Romania's Initial Report under

the Kyoto Protocol

(Assigned Amount Calculation)

Ministry of Environment and Sustainable Development

Romania

May 2007

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1. Introduction

Climate change is one of the major challenges of the XXI century - a complex area where the humanity still needs to improve the knowledge and understanding in order to take timely and correct measures for tackling climate change effects in the most cost-effective way, while following the precautionary principle. In this respect a reliable reporting system for greenhouse gas (GHG) emissions is needed under the framework of the Kyoto Protocol.

In order to demonstrate that it has implemented the requirements for accounting under the Kyoto Protocol, Romania, as an Annex I Party with a commitment inscribed in Annex B of the Kyoto Protocol, is required to submit the present report to facilitate the calculation of its assigned amount and demonstrate its capacity to account for its emissions and assigned amount.

In this respect, the present report includes or has attached different information about Romania, as follows:

- Complete recalculated GHG inventory for all years from 1989 (Romania's base year) to 2004 (most recent year at the date of this report);
- Identification of the selected base year for hydroflourocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) in accordance with article 3, paragraph 8 of the Kyoto Protocol;
- Calculation of its assigned amount pursuant to Article 3, paragraphs 7 and 8 of the Kyoto Protocol;
- Calculation of its commitment period reserve in accordance with Decision 11/CMP.1;
- Presentation of the definitions, election of activities and identification of the accounting period for use in accounting for Romania's land use, land use change and forestry activities under Article 3, paragraph 3 and 4 of the Kyoto Protocol;
- Description of the national system established in accordance with Article 5, paragraph 1 of the Kyoto Protocol;
- Description of the national registry, in accordance with the guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol.

This report is also required by the Article 23 of the Commission Decision 2005/166/EC laying down rules implementing Decision 2004/280/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol, that Romania shall comply with after its integration in the European Union (EU) at 1st of January 2007.

Romania signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 at the Rio Earth Summit and ratified it by Law no. 24/1994, being the first country included in the Annex I of the UNFCCC which ratified the Kyoto Protocol to the UNFCCC by Law no. 3/2001, committing itself to reduce the GHG emissions with 8%, in the first commitment period 2008-2012, comparing to the base year (1989). By ratifying the Kyoto Protocol in 2001, Romania not only committed to reduce GHG emissions but also showed the political will to engage in solving a global problem. The economic decline after 1989 induced by the transition from a planned

economy to a market based economy resulted in a relevant decrease of the GHG emissions as presented in this report.

Romania as an Annex I Party undergoing the process of transition to a market economy (EIT Party) and taking into account the flexibility provided by the Article 4.6 of the UNFCCC, has requested a different base year to better reflect its economic potential. Through the Decision 9/CP.2 it was agreed that Romania will use 1989 as a base year, instead of 1990. Based on the flexibility provided also by Article 3.5 of the Kyoto Protocol, Romania will use the different base year for the implementation of its emission reduction commitments provided by article 3 of the Protocol.

Romania became a full member state of the EU at the beginning of 2007 and a lot of concrete actions have been implemented during the process of accession, such as the development of the National Strategy and Action Plan on Climate Change, and the implementation of the EU Emissions Trading Scheme. As a result of the necessity to transpose the EU acquis communautaire (legal acts) in the national legislation Romania has already introduced and is implementing several polices and measures that directly or indirectly reduce GHG emissions. Therefore the objective of the Romanian Government is to continue implementing the existing and future EU policies and measures in order to reduce the carbon intensity of the Romanian economy and to stabilize the GHG emissions at current levels considering the economic growth.

Although it is a full member state of the EU, Romania is not participating in the first commitment period agreement between EU 15 initial member states ("burden sharing agreement") based on Article 4 of the Kyoto Protocol taking into account that Romania was not an EU member state at the date of the EU ratification of the Kyoto Protocol through Council Decision 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder.

In 2005, through the National Strategy on Climate Change (NSCC) and the National Action Plan on Climate Change (NAPCC) the Romanian Government has taken important steps towards a targeted and coordinated national effort to meet the UNFCCC and Kyoto Protocol commitments, to stabilize GHG emissions at current levels and to consider the expected climate change impacts and their respective adaptation measures.

NSCC outlines Romania's national priorities concerning climate change in the period 2005-2007, addressing the requirements in this field resulting from the EU accession, in order to prepare for the most feasible national approach in the short and medium term. NSCC also specifies the environmental and economic benefits for Romania regarding the participation in the application of the flexible mechanisms provided by the Kyoto Protocol, especially Joint Implementation (JI) and International Emissions Trading (IET).

NSCC represented only the first step and it was followed immediately by the NAPCC, which prioritized the actions needed to implement the strategy at all levels and in the same time it operationalized the NSCC's objectives into specific actions. NAPCC specifies the means of implementing the NSCC and determines the ways of reporting

the progress of the implementation. NAPCC assigns tasks and responsibilities to individual institutions and clearly identifies the responsible actor(s) for the specific actions and related tasks. Clear timeframes for the actions to be carried out have been set, and sources of funding for the specific actions were identified, where possible.

The time frame of the NSCC specific objectives and of the NAPCC actions covers the period until the end of 2007. This relatively short period was selected due to the obligations before the start of the first Kyoto Protocol commitment period as well as due to rapid changes in the national economic situation and the international climate change regime. Regarding the impact assessment of the NSCC and NAPCC, a longer-term perspective was taken into account, in particular up to the end of the first commitment period of the Kyoto Protocol, in 2012. However, NSCC and NAPCC are dynamic instruments that will be updated on a regular basis in order to reflect changing circumstances in the Romanian economy as well as the increased knowledge in the field. During 2007, both documents will be updated and approved before the start of the first commitment period of the Kyoto Protocol, taking into account the new obligations after Romania's accession to the EU.

According to the last inventory submitted to the UNFCCC Secretariat and taking into account the projections of GHG emissions for the period 2008-2012, presented in the Forth National Communication of Romania to the UNFCCC, there is a great probability for Romania to meet the Kyoto Protocol's commitments to reduce GHG emissions in the first commitment period (2008-2012) even considering a sustained strong economical development requested by the objective to reach the level of EU initial member states in a definite timeframe.

In Romania, the Ministry of Environment and Sustainable Development (MMDD) – different names over the years – is the governmental institution authorized to develop and carry out the state policy in the field of climate change. The National Environmental Protection Agency (ANPM) is the subordinated institution, which ensures the technical support for MMDD and coordinates the regional-level EPAs (ARPM) and the 42 county-level EPAs (APM).

2. Greenhouse Gas Inventory

Background

As a Party to the UNFCCC, Romania is required to elaborate, regularly update and submit the national GHG inventory. Based on all the subsequent requirements regarding reporting activities, Romania has been preparing and submitting national GHG inventories in the requested format, annually starting with 2002, using the 1996 Revised IPCC Guidelines for National Greenhouse Gas Inventories, the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories and the IPCC Good Practice Guidance for Land-Use, Land-Use Change and Forestry. The national GHG inventories were compiled also according to the recommendations set out in the UNFCCC Guidelines for the preparation of national communication by parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories (FCCC/CP/2002/8 and FCCC/SBSTA/2004/8). In the same time the entire time series of inventories have been recalculated for every submission due to new activity data, different changes of methods and/or emission factors, review reports recommendations and also due to the institutional and procedural changes.

The national GHG inventories submitted by Romania annually from 2002 have been reviewed by independent international expert review teams in 2003 (in-country review), 2004 (desk review) and 2005 (centralized review). The review reports can be downloaded from the UNFCCC Secretariat website.

For the submission presented in May 2006, Romania prepared the CRF Reporter database including inventories recalculated for all years, and CRF LULUCF tables containing emission estimates for the period 1989-2004 together with the National Inventory Report. The National Institute for Research and Development on Environmental Protection (ICIM) Bucharest has prepared the respective submission being under an annual contract with the MMDD. ICIM has also prepared the GHG inventory chapter for the 2nd and 3rd National Communication of Romania to the UNFCCC, being involved in the preparation of GHG inventories since 1997, and having annual contracts with MMDD since 2002. In the same time, it was decided that the newly established ANPM will be involved in the inventory preparation, firstly in activities related to data collection.

Taking into account the different financial, staff, and technical problems experienced over the years in the preparation of the GHG inventories, at the beginning of 2006, MMDD designated ANPM as the single national authority responsible with the national system for estimating anthropogenic GHG emissions and the national GHG inventory.

From the beginning of 2006, ANPM dedicated 4 full time experts for the inventory team. Considering the new organization, structure and capacity of the inventory preparation process, the first assignment of the inventory team was to recalculate all inventories taking into account new activity data, some national methods and emission factors, previous review reports recommendations and using IPCC Good Practice Guidance and Uncertainty Management in entirely. The national system is presented in detail in Chapter 8.

Thus, the complete recalculated GHG inventory for all years from 1989 (Romania's base year) to 2004 (most recent year at the date of this report) has been included in this report as requested (Romania's GHG Inventory – 2006 submission v.2).

