

Romania

Mapping national procedures, sources, available data and information

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Bucharest, 2011



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Acknowledgments: Anca Bardici, Irina Voda and Camelia Vasile (ISPE).



PROMITHEAS-4: “*Knowledge transfer and research needs for preparing mitigation/adaptation policy portfolios*”

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1. General information

1.1. Government structure

Romania is a constitutional republic based on the separation of three powers: legislative, executive and justice. According to the Romanian Constitution [Deputy Chamber, 2011], the public authorities are:

- the Parliament: it is organized in two chambers, the Deputy Chamber and the Senate – the senators and the deputies are elected for four years through popular vote;
- the Presidential Institution: the president is elected through popular vote for maximum two mandates of five years;
- the Government: the Prime Minister, who is elected by the President, proposes the composition of the Government, which must be accepted by the Parliament. The actual Romanian Government structure is as follows [Romanian Government, 2011]:
 - Ministry of Administration and Interior;
 - Ministry of Public Finance;
 - Ministry of Health;
 - Ministry of Economy, Trade and the Business Environment;
 - Ministry of Foreign Affairs;
 - Ministry of Transport and Infrastructure;
 - Ministry of Environment and Forests;
 - Ministry of Regional Development and Tourism;
 - Ministry of National Defense;
 - Ministry of Culture and National Cultural Heritage;
 - Ministry of Justice;
 - Ministry of Communication and Information Society;
 - Ministry of Labor, Family and Social Protection;
 - Ministry of Education, Research, Youth and Sports;
 - Ministry of Agriculture and Rural Development.
- the Public Administration:
 - central level (the Ministries) - proposed by the Prime Minister;
 - local level (counties, cities, communes) - the prefect, the mayors and the community councilors are elected for four years through popular vote;
- The Justice Authority

1.2. Mapping national procedures

1.2.1. Key categories according to IPCC

For the Romanian NIR the key category analysis is performed according to the provisions of Chapter 7 of IPCC GPG 2000 and Chapter 5 of IPCC GPG 2003.

Separate key category analyses are conducted taking into account both the exclusion and inclusion of the LULUCF sector and also both level and trend criteria; all IPCC sectors and categories, sources and sinks (as suggested in Table 7.1 of IPCC GPG 2000 and in Table 5.4.1 of IPCC GPG 2003), and gases are analyzed. The key category analysis follows a Tier 1 approach.

Considering the exclusion of the LULUCF sector:

- 18 categories are considered as key categories both by level and trend;
- 6 categories are considered as key categories, only by level;
- 7 categories are considered as key categories, only by trend.



Considering the inclusion of the LULUCF sector:

- 16 categories are considered as key categories, both by level and trend;
- 7 categories are considered as key categories, only by level;
- 8 categories are considered as key categories, only by trend

For year 2009 (according to the last Romanian NIR submitted in April 2011) the most important key categories are [ANPM, 2011]:

- CO₂ from energy industries - solid fuels;
- CO₂ from road transport;
- direct N₂O emissions from agricultural soils;
- CO₂ from energy industries - gaseous fuels;
- CH₄ from fugitive emissions-oil and natural gas;
- CO₂ from manufacturing industries and construction-gaseous fuels;
- CO₂ from forest land remaining forest land.

1.2.2. Methodology for retrieving key-category data

Data collection process comprises the following steps:

- identification of data requirements;
- identification of potential data suppliers;
- preparation of specific questionnaires;
- submitting the questionnaires to the potential suppliers of data;
- data collection;
- data verification: activity data received are examined (time series discrepancies, large changes in values from the previous to the current inventory year).

The collection of data is done by the National Environmental Protection Agency (ANPM), a specialized body with legal status and subordinated to the Ministry of Environment and Forests (MMP), which is receiving data from all the identified suppliers of data. The data providers are:

- the National Institute for Statistics (INS), which is the main data provider;
- central public authorities and the institutions under their authority, in their coordination and subordination;
- research institutes;
- local environmental protection agencies (EPAs);
- industry operators, owners and professional associations.

1.2.3. Responsible authorities and contact persons

The national authority responsible for administrating the National System for the estimation of anthropogenic GHG levels from sources and removals by sinks, adopted in 2007, is the National Environmental Protection Agency (ANPM). Its designated representative with overall responsibility for the national inventory is Mr. Sorin Deaconu.

