 for establishing the National System for the estimation of anthropogenic greenhouse gas emissions levels from sources and removals of CO₂ by sinks, regulated through the KP;
- Ministry of Environment Order (MoEO) no. 1376/2008 for approving the Procedure on NGHGI reporting and the modality for answering to the observations and questions raised following the NGHGI review;
- MoEO no. 1474/2008 for approving the Procedure on processing, archiving and storage of data specific to the NGHGI;
- NEPA's President Decision no. 23/2009 for approving the Procedure on selection of the estimation methods and of the emission factors needed for the estimation of the GHG levels;
- NEPA's President Decision no. 417/2012 on abrogating the NEPA's President Decision no. 119/2012 (on abrogating the QA/QC Procedure approved through the Decision no. 24/2009 and on approving a updated QA/QC Procedure related to the NGHGI) and on approving a updated QA/QC Procedure related to the NGHGI;
- Protocol of collaboration no. 3029/MMP-RP/3.07.2012 between Ministry of Environment and Forests, NEPA and ICAS, on administrating the NGHGI LULUCF Sector both under the UNFCCC and KP;
- Protocol of collaboration no. 3136/MMP/9.07.2012 between Ministry of Environment and Forests, NEPA, Romanian Automobile Register and Directorate on Driving Licenses and Vehicles Registration in the Ministry of Administration and Interior, on the preparation of Road transport category estimates based on COPERT 4 model.

Legislation on non-ETS sectors

- Decision 406/2009/CE, on the effort to reduce emissions of greenhouse gases;
- Commission decisions on determining annual emission allocations in the period 2013-2020 as a result of Decision 406/2009/EC, namely Commission Decision of 26.03.2013, Commission Decision 2013/162/EU and Decision of Implementation of Commission no. 2013/634/EU
- Regulations on CO2 emissions from passenger cars and vans, amending Regulation 2009/443/CE and Regulation 510/2011 CE;
- Directive 2010/31/UE on the energy performance of buildings
- Directive 2005/32/CE and implementation regulations, Directive 2003/66/CE and Directive 2010/30/CE;
- Regulation 2008/1275/CE;
- Regulation 2009/107/CE;
- Regulation 2009/245/CE, Regulation 859/2009 and Regulation 347/2010;
- Regulation 2009/244/CE;
- Regulation 2009/278/CE;
- Regulation 642/2009 and Regulation 1062/2010;
- Regulation 640/2009;
- Regulation 641/2009;
- Regulation 643/2009 and Regulation 1060/2010;
- Regulation 1015/2010 and Regulation 1061/2010;
- Regulation 1016/2010 and Regulation 1059/2010;
- Regulation 327/2011;
- Regulation 206/2012 and Regulation 392/2012;
- Regulation 1222/2009, Regulation 228/2011, Regulation 1235/2011;
- Regulation 2006/842/CE on fluorinated gas emissions;
- Directive 2006/40/CE on motor vehicles;
- Directive 2006/32/CE on users energy efficiency and energy services;

- Directive 2003/96/CE on energy taxation;
- Regulation 2007/715/CE on EURO 5 and EURO 6 model;
- Regulation 2009/595/CE on EURO 6 model of heavy vehicles;
- Fuel Quality Directive 2009/30/CE;
- Directive 2003/30/CE on biofuels;
- Directive 1999/31/CE on garbage dumps;
- Directive 2006/12/CE on waste management;
- Directive 2008/98/CE on waste management;
- Directive 1991/676/EEC on the use of nitrates;
- Decision 2006/144/CE on the Common Agricultural Policy;
- Directive 2009/33/CE on the promotion of energy efficient and environmentally-friendly road transportation
- Directive 2011/76/UE on road infrastructure taxation;
- Directive 2009/ 28/CE on the promotion of energy use from renewable resources.