The GHG inventory covers all sectors and the majority of the IPCC source categories. The direct GHGs (including groups of gases) included in the national inventory are:

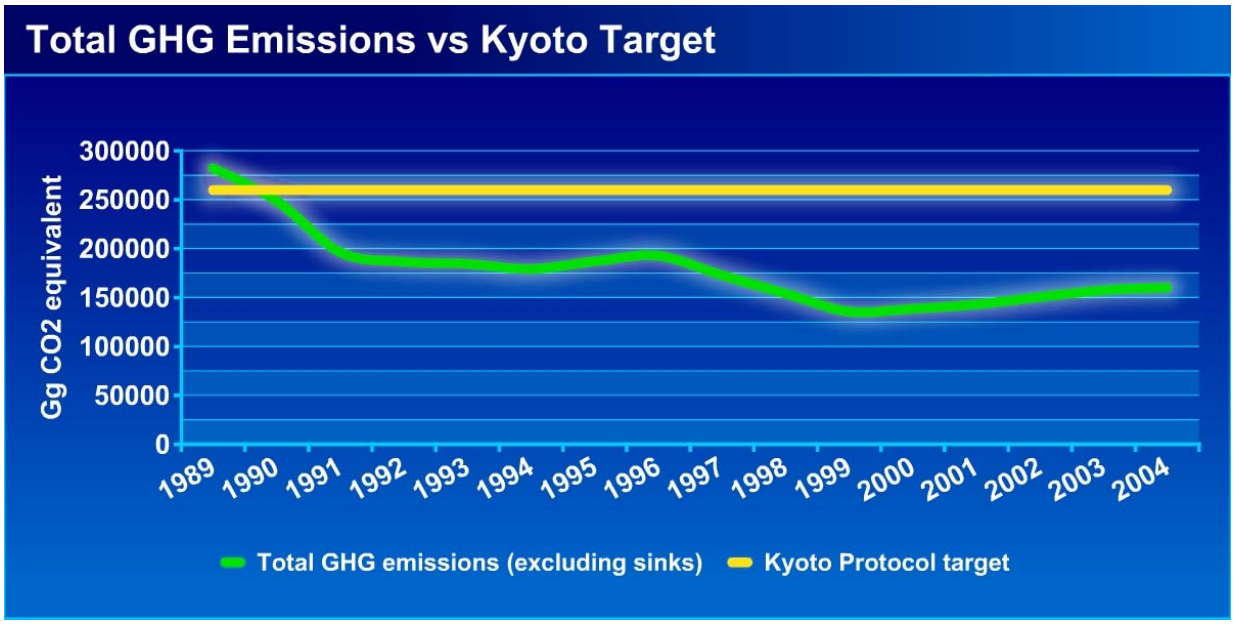
- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs);
- Sulphur hexafluoride (SF_6).

The national inventory report contains also information on calculations of emissions of the indirect GHGs like: NOx, NMVOCs, CO and SO_2. The main remaining gap in the inventory is related to the disaggregated estimate of the international bunker fuels.

The national GHG inventory covers all sectors, almost all the IPCC source/sink categories, all gases and it is complete in terms of geographical coverage. Emissions are presented by sector, by category and by gas. The completeness of the inventory has been improved over the years. However, there are still some minor IPCC source categories that are not estimated in the inventory due to lack of activity data, such as: asphalt roofing from road paving with asphalt and cultivation of histosols, but they are not key source categories having a limited effect on the overall GHG emissions.

Trends of aggregated GHG emissions

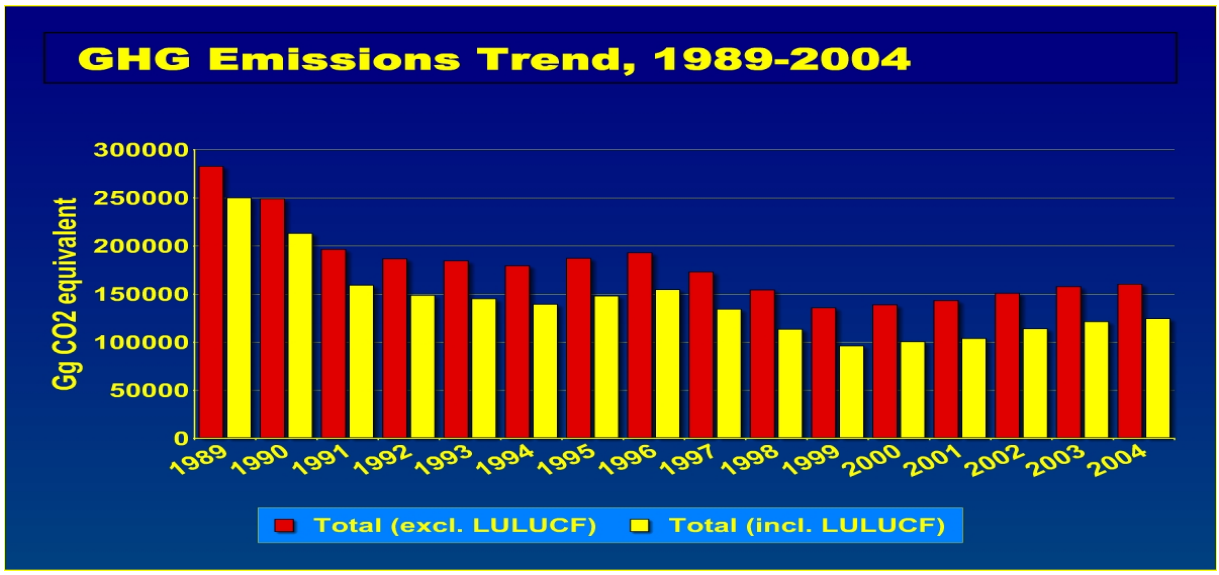
The aggregated GHG emissions trends reflect the main characteristics of the country's economic development. The period 1989-2004 was characterized by a restructuring process of the industry and a transition to the market economy. In the same time, the first reactor at the Cernavoda nuclear power plant started to operate in full capacity in 1996 having also an effect on reducing overall GHG emissions. After 1999, the improvement of the economic indicators and the starting of the EU accession process have been reflected in a slight increase of the overall GHG emissions.



The total GHG emissions, excluding removals by sinks, decreased with 43.3% in the period 1989-2004, and the net GHG emissions (taking into account the CO_2 removals) decreased with 50.2% in the same period. In absolute values, the total GHG emissions in 2004, amounted to 160,059.73 Gg CO_2 equivalent, compared with the base year emissions level of 282,467.18 Gg CO_2 equivalent. In accordance with the Kyoto Protocol, Romania is committed to reduce the GHG emissions by 8% in the period 2008-2012 comparing to the base year 1989. Based on the trends presented and the projections developed, there is a great probability for Romania to meet these commitments with the existing policies and measures.

The GHG emissions trend can be split in two parts: the period 1989-1996 and the period 1996-2004. The decline of economic activities and energy consumption in the period 1989-1992 had directly caused the decline in total emissions in that period. With the entire economy in the process of transition, some energy intensive industries reduced their activities and a lot of industrial facilities closed resulting in an important reduction in the GHG emissions in almost all sectors.

Emissions have started to increase until 1996, because of the economy revitalization. In the next period, the emissions started to decrease again taking into account the starting of operation at the first reactor at the Cernavoda nuclear power plant (1996). The decrease of GHG emissions continued until 1999 considering also a stagnation of the economical growth. The increasing trend after 1999 reflects the economic development in the period 1999-2004 and the start of the EU accession process.



The figures of the Romanian GHG emissions trends for the period 1989-2004, by gas and by sector, are presented in the **Annex 1** of this report.

Trends by gas

Emissions of all GHGs decreased comparing with the base year. The shares of emissions of different GHGs have not changed significantly during the period 1989-2004. The largest contributor to the overall GHG emissions is CO_2, followed by CH_4 and N_2O. The shares for emissions of different GHGs in the base year were as follows: 68.6% CO_2, 18.2% CH_4, 12% N_2O, and 1.2% F-gases. In 2004, the shares for emissions of the same GHGs were as follows: 73% CO_2, 16% CH_4, 10.5% N_2O, and 0.5% F-gases.

Carbon dioxide (CO_2) is the most important GHG in Romania. The decrease of CO_2 emissions (from 193,925.72 Gg in 1989 to 116,746.88 Gg in 2004) is caused by the decline of the amount of fossil fuels burnt in the energy sector (especially in the public electricity and heat production, and manufacturing industries and construction sectors) as a consequence of activity decline in this sector caused by the restructuring of the Romanian economy.

Methane (CH_4) emissions decreased with 49.5% in the period 1989-2004, in principal due to the decline of fugitive emissions from fossil fuels extraction and distribution, and emissions from livestock.