Address: Splaiul Independentei no. 294, Sector 6, Bucharest, Postal Code 060031;

Telephone/fax: +40-21-2071155;

E-mail: sorin.deaconu@anpm.ro.



1.2.4. Procedures to address climate-change issues

The Ministry of Environment and Forests (MMP) is the national authority responsible for climate change issues. MMP is technically supported by the ANPM, which is responsible for ensuring the implementation of the environmental protection related strategies, policies and legislation, including climate change.

According to the current environmental regulation, almost all ministries have to implement environmental protection (including climate change) measures in their sectoral policies; therefore, these ministries are part of the institutional framework in the field of climate change. For a better coordination between the ministries, the National Commission on Climate Change (NCCC) has been established as a consultative body which aims to support the integration of climate change policy within other sectoral policies and to provide advisory services related to the approval of the National Communications and GHG inventories, as well as the approval of JI projects and emission trading activities.

1.3. Population

1.3.1. Country's demographic characteristics

The latest Romanian census was done in 2002 when the total population of the country was amounting 21,680,974 inhabitants. The evolution of Romania's population (Table 1.3.1) shows a continuous decrease since then.

| Year | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|--------------------|------------|------------|------------|------------|------------|------------|
| Population (mill.) | 21,658,528 | 21,610,213 | 21,565,119 | 21,528,627 | 21,498,616 | 21,462,186 |

Source: INS, 2011

Table 1.3.1. Evolution of Romania's population¹

According to the National Commission for Forecasts the population of Romania is foreseen to continue its decrease until 2030 (Table 1.3.2).

| Year | 2015 | 2020 | 2025 | 2030 |
|--------------------------|--------|--------|--------|--------|
| Population (thou. mill.) | 21,180 | 20,800 | 20,322 | 19,753 |

Source: CNP, 2011

Table 1.3.2. Forecast of Romania's population

Main cities and towns in Romania account for more than half of the total population, 25 of them have over 100 thousands inhabitants each; this represent in total 57.6% of the urban population. Among the cities with the largest population, Bucharest ranks first (with as many as 2 million inhabitants), followed by Iași, Cluj-Napoca, Timișoara, Constanța and Craiova (each with more than 300,000 inhabitants). These 6 cities concentrate over 30% of the urban population.

In 2009, out of the total population of Romania, 55.1% was living in the urban area and 44.9% in the rural area.

1.3.2. Development indicators

The Human Development Index (HDI) which measures a country's average achievements is calculated based on three basic aspects of human development: health, knowledge and income.

¹ Time series 1990-2011 online [10]



According to the UNDP “Human Development Global Report 2010” Romania ranks the 50th in a total of 169 countries for which the HDI was calculated. With an HDI value of 0.767 in 2010 Romania is placed among the countries with a high level of human development. In Table 1.3.3 the Romanian HDI and its components are presented.

| Indicator | 2010 |
|-------------------------------------|--------------|
| GNI/capita (PPP 2008 \$) | 12,844 |
| Life expectancy at birth (years) | 73.2 |
| Expected years of schooling (years) | 14.8 |
| Mean years of schooling (years) | 10.6 |
| HDI | 0.767 |

Source: UNDP, 2010

Table 1.3.3. Romanian HDI and its components²

1.4. Geographic profile

1.4.1. Geomorphologic characteristics

With a size of about 240,000 km² Romania ranks 80th in the world and 13th in Europe. Its relief’s main characteristics are: proportionality (31% mountains, 36% hills and plateaus, 33% plains and meadows), concentric display in an amphitheatre of the relief major parts.

Romania's relief consists of three major levels: the highest one in the Carpathians (the highest peak Moldoveanu 2,544 m), the middle one which corresponds to the Sub-Carpathians, to the hills and plateaus and the lowest one in plains, meadows and Danube Delta (the youngest relief unit under permanent formation with an average height of 0.52 m).

1.4.2. Ecosystems

The general ecosystem categories used in the preparation of specific policies are the following:

- Pastures
- Hay meadows
- Steppes
- Moors and heathlands
- Forest
- Freshwater and brackish aquatic ecosystems
- Marine and coastal ecosystems

1.4.3. LULUCF

The land uses in Romania have been relatively stable over the last 21 years, even strong mutation occurred at political, economic and social levels. Due to various and spatially equilibrated relief forms of the Romanian territory, as well as due to the much diversified climate the land is suitable for a large range of activities and uses.