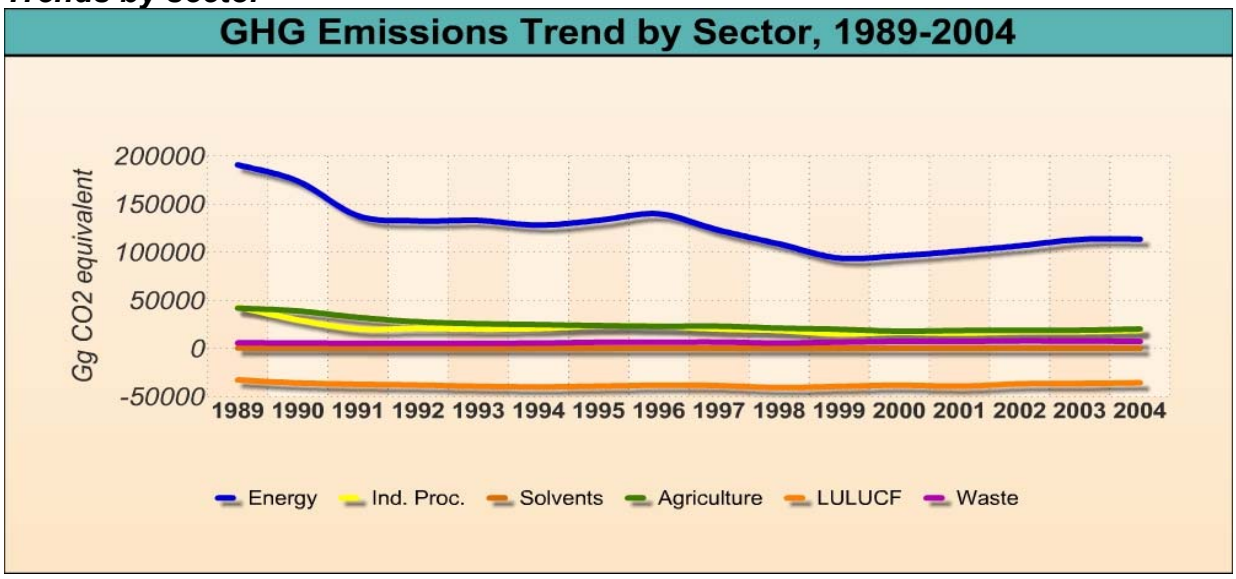
Nitrous oxide (N_2O) emissions are mainly provided by the agricultural soils and the chemical industry. The decline of these activities is reflected in the N_2O emissions trend as the decrease is about 50.2% comparing with the base year.

Most of the F-gases (HFCs, PFCs, SF_6) started to be used as substitutes for ODS in refrigerating and air conditioning systems since the mid 90's. The emissions resulted as a consequence of the use of these substances are estimated since 1995. The PFCs emissions generated in the production of the primary aluminum are reported for the entire period since 1989 (and have decreased with 84.7% since 1989).

The emissions of the indirect GHGs (NOx, NMVOC, CO and SO_2) are estimated but not included in the overall total, as requested by the guidelines. Fuel combustion activities in the energy sector are the major sources of SO_2, NOx and CO emissions. For the NMVOC emissions, another important source is the sector of solvents and other product use. The trends of the indirect GHGs are similar with the GHG trends, except for CO emissions, which strongly increased staring with 1995, due to the raise of the firewood used in households.

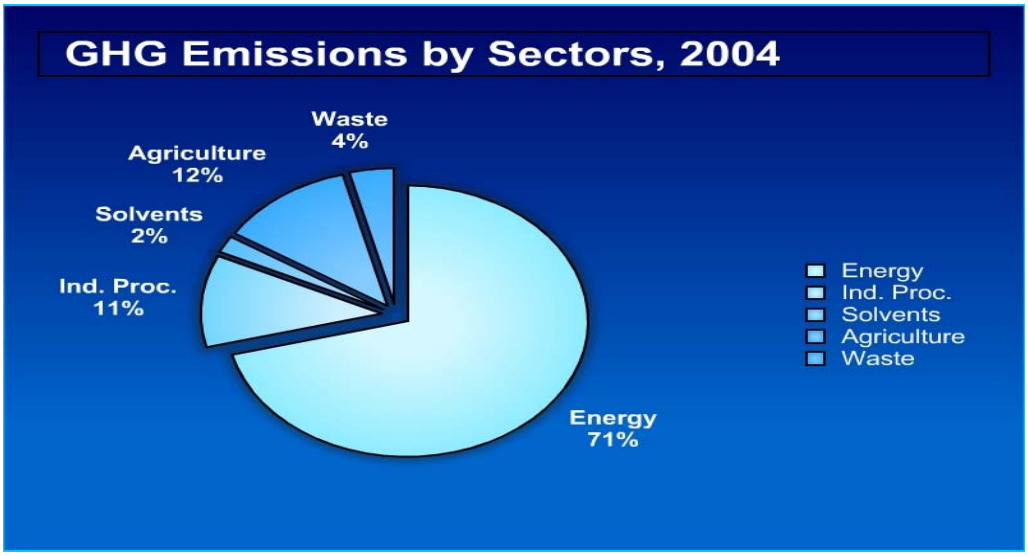
The NOx, NMVOC and SO_2 emissions evolution follows the general GHG emissions trend. The SO2 emissions decrease is caused by the decline of the fuels burnt for energy and by the decrease of sulphur content in fuels. The unusual increase of CO emissions after 1994 is due to the increase of firewood for households.

Trends by sector



Energy is the most important sector for total GHG emissions of Romania. The energy sector accounted for 71% of the total GHG emissions in 2004. The GHG emissions generated in the energy sector decreased with 40.5% comparing with the base year.

Industrial processes sector contributes with 11.7% to the total GHG emissions. A significant 56.7% decrease of GHG emissions was registered in this sector from 1989 to 2004. The main reason for this important decrease of GHG emissions is the decline or phase out of certain productions and the restructuring of main industrial branches.



Agriculture sector GHG emissions have also decreased significantly. The GHG emissions in 2004 were 51.8% lower than the level registered in 1989. In 2004, 12.6% of the total GHG emissions were generated in the agriculture sector.

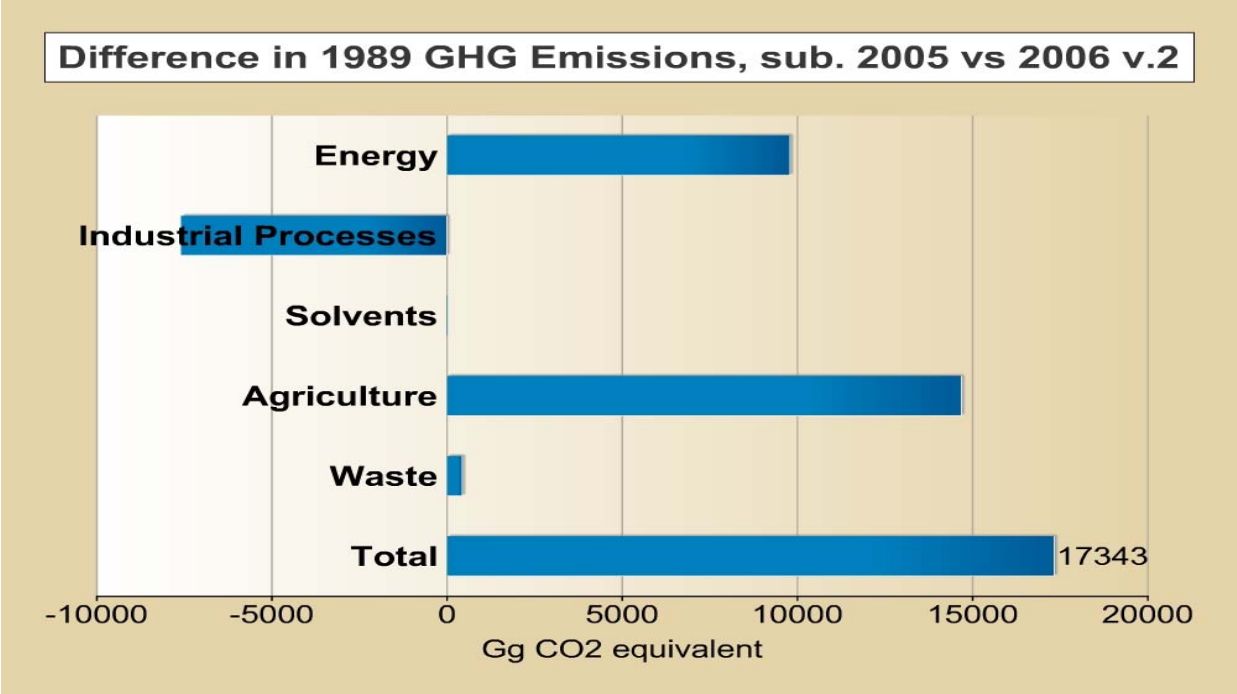
LULUCF sector CO_2 removals by sinks are 9.6% higher in 2004 compared with 1989.

Waste sector GHG emissions have increased with 25.89% in the period 1989-2004. The contribution of the waste sector to the overall GHG emissions is 4.6% in 2004.

Recalculation of the base year (1989) GHG estimates by sectors

Differences of 1989 GHG emissions	Change in Gg CO_2 eq.	Difference [%]	Submission 2005 [Gg]	Submission 2006v.2[Gg]
1. Energy	9,799.45	5.41%	181,140.67	190,940.13
2. Industrial Processes	-7,595.65	-14.96%	50,783.30	43,187.65
3. Solvent and Other Product Use	0.00	0.00%	645.80	645.80
4. Agriculture	14,693.18	54.03%	27,196.56	41,889.74
5. LULUCF	-16,927.96	107.73%	-15,713.23	-32,641.18
6. Waste	445.62	8.32%	5,358.02	5,803.64
Total (excl. net CO_2 from LULUCF)	17,342.83	6.54%	265,124.36	282,467.18

Comparing the 2006 second submission with the 2005 submission, the total GHG emissions of Romania in 1989, not including LULUCF, increased by 6.5% (17343 Gg CO_2 equivalent), mostly due to the increase of emissions in the agriculture sector. More information related to the recalculations performed in the 2006 second submission are included in the National Inventory Report (NIR).



3. Selection of Base Year for HFCs, PFCs and SF_6

Romania is using 1989 as a base year for UNFCCC and Kyoto Protocol, instead of 1990, taking into consideration the flexibility provided by the Article 4.6 of the UNFCCC and based on Decision 9/CP.2. Considering also the flexibility provided by Article 3.5 of the Kyoto Protocol, Romania is using the different base year for the implementation of its emission reduction commitments provided by Article 3 of the Protocol.

Although, Article 3.8 of the Kyoto Protocol provides that “any Party included in Annex I may use 1995 as its base year for hydrofluorocarbons, perfluorocarbons, and suphur hexafluoride, for the purpose of the calculation” of the assigned amount for that Party in the first quantified emission limitation and reduction commitment period”, Romania has chosen the same base year 1989, for the HFCs, PFCs and SF_6 emissions, as for the emissions of the other GHGs included in the Annex A of the Kyoto Protocol.

4. Calculation of Assigned Amount

Calculation of Romania's assigned amount is based on the national GHG inventory recalculated for the entire period 1989-2004, presented in, and re-submitted with this report (Romania's GHG Inventory – 2006 submission v.2).

Taking into account:

- the total aggregated GHG emissions estimated in the year 1989 (the base year for Romania based on Article 4.6 of the UNFCCC, Decision 9/CP.2 and Article 3.5 of the Kyoto Protocol),
- 1989 as a base year also for the F-gases, and
- the 8% reduction target presented in Annex B of the Kyoto Protocol,

the assigned amount of Romania in the first commitment period of the Kyoto Protocol is calculated using the formula below:

*$AA_{2008-2012}$ (Romania) = [total GHG emissions in CO_2eq (1989 estimates excl. sinks)] * GHG emissions reduction target established under the Kyoto Protocol (92%) * 5 years (2008-2012)*

$AA_{2008-2012}$ (Romania) = 282 467 184.19 * 0.92 * 5

$AA_{2008-2012}$ (Romania) = 1 299 349 047 tCO_2 eq.

5. Calculation of the Commitment Period Reserve (CPR)

According to paragraph 6 of the Decision 11/CMP.1, Romania shall maintain, in its national registry, a commitment period reserve (CPR) which should not drop below 90 per cent of Romania's assigned amount calculated pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, or 100 per cent of five times its most recently reviewed inventory, whichever is lowest.

Taking into account that Romania made a lot of efforts to improve the inventory in 2006 using additional resources, new activity data and appropriate methods and emissions factors, resulting in significant changes comparing with the previous submissions, it was decided that Romania's second GHG inventory submission from 2006 (attached to this report) represents the most recently submitted inventory as the basis for the CPR calculation, as this will become the most recently reviewed inventory by the time the CPR is recorded in the Compilation and Accounting Database of the UNFCCC Secretariat.

The two ways of calculating the CPR provides the following results:

1) Assigned amount basis

*90% of $AA_{2008-2012}$ (Romania) = 0.9 * 1 299 349 047 = 1 169 414 142 tCO_2 eq.*

2) Most recent inventory basis

*5 * GHG emissions in 2004 = 5 * 160 059 731.4 = 800 298 657 tCO_2 eq.*

Considering the provisions of the Decision 11/CMP.1 and the calculations presented above, Romania's commitment period reserve is:

CPR (Romania) = 800 298 657 tCO_2 eq.

6. Land Use, Land Use Change and Forestry (LULUCF)

Definition of forest for reporting of information under Article 3.3 and 3.4 of the Kyoto Protocol

Romania, as an Annex I Party, should account for the net changes in GHG emissions by sources and removals by sinks resulting from direct human induced land use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, in order to meet its commitments under the Kyoto Protocol, according to Article 3.3 of the Protocol. In the same time, the GHG emissions by sources and removals by sinks associated with these activities shall be reported in a transparent and verifiable manner.

Taking into consideration the definition provided by the Governmental Emergency Ordinance no. 139/2005 regarding the administration of forests in Romania, "forest represents a land of minimum 0.25 hectares with a tree crown cover of more than 10 per cent of the area. Tree's minimum height must be 5 m in mature stage in natural sites. The definition includes also: forest nurseries, trees genetic trials within the forest land, forest pathways and roads, meadows, glades and other forest gaps, forest ecosystems within the national and natural parks, natural protected areas and other protected forest areas, protection forest belts with an area larger than 0.5 ha and a minimum width of 20 m, as well as *Pinus mugo* shrubs in alpine areas". This definition is consistent with the information reported by Romania to FAO.

According to the Romanian legislation "deforestation represents the removal of forest vegetation followed by land use or land cover change", as provided by the Governmental Ordinance no. 96/1998 (amended subsequently). In comparison, the definition provided by the Marrakech Accords specifies that "deforestation is the direct human-induced conversion of forested land to non-forested land".

As a summary, the forest in Romania is characterized by the following elements:

- minimum value for area: 0.25 hectares
- minimum value for tree crown cover: 10%
- minimum value for tree height: 5 m
- minimum value for width: 20 m

7. Selection of Activities under Article 3.4 of the Kyoto Protocol

Selected activities under Article 3.4 of the Kyoto Protocol

Considering Article 3.4 of the Kyoto Protocol and the Decision 16/CMP.1, Romania as an Annex I Party, may choose to account for anthropogenic GHG emissions by sources and removals by sinks resulting from any or all of the following human-induced activities, other than afforestation, reforestation and deforestation, in the first commitment period: revegetation, forest management, cropland management and grazing land management.

Romania selects two types of activities under Article 3.4 of the Kyoto Protocol, namely:

1. Forest management – applied on forest land that was forest on 1st of January 1990 ("Forest management" is a system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner);
2. Revegetation – applied to forest patches and belts (with a width of less than 20 m and area less than 0.5 ha, planted for protecting crop fields) and short rotation forestry crops for bioenergy ("Revegetation" is a direct human-induced activity to increase carbon stocks on sites through the establishment of vegetation that covers a minimum area of 0.05 hectares and does not meet the definitions of afforestation and reforestation).

Identification of land areas associated with LULUCF activities

During the first commitment period, Romania will demonstrate that activities like forest management and revegetation have occurred since 1990 and are human-induced. The Romanian national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs will identify land areas associated with the activities selected under Article 3.4 taking into consideration the information provided by the Ministry of Agriculture and Rural Development (MADR), INS, the Territorial Inspectorates for Forest and Game Management (ITRSV) and the Institute for Forest Research and Management (ICAS).

Accounting of activities under Article 3.3 and 3.4

Romania selects accounting of activities under Article 3.3 and 3.4 (forest management and revegetation) of the Kyoto Protocol, for the entire commitment period and intends to report at the end of the commitment period.

8. National System for Estimating GHG Emissions

Background

Based on Article 5 of the Kyoto Protocol, Romania established a national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol. The system complies with the provisions of subsequent CoP/MoPs decisions (Decision 20/CP.7) and with the provisions of Decision 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community GHG emissions and for implementing the Kyoto Protocol and of the Commission Decision 2005/166/EC laying down rules implementing Decision 280/2004/EC.

The system provides the legal, institutional and procedural framework for cooperation between authorities and public institutions that have competences and responsibilities in activities generating GHG emissions (activity data, emission factors, methods) in Romania and the single national authority responsible with the national system.

Romania has prepared and submitted the national GHG inventory annually since 2002, based on a clear internal procedure and institutional structure, using also the recommendations for inventories set out in the UNFCCC Guidelines on Reporting and Review (FCCC/CP/2002/8 and FCCC/SBSTA/2004/8). In the same time, the National Inventory Report included detailed information on the inventories for all years, in order to ensure the transparency of the process. Although the quality of the Romanian inventory has been gradually improved, based on the recommendations from the previous reviews, some aspects still needed to be improved according to the latest review report.

Considering these recommendations, MMDD together with ANPM, ICIM, ICAS and INS have been working continuously for improving the national system for the estimation of GHG emissions taking into account also the provisions of the NSCC and NAPCC. This activity has been materialized after the establishment of the ANPM and based on the technical and financial support provided by the Government of Denmark (Danish EPA).

Establishment of the national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs represents also one of the eligibility criteria for participating in the flexible mechanisms (JI Track 1 and IET) provided by the Kyoto Protocol and Romania intends to use these mechanisms in the first commitment period.

Legal framework

Although in Romania a system has been used in the last five years for preparing the national inventories, a specific legal procedure has been proposed only at the beginning of 2007, being approved as a specific Governmental Decision. In the past, legislation established for other purposes has been used as a legal framework for the national system. In particular, the legal requirements have been provided in the past by the national system for integrated air quality assessment and management, set up

by the Governmental Decision no. 586/2004. The system ensured the framework for cooperation between authorities that have responsibilities in atmosphere protection and air quality assessment and management in Romania.

Taking into consideration the NSCC and the NAPCC provisions, especially clarification in terms of division of competences and designation of responsible institutions with the national system, the Government of Romania approved the specific procedure for the national system as an independent Governmental Decision, thus setting up the framework for formatting, collecting, processing, submitting and archiving data regarding GHG emissions activities and information necessary for the preparation of the annual national inventory.

The new Governmental Decision for establishing the national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol is going to provide support for ANPM's efforts in preparing the national GHG inventories by defining a legal, institutional and procedural framework to involving actively the relevant authorities: ministries, INS, other authorities, research institutes, professional associations and operators.