Out of the national territory, agricultural land represents 62%, forests and other wooded lands is 28%, construction and roads/railways is 4.5%, waters and ponds are 3.5% and other areas some 2%.

² These indicators are not calculated at national level; UNDP has data for development indicators starting from 1990 (available at <http://hdr.undp.org/en/reports/global/hdr2010/>)



The forest³ and woodlands⁴ represent about 28% from the national territory. According to the 1985 National Forest Inventory the national forest fund was characterized by: standing wood volume of 1,287.8 millions m³, an average volume of 227 m³/ha and an annual average increase of 5.7 m³/ha/year.

Romanian forests grow more than it harvests, with a growth to harvest ratio of around 2. Forest management is done according to a decennial management plan elaborated for every single management unit. "Woodlands" are not mapped and planned, compared to "forest".

After 1990, abandoned lands (orchards, vineyards, pastures, crop fields) occasionally resulted in spontaneous forest regeneration, which is not yet assessed but it would be significant in the land use share and GHG balance.

Forestry sector is still in transition process, which consists in continuing of restoration of the properties and crystallization of a new administration system.

1.5. Climatic profile

1.5.1. Precipitation

Romania's climate is a transitional temperate-continental with oceanic influences from the West, Mediterranean influences from the South-West and excessive continental influences from the North-East.

Annual average amount of precipitations vary between less than 300 l/m²*yr and about 1,300 l/m²*yr [MMP, 2009]. Based on statistics from 104 meteo stations between 1961 and 2007, there are a few conclusions that may be drawn:

- There is a trend of decrease of the average amount of precipitations especially on summer and winter; this is confirmed with a certitude level of 90% only for a few small areas especially in the southern and eastern parts of Romania;
- There is a trend of increase of the amount of precipitations on the fall.

1.5.2. Temperature

Climatic variations are caused by geographical elements, the position of the main mountain ranges, elevation, etc. The average annual temperature varies with latitude, standing at 8°C in the North and 11°C in the South, with 2.6°C in the mountains and 11.7°C in the plains [ANM, 2011]. In winter the Scandinavian (Arctic) anticyclone frequently affects the country, influencing the climate with the specific features of the sub-polar Scandinavian climate. An absolute minimum temperature of -38.5°C was registered at Bod in Brasov County in 1942 and an absolute maximum temperature of 44.5°C at Ion Sion in the Baragan Plain in 1951.

Analysis performed on statistical data collected between 1961 and 2007 in 94 meteo stations, highlight significant changes in the temperature regimes in all seasons:

- About 2°C increase of average temperature during summer, winter and spring; in the eastern side of Romania temperature increase exceeds 2°C during winter;
- In autumn, there is a slight trend of decrease of the average temperature.

The hottest year was 2007 in 107 years in Romania. The average temperature in January was 6°C higher than the average measured between 1961 and 1990. In 2007 the highest temperature for July in Romania was registered: 44.3 °C, in the city of Calafat. In terms of precipitation, year 2007 was a very dry year in the period April-July and excessively wet during August-November.

³ Forests refer to national forest fund.

⁴ Woodlands refer to pastoral forests, forest belts, re-growth and invasive trees on abandoned lands, etc.



1.5.3. Other

Other phenomena observed in Romania include:

- Decrease of the average wind speed both annually (entire country) and seasonally; the decrease trend is more important for the eastern side of the country and for the mountains;
- Increase of the maximum length of the periods without precipitations in the south of the country (on winter) and in the west (on summer);
- Increase of the number of days with more than 10 mm/day of precipitations (up to 4 days), extended areas in the northern side of the country, especially on fall;
- Significant increase in the number of hoar frost days; tendency of moving of the last day towards spring.

1.6. Economic profile

1.6.1. General

The main branches of the economy are the energy industry, metallurgy, automobile industry, chemical and petrochemical industry, light industry, constructions, agriculture and the food industry. The major part of the sectors of the economy remain insufficiently exploited and offer for the future investors great potential, especially in the manufacturing, agriculture and tourism.