The national system is designed and managed by the designated single national authority (ANPM) in a way to ensure the compliance with the Kyoto Protocol, subsequent CoP/MoP decisions, and EU regulations on GHG emissions monitoring, and to provide for transparency, accuracy, consistency, comparability and completeness of the national GHG inventory, as defined by the 1996 Revised IPCC Guidelines for National GHG Inventories.

A good impetus for the national system was the implementation in Romania of the Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for GHG emission allowance trading within the Community. The direct participation of operators ("installations") in this trading scheme (EU ETS) from 2007 is expected to enhance concern on GHG emissions and develop a database with reliable updated information from sources and sectors.

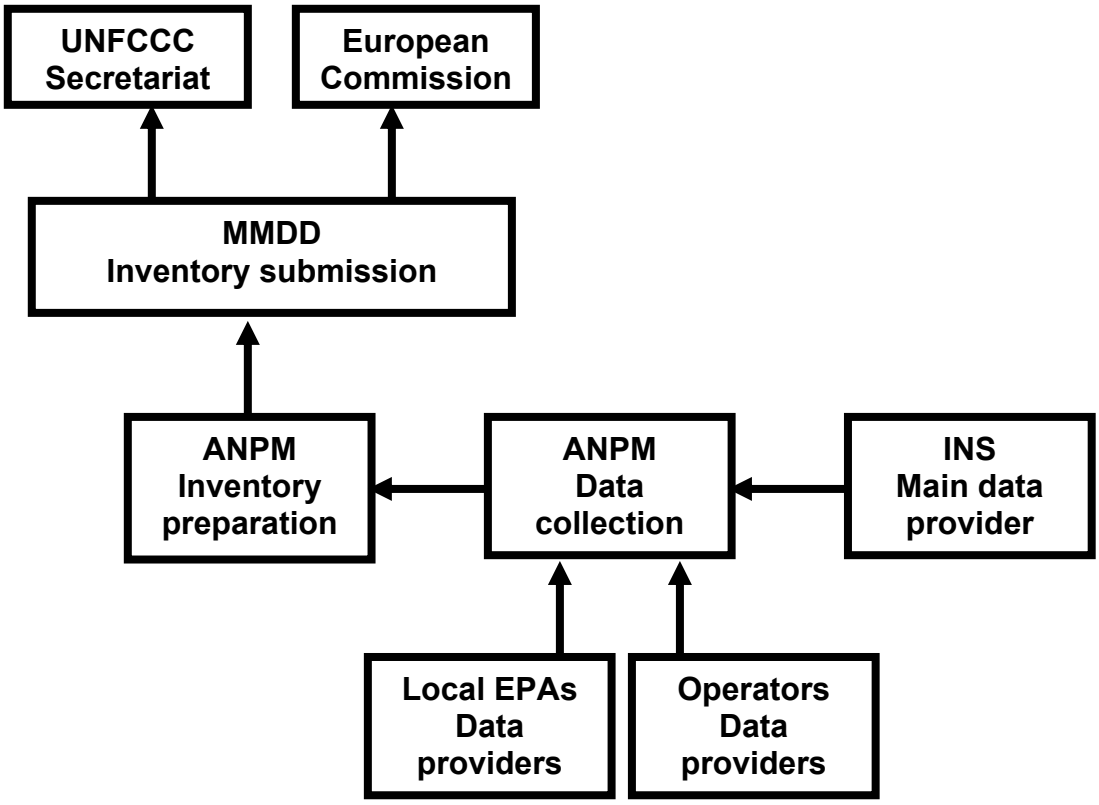
Institutional framework

As it has been presented previously, MMDD has the overall responsibility of the national system as the higher authority on environmental policy in Romania and as the coordinator of ANPM's activity, and annually submits the national GHG inventory to the European Commission and UNFCCC Secretariat.

In 2006, considering the different financial, staff, and technical problems experienced over the years in this field, MMDD has designated ANPM as the single national entity responsible with the national system management and with the preparation of the annual national GHG inventory, this designation being reiterated in the above-mentioned Governmental Decision for establishing the national system.

From the beginning of 2006, ANPM dedicated 4 full time experts for the inventory team including an expert which started to prepare the LULUCF sector. For the previous submissions, the LULUCF sector has been prepared by ICAS, under a contract with ICIM Bucharest (the entity previously responsible for inventory preparation).

The institutional structure of the Romanian national system for the estimation of GHG emissions is presented in the figure below.



Procedural framework

Based on the Governmental Decision for establishing the specific procedure of the national system, three stages are considered in the elaboration of the national GHG inventory: planning, preparation and management. In the first stage specific responsibilities are defined and allocated to the single national entity and to different authorities and institutions, the second stage refers to inventory preparation process (data collection, relevant information needed for estimating emissions, methodological choices) and the third stage refers to the inventory management that also includes uncertainty management, as well as documentation and QA/QC activities.

The major improvement emerged from the Governmental Decision is represented by the deadlines and specific responsibilities of different authorities for providing activity data to ANPM.

Data collection and processing

The main activity data supplier is INS through the yearly-published documents like the National Statistical Yearbook and the Energy Balance. In 2002, MMDD and INS signed a protocol of cooperation. Under this protocol, INS agreed to provide, besides its yearly publications, additional data necessary for the inventory preparation. INS agreed also to provide up-front information in written form if the National Statistical Yearbook or the Energy Balance has not been published. There are still some

problems related to the timing for receiving activity data that are to be resolved considering the new Governmental Decision.

Moreover, contacts were established with ministries, research institutes, organizations and companies that were requested to provide data for the inventory preparation. The 42 local EPAs are used, in some cases, as a source of bottom-up data for the inventory (in case of some HFCs, PFCs and SF_6 consumption).

The table below presents the main data sources used for activity data:

Sector	Data sources
Energy	• INS - Energy Balance and other additional data
Industrial Processes	• INS - Statistical Yearbook and other additional data • 42 local EPAs • Direct information from industry operators
Solvent and other product use	• INS • 42 local EPAs
Agriculture	• INS - Statistical Yearbook and other additional data
LULUCF	• INS - Statistical Yearbook • National Forest Administration (RNP) • Territorial Inspectorates for Forest and Game Management (ITRSV)
Waste	• INS - Statistical Yearbook and other additional data • ANPM • Institute for Public Health

Data collection process comprises the following steps:

- Identification of additional data requirements
- Identification of potential data suppliers
- Preparation of specific questionnaires or inquiries
- Submitting the questionnaires to the potential suppliers
- Receiving requested data
- Data verification: activity data received is checked/verified (time series discrepancies, large changes in values from the previous to the current inventory year)

Activities regarding data processing and calculation of estimates carried out by ANPM:

- procession of primary data (aggregation, disaggregation)
- selection and application of methods, emission factors and parameters
- calculation of emission estimates
- internal review (errors are corrected)

Archiving of information is performed by inventory experts at ANPM premises in a separate database and office. The input data used for the calculation of GHG emissions, the resulted emissions estimates and all other relevant information including procedures and methods are archived in this database.

Selection of methods and emission factors

The emissions are estimated using the “Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories” (IPCC, 1996), as well as the “IPCC Good Practice

Guidance and Uncertainty Management in National Greenhouse Gas Inventories "(IPCC GPG, 2000) and "IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry" (IPCC GPG LULUCF, 2003).

The sources of emission factors used are: IPCC 1996, IPCC GPG 2000 and limited country-specific or plant-specific. The methods used to estimate emissions are mostly Tier 1, but also Tier 2 are used for some energy and industrial processes sources and CORINAIR in case of solvents and other product use. Descriptions of methods and emission factors used are presented in the National Inventory Report for all categories. Romania is planning to introduce gradually, based on available information, more national emission factors and national methods for calculation of emission values in different sectors such as energy, agriculture, LULUCF, at least for the key categories

Reporting
As an EU member state from the beginning of 2007, Romania is going to comply with all the reporting requirements and deadlines at the EU level as required by the Decision 280/2004/EC and also with the requirements and deadlines provided by the Kyoto Protocol and subsequent CoP/MoP decisions. Therefore, the final national GHG inventory will be submitted to the European Commission annually on 15th of March (to be included in the European Community GHG inventory) and to the UNFCCC Secretariat on 15th of April.

The Romanian GHG inventories have been reported since the 2005 submission by using the CRF Reporter software, delivered by the UNFCCC Secretariat. The last submission included in this report (Romania's GHG Inventory – 2006 submission v.2) is based on CRF Reporter software version 3.0.37. As new versions of the CRF Reporter software are regularly deployed by the UNFCCC Secretariat to the Parties, Romania is going to use for every submission the latest version available.

Key source categories
Based on the "IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories", the key source categories are determined with the application of Tier 1 method. All GHGs and all IPCC sectors, except for LULUCF, are considered in this process. Both level and trend analysis are performed for determining the key source categories and 1989 (base year) is used for comparison.

Recalculations
Taking into account new activity data, different changes of methods and/or emission factors, review reports recommendations and also due to the institutional and procedural changes, the entire time series of inventories have been recalculated for every submission of Romania until now.

QA/QC analysis
In the preparation of every annual GHG emission inventory several quality control (QC) procedures are carried out by the ANPM inventory experts. For the previous submissions there was no formal quality assurance/quality control (QA/QC) plan in place. Based on the Governmental Decision for establishing the specific procedure of the national system, ANPM experts are developing the QA/QC plan to be used for the next submission.

The ANPM expert team involved in the inventory preparation performs general QC activities related to the processing, archiving and reporting of data. Some basic QC activities are: checking for transcription errors in data input, checking whether the parameters and emission units are correctly recorded, and analyzing the time series in order to obtain consistent trends, including the comparison of activity data with FAO and EUROSTAT databases. In the case where the local EPAs provided bottom-up data for some source categories, information is checked against the similar data provided in the national statistics. No QA activities were performed in addition to the UNFCCC annual reviews (in-country review in 2003, desk review in 2004 and centralized review in 2005).

Uncertainty assessment

Considering the new Governmental Decision for establishing the specific procedure of the national system Romania is going to provide in the next submission a full uncertainty assessment as described in the IPCC GPG 2000. Romania has not prepared for the previous submissions the full quantitative uncertainty analysis taking into account that the uncertainty estimates associated to the activity data have not been provided by the official statistics. However, uncertainty analysis is presented at sectoral level.

9. Description of the National Registry

Background

Romania as a Party included in Annex B of the Kyoto Protocol has to establish a national registry, being one of the eligibility criteria for using the flexible mechanisms of the Kyoto Protocol and also a pre-requisite for participating in the EU Emissions Trading Scheme (EU ETS). The purpose of the registry is to ensure the accurate accounting of the issuance, holding, transfer, acquisition, cancellation and withdrawal of assigned amount units (AAUs), removal units (RMUs), emissions reduction units (ERUs), and certified emission reductions (CERs), as well as the carry over of these units. In the same time the registry will be used for the operations involving EU allowances (EUAs) under the EU ETS, based on the EU Directive 2003/87/EC.

Romania started to set up the national registry, complying with the basic registry requirements as defined in the UNFCCC Decision 19/CP.7 as well as with the technical data requirements in UNFCCC Decision 24/CP.8. Furthermore, the registry is in compliance with the requirements for the EU ETS registries as elaborated by the European Commission and presented in the Commission Regulation no. 2216/2004/EC for a standardized and secured system of registries pursuant to Directive 2003/87/EC and Decision 280/2004/EC.

MMDD has appointed ANPM as the national registry administrator. ANPM is establishing the Romanian registry based on a technical and financial assistance from the Government of Denmark (Danish EPA). In the same time, adequate additional financial resources will be allocated from the national budget in order to ensure that the registry is established and operated properly and in compliance with all the UN and EU regulations in this area. The Romanian registry is expected to start operating in May-June 2007.

The Romanian registry is described in more detail in the Registry Initialization Specifications included in **Annex 2**.

Information on the registry administrator

Ministry of Environment and Sustainable Development
National Environmental Protection Agency
Address: Splaiul Independentei no. 294
Phone: +40 21 207 11 28
Fax: +40 21 207 11 03
E-mail: romanian.registry@anpm.ro

Cooperation with other countries concerning operation of the registry

Romania does not cooperate with other countries concerning the administration or operation of the Romanian emissions trading registry.

Database structure

The Romanian registry is implemented using a Microsoft SQL Server relational database management system with a dedicated data model for supporting registry operations.

Standards for data exchange

The Romanian registry system follows the UN Data Exchange Standards 7 (DES).

Procedures for administration and operation of the registry

The procedures for administration and operation are the ones described in the Commission Regulation no. 2216/2004 on a standardized and secure system of registries adopted pursuant to the Parliament and Council Directive 2003/87/EC and the Parliament and Council Decision 280/2004/EC. Romanian registry is in compliance with the procedures stated in the regulation.

Safety standards

The initial safety standards are further described in **Annex 2**.

Any person registering as a user in the registry receives its own username and password and is instructed to ensure that these remain confidential. If a user discovers that an unauthorized person has gained access to its password, the password must be changed in the registry immediately and the registry administration must be notified.

The registry automatically disconnects when access has been inactive for some time. The user must log on again using its username and password.

Information available to the public

Only the information stated in Article 9 and the corresponding appendices of the Commission Regulation no. 2216/2004 is available to the public.

Internet address for the registry

The internet address of the Romanian registry will be presented later, when it will be assigned and finalized.

Protection, maintenance and recreation of data

The initial procedures for protection, maintenance and recreation of data are described in **Annex 2**.

Annex 1: Romania's GHG Emissions Trends in the period 1989-2004

GREENHOUSE GAS EMISSIONS	Base year (1989)	1990	1991	1992	1993	1994	1995	1996	1997	1998
	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)
CO_2 emissions including net CO_2 from LULUCF	161.284,31	136.803,91	96.029,53	92.868,13	92.369,17	88.572,98	95.539,61	102.107,88	87.260,78	71.056,57
CO_2 emissions excluding net CO_2 from LULUCF	193.925,73	172.652,15	133.349,25	130.994,24	131.800,79	128.607,40	134.824,59	140.401,15	125.949,71	111.857,79
CH_4	51.352,53	44.690,81	38.841,61	33.330,75	31.172,23	30.159,43	31.321,91	31.913,87	28.526,92	25.787,27
N_2O	33.839,41	29.276,30	22.148,98	20.817,76	19.952,08	19.026,19	19.047,46	18.600,91	17.976,91	16.062,19
HFCs	NA,NE	NA,NE	NA,NE	NA,NE	NA,NE	NA,NE	0,22	0,44	0,73	1,97
PFCs	3.349,52	2.115,77	1.942,01	1.352,05	1.409,32	1.490,97	1.773,67	1.768,98	390,19	416,47
SF_6	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0,06	0,06	0,02	0,01
Total (incl. net CO_2 from LULUCF)	**249.825,77**	**212.886,79**	**158.962,12**	**148.368,70**	**144.902,80**	**139.249,57**	**147.682,93**	**154.392,14**	**134.155,55**	**113.324,47**
Total (excl .net CO_2 from LULUCF)	**282.467,18**	**248.735,03**	**196.281,84**	**186.494,80**	**184.334,42**	**179.283,99**	**186.967,91**	**192.685,40**	**172.844,48**	**154.125,69**

GREENHOUSE GAS EMISSIONS	1999	2000	2001	2002	2003	2004	Change from base to latest reported year
	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	(%)
CO_2 emissions including net CO_2 from LULUCF	55.054,29	59.177,34	62.863,46	72.984,83	79.198,45	80.978,43	-49,79
CO_2 emissions excluding net CO_2 from LULUCF	94.567,65	97.474,49	102.171,22	109.829,25	115.667,27	116.746,88	-39,80
CH_4	25.126,82	25.693,40	25.214,94	25.784,79	26.140,68	25.935,04	-49,50
N_2O	15.427,86	15.008,67	15.183,19	14.521,26	15.228,92	16.857,45	-50,18
HFCs	2,43	2,93	2,78	3,25	5,12	6,94	100,00
PFCs	415,04	413,14	428,75	444,59	471,90	513,34	-84,67
SF_6	0,05	0,00	0,00	0,01	0,00	0,08	100,00
Total (including net CO_2 from LULUCF)	**96.026,49**	**100.295,48**	**103.693,13**	**113.738,74**	**121.045,08**	**124.291,28**	**-50,25**
Total (excluding net CO_2 from LULUCF)	**135.539,84**	**138.592,63**	**143.000,88**	**150.583,16**	**157.513,90**	**160.059,73**	**-43,34**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year (1989)	1990	1991	1992	1993	1994	1995	1996	1997	1998
	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)
1. Energy	190.940,13	173.967,13	137.923,38	132.609,21	133.088,03	128.230,54	133.240,34	139.915,74	122.950,84	108.660,22
2. Industrial Processes	43.187,65	29.716,27	20.270,87	20.708,42	20.083,48	20.582,46	23.516,28	23.207,40	20.089,44	18.601,86
3. Solvent and Other Product Use	645,80	540,50	448,20	237,60	237,50	225,40	229,40	225,30	219,00	221,90
4. Agriculture	41.889,74	38.992,76	32.369,87	27.743,31	25.651,17	24.738,36	23.677,07	22.941,20	23.078,23	21.129,58
5. Land Use, Land-Use Change and Forestry	-32.641,18	-35.847,13	-37.319,02	-38.124,28	-39.430,32	-40.033,65	-39.284,46	-38.292,70	-38.688,77	-40.800,87
6. Waste	5.803,64	5.517,25	5.268,82	5.194,43	5.272,94	5.506,45	6.304,30	6.395,20	6.506,80	5.511,79
7. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (including LULUCF)	**249.825,77**	**212.886,79**	**158.962,12**	**148.368,70**	**144.902,80**	**139.249,57**	**147.682,93**	**154.392,14**	**134.155,55**	**113.324,47**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1999	2000	2001	2002	2003	2004	Change from base to latest reported year
	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	CO_2 eq. (Gg)	(%)
1. Energy	93.993,75	96.476,30	101.201,96	106.797,53	113.340,05	113.601,73	-40,50
2. Industrial Processes	14.986,29	16.661,67	15.735,22	17.182,98	17.392,37	18.692,08	-56,72
3. Solvent and Other Product Use	222,40	224,30	200,50	222,30	279,90	277,40	-57,05
4. Agriculture	19.873,63	17.925,30	18.602,33	18.638,84	18.925,44	20.182,19	-51,82
5. Land Use, Land-Use Change and Forestry	-39.512,41	-38.288,13	-39.305,20	-36.835,44	-36.466,92	-35.768,14	9,58
6. Waste	6.462,82	7.296,04	7.258,32	7.732,53	7.574,24	7.306,02	25,89
7. Other	NA	NA	NA	NA	NA	NA	0,00
Total (including LULUCF)	**96.026,49**	**100.295,48**	**103.693,13**	**113.738,74**	**121.045,08**	**124.291,28**	**-50,25**