The trend of main economic indicators is presented in Table 1.6.1.

| Indicator | 2006 | 2007 | 2008 | 2009 |
|--|---------|---------|---------|---------|
| GDP (€ ₂₀₀₅ billion) ⁵ | 84.25 | 89.3 | 95.64 | 88.28 |
| GDP growth rate (%) | 6.3 | 6 | 7.1 | -7.7 |
| GDP per capita (€ ₂₀₀₅) | 3,898.6 | 4,140.9 | 4,442.5 | 4,106.3 |
| Industrial output growth rate (%) | 7.2 | 5.4 | 10.6 | 7.1 |
| Unemployment rate (%) ⁶ | 5.2 | 4.0 | 4.4 | 7.8 |
| Consumer price growth rate (%) | 4.9 | 6.6 | 6.3 | 4.74 |
| FDI (€ million) ⁷ | 9,056 | 7,250 | 9,496 | 3,490 |
| FDI per capita (€) | 419.2 | 336.2 | 419.2 | 162.2 |

Source: INS, 2011; ARIS, 2011

Table 1.6.1. Main Economic Indicators

The inflation rate has dropped from 6.3% in 2008 to 4.74% in 2009. Nevertheless, it was higher than the National Bank target of 3.5%.

1.6.2. Primary sector

In this group of activities are included the emissions from:

- livestock feeding and housing;
- manure storage;
- field-applied manure;
- fertilizer application (NH₃);
- soil cultivation and crop harvesting.

In Romania, the agricultural sector represents a basic branch of the national economy, having significant economic and social importance and implications. In 2009 the contribution of agriculture, forestry, fishery

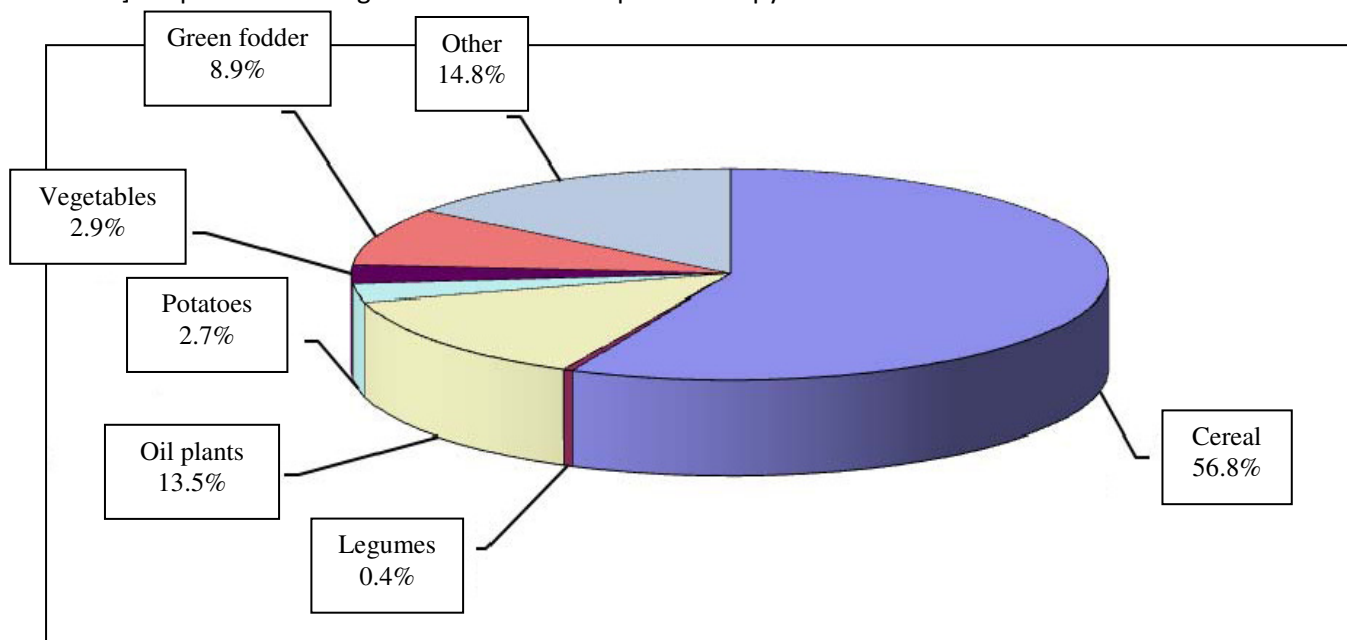
⁵ Time series in national currency 1990-2009 online [18]

⁶ Time series 1991-2009 online [19]

⁷ Time series 2004-2011 online [14]



and hunting to total gross value added (GVA) was about 7%. Romania has an agricultural capacity of approximately 14.7 million hectares which stands for about 62% of the country's territory. Agricultural lands comprise arable lands whose areas were relatively stable to 64% (9.38 million ha) over the period 1989-2009, pastures amounting 23%, hayfields - 10% and 3% orchards and vineyards areas in 2009 [MADR, 2011]. As presented in Fig. 1.6.1 cereal and oil plants occupy about 70% of the arable land.