Annex 2: Registry Initialization Specifications

Staff identification and planning

Romanian Emissions Trading Registry
Romanian Ministry of the Environment and Sustainable Development
National Environmental Protection Agency
Address: Splaiul Independentei no. 294,
Phone: +40 21 207 11 28
Fax: +40 21 207 11 03
E-mail: romanian.registry@anpm.ro

Registry Administrator	National Environmental Protection Agency Splaiul Independentei no. 294 Phone: +40 21 207 11 28 Fax: +40 21 207 11 03 Email: romanian.registry@anpm.ro
Registry Manager	Mrs. Hortensia Dumitriu Phone: +40 21 207 11 28 Fax: +40 21 207 11 03 Email: hortensia.dumitriu@anpm.ro
Registry Staff	Mrs. Adriana Mârşolea Phone: +40 21 207 11 28 Fax: +40 21 207 11 03 Email: adriana.marsolea@anpm.ro Ms. Andreea Popa Phone: +40 21 207 11 28 Fax: +40 21 207 11 03 Email: andreea.popa@anpm.ro
Registry Host	Innofactor Ltd Tekniikantie 12, FIN – 02150 Espoo, Finland Phone: +358 9 2517 2520 Fax: +358 9 2517 2521 Email: contact@innofactor.com http://innofactor.com

Initialization Schedule

Completion dates of each step of the initialization process

The initial test-plan for the Romanian Emission Trading Registry (the initialization process in under development):

- End April 2007: Connectivity test

- June 2007: Functional test
- June 2007: Confirmation of Romanian governmental accounts for Cancellation, Replacement and Retirement for first Commitment Period to be submitted to the ITL

Documentation

The following sections are describing the hosting responsibility and different plan setups of the Romanian Emission Trading Registry. Romania has chosen to outsource the hosting to Innofactor Ltd, Finland.

Technical description

Production environment consists of two dedicated servers. One of the servers is used as a database server and another is used both as a web server and an application server. The server models are Dll PowerEdge 1950 with the following specifications:

- Dual Core Intel Xeon processor
- 2GB DDR2 SDRAM
- PERC 5/I Integrated RAID Controller Card
- 143 GB RAID1 disk (2 x 143 GB SAS, contains system and data partitions)
- Dual GigaBit Ethernet adapters on the motherboard
- Redundant power supply

Database and Application Backup Plan

Background

This section describes the backup procedures for database and application servers. Innofactor uses in-channel backup method – the backups are taken through the same network that is used to connect to the servers.

Scope or content of backup procedures

Application server: Full backup of directories of installation for the application.
Database server: Full backup of the databases is taken to server's backup-directory. Backup directory is backed up.

Backup hardware and software

Innofactor uses currently BackupExec version 9.1 as backup software. Removable hard disks (500 GB each) are used as the backup media. The backup system is going to be replaced with a new one during H1/2007. The new system will be based on large array of SATA disks, and LTO3 tape drive will be used to make archive copies and off-site backups. Backup system is always located in different section of the building relative to the system being backed up. Fresh backup is taken to an off-site facility on a weekly basis.

Backup frequency, schedule and backup generations plan

Full backups of the databases are taken everyday at 2:00 am to server's disk. The directories mentioned in chapter two are backed up daily in the following way:

- Full backup taken every Friday at 8:00 pm

- Differential backup from the servers are taken every Monday, Tuesday, Wednesday, Thursday, Saturday and Sunday at 11:00 pm

Currently Innofactor uses three backup disks. After being in use for one week, the disk is moved to an off-site facility and stored there for two weeks. After two weeks it is erased and used again. This means that daily backups are available in 14 generations (two weeks). The plan for the new backup system is not yet ready, but the amount of backups stored will be at least the same as in the current system.

Backup media and location
Backup hardware is located at secondary server premises in the same building, in different section than the primary server premises. Off-site facilities are located in different buildings. All locations for backups are equipped with alarm system.

Personnel responsible for backup
Primary responsible person is currently Mr. Teemu Muukkonen, alternate responsible persons are currently Mr. Jouko Wessman and Mr. Rami Laiho.

Monitoring performance of backup tasks
Backup software's log is checked every weekday. Abnormalities are checked and necessary corrections are made.

Backup restore process
When backups need to be restored, administrators restore the backups first to the local disk of the backup server. This phase is logged by backup software. Then the administrators move the files to their appropriate location. This method eliminates accidental removal of more current data. If the backup is a database backup, database administrator continues by restoring the database to the RDBM software.

The data stored in the production environment system is backed up daily at night time. For security reasons the back-up media is located in a separate fire proof department of the building than the production environment servers. The backup and data recovery processes were translated from Finnish to English and delivered to the Romania registry administrator.

Disaster and Problem Recovery Plan

Background
The purpose of this section is to describe how to recover the registry activity in certain situations. Some indications of the times needed in different scenarios are also given. There are several parts in the server environment which are critical for the operation of the registry. Failure of any of these may render the registry unusable.

Network errors (LAN and WAN)
All switches used in the production network have 24/7 warranty and support services with 4-hour response time. All critical switches have been duplicated and have a stand-by switch that can handle the critical network services in case of a hardware failure.

Firewalls are duplicated in Innofactor Ltd network, and hardware errors do not make the services unusable. Firewalls have 24/7 warranty and support services with 4-hour response in case of a hardware failure.

WAN services are provided by Elisa Plc., Innofactor Ltd having a service level agreement that guarantees two hours response time in network failures. In addition, there is a guarantee of fixing the service in 12 hours in any case. Both guarantees are given by Elisa Plc.

Hardware errors on the servers
The most probable hardware errors on server computers occur on hard drives and power supplies. Both are duplicated in production environment, and hardware errors on them would not result in server shutdown. All production servers have 24/7 warranty and support services with 4-hour response time. This means that most of the hardware errors can be corrected in 6 to 8 hours (4 hour response time and 2 to 4 hours time for repairing the hardware). If hardware error has resulted in data loss, after correcting the hardware error, the registry software and the necessary data has to be recovered according to software and data recovery plan.

Software errors
Common reasons for data corruption are failed software upgrade, security fix installation, hardware malfunction or unexpected server shutdown. Software recovery consists currently of three phases.

First phase is for recovering the operating system and the other requirements of the registry. Operating system installation can be done in 1 to 3 hours per server. Installing the required software takes an additional hour per server. Next phase is for reinstalling the registry, which takes about two hours per registry. Final phase is for importing the data from the backups to the servers and bringing them online. This last phase is estimated to take 30 to 60 minutes, provided that the backup system and on-site backups are available.

Server facilities
Recovery from a total destruction in server facilities takes some days. If disaster is limited to server premises only, services can be rerouted to secondary server premises in the same building in the time required to re-route internet connections, which can take 1 to 3 days. If the servers are unusable, the registry can be installed on workstation computers taken from the Innofactor Ltd network and reinstalled with server software. This operation can be done in the same timeframe than the re-routing of the internet connections.

Recovery plan in the event of complete disruption of the host environment

1) Minimum hardware and software requirements to host registry on temporary basis

Temporary hosting of the registry software can be done with the following hardware and software:
Database server:
- modern, Intel-compatible processor
- 1 gigabyte of RAM (2 gigabytes recommended)

- 80 gigabytes of hard disk
- Windows Server 2003 Standard Edition (license and media available at location)
- SQL Server 2000 Standard Edition (license and media available at the location)

Application server:

- modern, Intel-compatible processor
- 1 gigabyte of RAM
- 80 gigabytes of hard disk installed
- Windows Server 2003 Standard Edition (license and media available at location)

Network connection:

- Services can be made visible to the public network (tcp ports 80 and 443 made visible)
- Possibility to build a VPN ITL (Firewalls compatible with ITL VPN connection)

2) Recovery plan

The following procedure will be used in the event of a complete disruption of the host environment:

1. Redirect registry's website to the URL that indicates that the system is under maintenance;
2. Contact CITL/ITL to disable national registry's processes at the CITL/ITL;
3. Establish required server environment in alternative facility;
4. Install and configure Greta software (database, web-services and application) on the server environment;
5. Roll back latest available backup to the database;
6. Enable the registry website and web services with access restricted to admin users;
7. Keep national registry's processes disabled at CITL/ITL, run reconciliation to ensure data consistency of the national registry database. If reconciliation fails, perform needed manual interventions and repeat the phase until reconciliation is completed;
8. When reconciliation is completed successfully, enable registry's processes at the CITL/ITL;
9. Test connectivity and transfer functionalities of the registry;
10. When tests are successfully completed, allow all users access to the registry.

3) Disaster recovery strategy and off-site facilities

Part of the amount of work reserved monthly for the continuous consultancy service of Innofactor Ltd can be used for keeping the disaster recovery strategy up-to-date and training the disaster recovery on a regular basis. Reserving the possible required off-site facilities is normally the sole responsibility of the Romanian registry administrator. As agreed, Innofactor Ltd will prepare the required off-site facilities and take care of the documentation to transfer the registry to the off-site facility.

Security Plan

Background

This section describes how the registry software hosted by Innofactor Ltd is protected from unrestricted and unsolicited use.

Server security

The servers are located in a temperature and humidity monitored server room that is equipped with uninterruptible power supply (UPS). In the case of fire the server premises are equipped with an automatic fire suppressant system specially designed for electronic devises. The geographical location of the servers is not exposed to natural flooding. In the case of pipe breaking or other water damage the floor of the server room is raised so that the server racks are located on a podium compared to the normal floor level.

Innofactor Ltd emphasizes physical security of server premises in addition to normal logical access control methods. The server's location is 24/7 guarded and access to it has been restricted to a list of named persons. The server's location is equipped with recording surveillance camera and guarded by burglar alarm system with a straight connection to a guard center. The server premises meet the requirements for physical protection of priority premises (48B/2004M) of the Finnish Communications Regulatory Authority. When moving servers or backup media between controlled premises, they are never left unattended. Logical protection relies on Innofactor Ltd Active Directory (AD) domain. Active directory is used to enforce the following password policies: Maximum password age is 90 days and both password length and complexity requirements are activated. Computers are automatically locked after 15 minutes of idle time and employees have been ordered to lock the computers manually whenever leaving the desk.

The auditing settings on the servers have been set according to Microsoft's recommendations. They are not currently forced by AD. Servers are located in Innofactor Ltd service network protected by firewalls. Currently the firewalls are PC computers running Linux kernel packet filter. New firewalls are Cisco ASA appliances and will be put on production during H1/2007. All servers are protected with Symantec's Anti-Virus products that are kept current over the Internet.

Session security

Session security is ensured by using encryption both in management traffic and production network traffic (SSL). After the new firewalls of Innofactor Ltd are brought to production (scheduled to H1/2007), it will be possible to build the required VPN connections with the ITL.

User-authentication security at the application level

A number of measures were taken in order to make sure that the security for the account holders meets the Data Exchange Standards for registry systems under the Kyoto Protocol. As a first security measure, the password requirements for each of the registered users are built into the registry software. The registry software requires at least an 8 character long password, which has to be a mix of both alpha and numeric characters.

When the registry is handling requests by registry users the email is used as a validator for the user and if necessary the registry staff can request more individually validation data, such as passport number or civil registration number. Along with the above password requirements the software also requires the registry users to change their passwords every three months. With regards to maintenance of user ID's, these remain the same from the registration date until the person retires from the registry. Furthermore the users also have the possibility of changing their user ID. The registry administrator can disable unused user IDs and passwords on a regular basis.

Personnel security
Only separately named personnel are given the access to the registry production servers. When an employee signs an employment contract with Innofactor Ltd. a non-disclosure agreement (NDA) is signed at the same time. Innofactor Ltd checks the background of the persons being recruited to the extent allowed by the Finnish law.

Application Logging Documentation

Background
This section describes, how the registry software hosted and/or maintained by Innofactor Ltd is maintaining database logs and activity logs

Application logging plan
The Greta registry software maintains automatically logs of performed transactions in:

- application database, and
- XML-form transaction log files

The database and transaction log file backups are periodically shipped to other premises according to Innofactor Ltd server services backup procedures. As agreed with the customer of Innofactor hosting services, certain backup generations can as well be delivered to customer on a specific media, or stored for longer times than defined in the standard Innofactor Ltd backup procedures. Hardware used to store the logs is Innofactor's backup system.

The Greta registry software lists Microsoft SQL Server 2000 Standard Edition as prerequisite. To Innofactor's knowledge, log shipping to another server requires Microsoft SQL server 2000 Enterprise Edition or Microsoft SQL Server 2005 Standard Edition. Registry software has not yet been tested with SQL Server 2005 Standard Edition. If the software will be migrated to SQL Server 2005 Standard Edition, configuring log shipping can as well be negotiated with the customer.

The personnel responsible for reviewing on a regular basis the activity logs of Innofactor registry hosting customers are currently Mr. Mikko Lampi and Mr. Rami Laiho.

Time Validation Plan

Background
This section describes, how the registry software hosted and/or maintained by Innofactor Ltd is maintaining and validating server time on a periodic basis.

Time validation
NTP/Time servers are used in Innofactor Ltd production network to provide correct time to the servers. Active Directory domain controllers are synchronized to public Stratum 2 servers provided by Centre for Metrology and Accreditation (http://www.mikes.fi). The production servers synchronize their clocks with the Active Directory domain controllers, which are effectively stratum 3 servers.

The Romanian registry administrator checks continuously the time synchronization by using the specific time management function of the registry software. The Greta registry software maintains an automatic log of the time validations performed. In the case of time discrepancies the NTP-synchronization of the servers is validated immediately, until the time synchronization is reached.

Procedures for Change Management, Test Plan and Test Reports

Background
This section describes, how Greta registry software hosted and/or maintained by Innofactor Ltd is prepared for the CITL/ITL initialization tests (the change management procedure is not only for the initialization phase).

Change management process

Deployment strategy
As any new version of the Greta registry software is released, it is configured and installed to customer-specific test environments, where regression, connectivity and process tests are run with the software. The scope of the tests run depends on the degree of customer-specific localizations (that affect only the user interface of the registry software, such as language terms) made to the software. After all necessary testing is carried out and reported successfully the new version is ready to be updated to the production environment.

Test plan and test reports
The Greta software provider tests all new versions of the registry software prior to delivering them to software licensees. The regression tests are completed according to the regression test cases made by the software developer:

- Greta Regression Test Cases, and
- Greta Regression Test Results

The last full regression test of the registry was performed by the Greta IT supplier in July 2006. All tests performed by Innofactor Ltd to the Greta registry software are documented. All tests completed by Innofactor Ltd are based on information that the software has passed the described regression testing. All testing performed by Innofactor Ltd and/or the customer of Innofactor Ltd is assigned the needed personnel according to the agreement between Innofactor Ltd and the customer. The testing environments used have been designed such that the test results replicate the results expected in the production environment.

If there are national localizations that have been implemented by Innofactor Ltd on the new version, Innofactor is planning also localization-specific regression test cases that are run to the localized software version separately. When the possible localization-specific regression test cases have been successfully passed, the new software is ready for connectivity and process testing.

In the next phase the software installed by Innofactor Ltd is performed basic connectivity and process testing according to the test cases provided by the European Commission/UN. Testing is performed in the testing environment, and after successful completion of the tests and acceptance of the tests by the European Commission/UN the date of the version update to the production is decided.

Notification strategy
The users of the system are notified through the registry's public website two weeks before selected system update date. Version update is done such that disadvantages caused to users of the system are minimized. CITL and ITL are also notified of the update at least two weeks before the planned system update date. After these procedures are completed the version update to the production environment can be performed.

Version update and data management/ loading plan
After testing phase the version update to the production environment is completed in the following phases. These phases are also used when updating the national test environment:

1. Full backup of the software and the database of the system
2. Redirect registry's website to the URL that indicates that the system is under maintenance
3. End all existing user sessions
4. Disable national registry's processes at the CITL/ITL
5. Turn off the registry's web services and Windows services
6. Update national registry database by using update scripts by Greta with possible localization-related modifications
7. Update the registry's Web services
8. Update the registry's user interface (application)
9. Commit possible configuration file changes
10. Enable the registry's website and the web services with access restricted to admin users
11. Keep national registry's processes at the CITL/ITL disabled, run reconciliation to ensure data consistency of the registry database
12. When reconciliation is completed successfully, enable registry's processes at the CITL/ITL
13. Test connectivity and transfer functionality of the registry
14. When tests are successfully completed, allow access to the registry to all users

Software build & version control
Core registry software build and version control is performed by the registry software provider, Greta. If the software is made any customer-specific localization by Innofactor Ltd, the localized software build and version control is performed according to the Innofactor Ltd ISO 9001-compatible quality system.

Documentation control
Core registry software documentation controls is performed by the registry software provider, Greta. The testing, environment establishment and installation documentation control is performed according to the Innofactor Ltd ISO 9001-compatible quality system. If the core software is made any customer-specific localization by Innofactor Ltd, the localization documentation control is performed according to the Innofactor ISO9001-compatible quality system.

Naming conventions
Core registry software documentation conventions naming is taken care by the registry software provider, Greta. Testing, environment establishment, installation and possible customer-specific localization related conventions are named according to the Innofactor ISO 9001-compatible quality system.

Operational Plan

Background
This section presents the plan for an effective running of the registry with emphasis on the different requirements of the DES and the continued upholding of these requirements

Daily management
The daily management of the registry will be handled by two fulltime and one part-time registry operators. Everything concerning management of IT was outsourced to the "Innofactor Ltd" hosting center, who manages all IT activities for the Romanian National Environmental Protection Agency. A hotline is open during all Romanian working days from 9.00 to 13.00 (GMT+1). The hotline takes care of all enquiries from CITL/ITL and/or private account holders in the registry.

All functionalities and requirements for the registry manager are described in detail in an internal procedure. This document includes all deadlines for CITL/ITL and all relevant information. It functions as a complete manual for managing the registry. The document is constantly being updated and it is only accessible in Romania. A record of all changes, transactions, manual interventions etc. made by the registry operators are documented and filed.

Training of staff
Every new member of the registry team will receive a 2 day training course arranged by the experienced members of the staff. The training includes basic knowledge and functionality of the registry software, national and international legislation, EU and Kyoto Protocol issues and internal procedures for the daily management of the registry. The responsibilities for new staff will be expanded due to the development of their skills and the understanding of the registry system.