Source: MADR, 2011

Figure 1.6.1. Arable land use

At the end of 2008, 2.42 million Romanians (close to 28% of the country's workforce) were employed in agriculture, forestry and hunting.

Livestock breeding has an important share in the Romanian agriculture and is one of the base activities in the rural sector (Table 1.6.2).

| | |
|---------------|--------|
| Cattle | 2,512 |
| Pigs | 5,793 |
| Sheep + Goats | 10,048 |
| Poultry | 83,843 |

Source: INS, 2010

Table 1.6.2. Livestock in 2009 (thousands)⁸

28% of the national territory is covered by forest and woodlands. The structure of the forest fund in 2009 is the following: resinous forests (30.55%), beech forests (32.16%), oaks forests (17%), hardwood forests (15.17%) and softwood forest (5.11%). Additionally there is an area of about 418,900 ha of woodlands. [INS, 2010]

1.6.3. Secondary sector

The contribution of the secondary sector to total GVA had a slight growth from 37.7% in 2008 to 38.2% in 2009.

⁸ Time series 1990-2009 online [20]

In 2008 the employment rate in this sector was about 31%. The contribution of each category of the secondary sector to GVA at current prices in 2008 is presented in Table 1.6.3.

| | GVA⁹ | Employment¹⁰ | |
|--|------------------------|--------------------------------|------------|
| | (million Euro) | (thousands) | (%) |
| Total secondary sector | 47,007.41 | 2,898.6 | 100 |
| Mining and quarrying | 1,405.33 | 105.3 | 3.6 |
| Manufacturing | 27,924.16 | 1,904 | 65.7 |
| Electricity & heat, gas and water supply | 2,844.19 | 157 | 5.4 |
| Construction | 14,833.74 | 732.3 | 25.3 |

Source: INS, 2010

Table 1.6.3. Contribution of secondary sector to GVA at current prices and employment

1.6.4. Tertiary sector

The tertiary sector contributed with 54.7% in total GVA in 2009. The contribution of each category of the tertiary sector to GVA at current prices in 2009 is presented in Table 1.6.4. The employment rate for each category of this sector in 2008 is shown in Table 1.6.5.

| | GVA¹¹ |
|---|-------------------------|
| | (million Euro) |
| Total tertiary sector | 57,800.91 |
| Trade | 12,291.74 |
| Hotels and restaurants | 2,014.21 |
| Transport, storage and communications | 11,077.24 |
| Financial intermediations | 2,491.19 |
| Real estate transactions, renting and service activities mainly rendered to enterprises | 17,304.34 |
| Public administration and defense | 5,205.48 |
| Education | 3,974.28 |
| Health and social assistance | 3,442.43 |

Source: INS, 2010

Table 1.6.4. Contribution of tertiary sector to GVA at current prices

⁹ Time series in national currency 1991-2009 online [18]

¹⁰ Time series 2003-2009 online [19]

¹¹ Time series in national currency 1991-2009 online [18]



| | Employment ¹² | |
|--|--------------------------|------------|
| | (thousands) | (%) |
| Total tertiary sector | 3,417.7 | 100 |
| Wholesale and retail; repair of motor vehicles, motorcycles and personal and household goods | 1,166 | 34.1 |
| Hotels and restaurants | 136.3 | 4 |
| Transport, storage and communications | 498.7 | 14.6 |
| Financial intermediations | 98 | 2.9 |
| Real estate, renting and business activities | 345.4 | 10.1 |
| Public administration and defence | 396.9 | 11.6 |
| Education | 389 | 11.4 |
| Health and social assistance | 387.4 | 11.3 |

Source: INS, 2010

Table 1.6.5. Employment rate for tertiary sector

1.6.5. Future prospects for the country's economy

For 2011 the economy of Romania is widely believed to start recovering, yet slowly and not all of the massive drawbacks can be overcome. Especially the Romanian labour market will remain in a bad shape.

According to the latest estimations of Romanian National Commission of Forecasting (CNP) the GDP of Romania (Table 1.6.6) decreased in 2010 with 1.3%. The economy is expected to turn on the positive side in 2011, with real GDP forecasted to grow by 1.5% and reaching by the end of the year the former level of 2008.

After falling severely in 2009 and 2010, investment should start to grow vigorously by 4.2% and is expected to be a main driver of growth as companies re-adjust their production lines to meet the increased external demand. Exports have been a main driver of growth during the past years. They have maintained their strong momentum during 2010, and together with the increase of industrial orders, this development is expected to re-assure companies even if risk spreads remain somewhat elevated. Moreover, increased absorption of substantial EU funds would provide an incentive for infrastructure investment.

The prolonged economic recession led to higher unemployment in 2010 and a substantial correction in wage growth. The unemployment rate is projected to average 8% in 2010, up from 7.8% last year, and then to diminish slowly in 2011-12. The former level of unemployment in Romania of just some 4.4% is not expected to be reached again before 2014.

Inflation is believed to remain on the low side for Romanian standards, yet still on the high side for overall trends in the EU. The Exchange rate for Romania's currency is estimated to stabilize at 4.25 RON/EUR, yet this estimate has not remained unchallenged. Several analysts expected the LEU to drop until 4.5 RON/EUR. On the other hand, during the first half of January 2010 the RON appreciated considerably for some days, but without convincing that the effect will stand the test of time.

¹² Time series 2003-2009 online [19]



| Economic Indicator/Year | Unit | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-------------------------|-----------|---------|---------|---------|---------|---------|---------|---------|
| GDP | Mill. EUR | 136,845 | 117,016 | 123,554 | 134,079 | 147,053 | 161,870 | 178,910 |
| | % | 7.1 | -7.7 | -1.3 | 1.5 | 3.9 | 4.5 | 4.7 |
| Exports | Mill. EUR | 33,725 | 29,116 | 34,350 | 37,980 | 41,700 | 45,830 | 50,550 |
| | % | 14.1 | -13.7 | 19.0 | 9.6 | 9.8 | 9.9 | 10.3 |
| Import | Mill. EUR | 52,834 | 35,903 | 39,740 | 43,000 | 47,090 | 51,750 | 56,980 |
| | % | 11.5 | -32.0 | 10.7 | 8.2 | 9.5 | 9.9 | 10.1 |
| Current Account | Mill. EUR | -16,157 | -5,168 | -6,920 | -7,125 | -6,975 | -6,430 | -6,935 |
| | % of GDP | -11.6 | -4.5 | -5.7 | -5.5 | -4.9 | -4.1 | -4.0 |
| Exchange Rate | RON/EUR | 3.6827 | 4.2373 | 4.2400 | 4.2100 | 4.1800 | 4.1600 | 4.1300 |
| | RON/USD | 2.5189 | 3.0493 | 3.2400 | 3.2100 | 3.1900 | 3.1800 | 3.1500 |
| Inflation | % | 6.3 | 4.74 | 8.1 | 3.2 | 3.0 | 2.8 | 2.5 |
| Unemployment | % | 4.4 | 7.8 | 8.0 | 7.8 | 7.3 | 6.9 | 6.3 |

Source: CNP, 2011

Table 1.6.6. Forecast of Romania's main economic indicators

1.7. Transportation

1.7.1. Road transport

The road transport sector includes emissions from passenger cars, light duty vehicles, heavy duty vehicles and busses, mopeds and motorcycles.

The data on fleet structure, provided by Romanian Auto Registry consists of:

- number of vehicles and technical parameters for each one of the following categories:
 - Passenger cars;
 - Light-duty vehicles with a capacity under 3,5 t;
 - Heavy-duty vehicles with a capacity over 3,5 t;
 - Buses and coaches;
 - Mopeds and motorcycles with a capacity under 50 cm³;
 - Motorcycles with a capacity over 50 cm³.
- annual number of kilometers per motor vehicle category and driving share: urban, rural and highway;
- average driving speed on motor vehicle and road category;

At the level of 2008 the number of diesel passenger cars was higher by almost 60% compared to 2005, while the gasoline fueled ones recorded only a 16% increase. Annual fuel consumption is provided by the National Institute of Statistics.

According to the 2010 database of the Romanian Auto Register, the auto park in 2009 was of 5,785,575 vehicles, 8% more than in 2008 (5,357,014). The cars entered in the auto park are light motor vehicles, heavy vehicles, buses, mopeds, motorcycles (Table 1.7.1).



| Vehicle categories | Thousands vehicles | % |
|-----------------------------|--------------------|------------|
| Total, out of which: | 5,785.575 | 100 |
| Cars | 4,745.907 | 82.03 |
| Easy vehicles | 517.230 | 8.94 |
| Heavy vehicles | 300.271 | 5.19 |
| Buses | 26.614 | 0.46 |
| Mopeds | 68.270 | 1.18 |
| Motorcycles | 127.283 | 2.20 |

Source: RAR, 2010

Table 1.7.1. Vehicle categories in 2009

1.7.2. Shipping

Romania does not have big internal waterways; its river transport is organized only along the Danube River and on the Black Sea coast. The number of vessels/ships in 2009 is shown on Table 1.7.2.

| Inland waterways transport | |
|--|------|
| Ships without propulsion for merchandise transport | 1232 |
| Tugboats and pushers | 258 |
| Ships for passengers transport | 65 |
| Maritime transport | |
| Freight ships – total | 24 |
| Ships for general merchandise | 5 |
| Ore carriers | - |
| Oil tankers | 10 |

Source: INS, 2010

Table 1.7.2. Water transport vessels/ships¹³ (number)¹⁴

The main ports of Romania are:

- Black Sea ports: Constanța – the main Romanian port and also the largest Black Sea port – Mangalia, Midia-Navodari and Sulina;
- Danube River ports: Moldova Noua, Orsova, Drobeta Turnu-Severin, Calafat, Corabia, Turnu Magurele, Zimnicea, Giurgiu, Oltenita, Calarasi, Cernavoda, Harsova, Macin, Braila, Galati, Tulcea;
- Danube – Black Sea Canal ports: Cernavoda, Medgidia, Basarabi, Agigea-Constanta Sud.

The number of passengers and the transported goods in 2009 is shown on Table 1.7.3.

| Transport mode | Number of passengers | Transported good ¹⁵ (thousand tonnes) |
|----------------------------|---|---|
| Inland waterways transport | 161 ¹⁶ | 24743 |
| Maritime transport | 13 ¹⁷ (Cruise passengers, including cruise passengers on trips – inwards) | 36021 |

Source: INS, 2010

Table 1.7.3. Number of passengers and transported goods

¹³ Data refer to registered ships in the Registration File of the Romanian Naval Authority.

¹⁴ Time series 1991-2009 online [21]

¹⁵ Time series 1990-2009 online [21]

¹⁶ Time series 1990-2009 online [21]

¹⁷ Time series 2004-2009 online [21]



1.7.3. Railways

The total length of railway network in 2009 was 10,784 km, of which the total length of electrified lines is 4002 km, representing 37.1% of the total. Out of the total length, 98.7% are normal gauge lines and 1.3% is large gauge lines.

The length of railway lines as of the end of 2009 is shown on Table 1.7.4.

| | |
|-----------------------------|---------------|
| Total, out of which: | 10,784 |
| Normal gauge lines | 10645 |
| Narrow gauge lines | 5 |
| Large gauge lines | 134 |

Source: INS, 2010

Table 1.7.4. Total length of railway network¹⁸ (Km)

According to the statistics regarding the interurban and international transport of passengers, in the period 2006 – 2009 the number of passengers and the passengers transport performance decreased consistently.

| Year | 2006 | 2007 | 2008 | 2009 |
|--|--------|--------|--------|--------|
| No. of passengers (10 ³ passengers) | 94,441 | 88,264 | 78,252 | 70,332 |
| Passenger transport performance (million passengers-km) | 8,093 | 7,476 | 6,958 | 6,128 |

Source: INS, 2010

Table 1.7.5. Number of passengers¹⁹

The evolution of goods transported on the railways is presented on Table 1.7.6. A decrease of the goods transported and of the goods transported performance can be noticed.

| Year | 2006 | 2007 | 2008 | 2009 |
|--|--------|--------|--------|--------|
| Goods transported (thousand tons) | 68,313 | 68,772 | 66,711 | 50,596 |
| Goods transport performance (million tons-km) | 15,791 | 15,757 | 15,236 | 11,088 |

Source: INS, 2010

Table 1.7.6. Goods transported²⁰

1.7.4. Air transport

The number of Landing/Takeoff cycles is not available.

The number of passengers, tonnage and air transport performance in 2009 are presented on Table 1.7.7.

| | |
|---------------------------|-----------|
| Passengers - number | 9,092,853 |
| Freight and mail (tonnes) | 24,499 |

Source: INS, 2010

Table 1.7.7. Civil aviation activity²¹

¹⁸ Time series 1990-2009 online [21]

¹⁹ Time series 1990-2009 online [21]

²⁰ Time series 1990-2009 online [21]



There are 17 airports in Romania, 4 are open to domestic and international traffic of passengers and cargo and 13 are specific to particular local interest. Bucharest-Otopeni International Airport is the main airport of Romania which carries 75% of international passenger and freight traffic of our country.

| Airport type | Number | Location |
|--------------------------|--------|--|
| International airports | 16 | Bucharest (Baneasa, Otopeni), Craiova, Timisoara, Arad, Oradea, Cluj Napoca, Baia Mare, Satu Mare, Targu Mures, Suceava, Iasi, Bacau, Tulcea, Constanta, Sibiu |
| Non-functioning airports | 1 | Caransebes |
| Planned airports | 5 | Deva, Alba Iulia, Brasov, Galati, Bistrita |

Source: INS, 2010

Table 1.7.8. Airports in Romania

1.8. Energy

In 2009, the gross domestic energy consumption was 34,328,000 toe, out of which about 82% was supplied from domestic production. The main energy statistics for Romania are presented in Table 1.8.1.

| Year | 2005 | 2006 | 2007 | 2008 | 2009 |
|--|--------|--------|--------|--------|--------|
| Primary energy production ²² | 27,090 | 27,065 | 27,300 | 28,779 | 28,034 |
| Imports ²³ | 17,072 | 17,605 | 17,399 | 16,324 | 11,235 |
| Exports | 6,534 | 5,983 | 4,901 | 5,565 | 4,560 |
| Primary energy consumption ²⁴ | 37,868 | 39,381 | 39,159 | 39,658 | 34,328 |
| Final energy consumption ²⁵ | 25,102 | 25,312 | 25,028 | 25,303 | 22,387 |

Source: INS, 2010

Table 1.8.1. Main energy statistics of Romania (10³ toe)

The types of primary energy resources and their contribution in 2009 are presented in Fig. 1.8.1.

²¹ Time series 1997-2009 online [21]

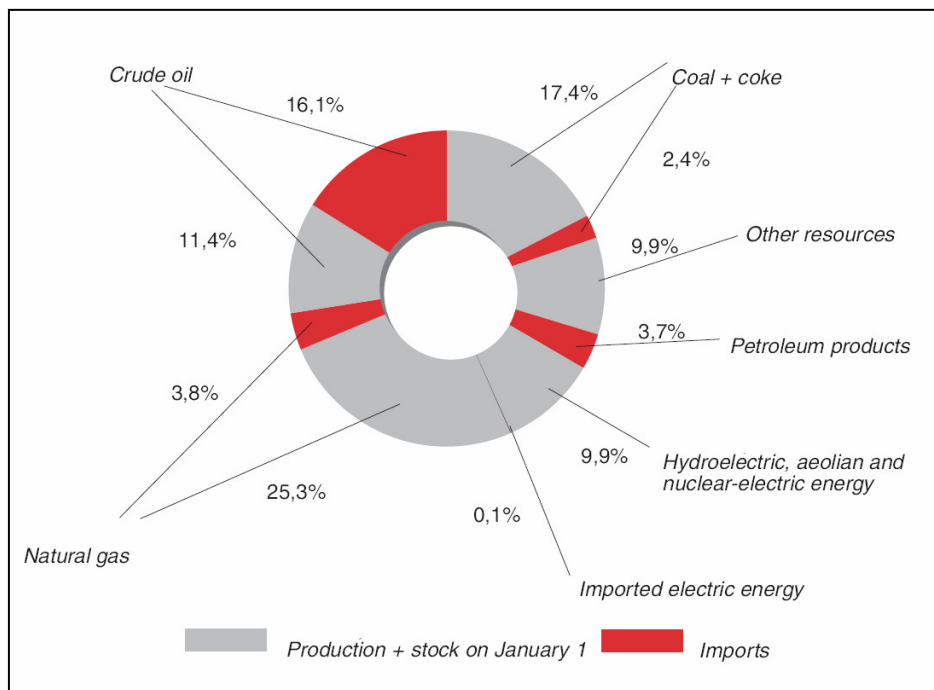
²² Time series 1992-2009 online [22]

²³ Time series 1992-2009 online [22]

²⁴ Time series 1995-2009 online [22]

²⁵ Time series 1995-2009 online [22]





Source: INS, 2010

Figure 1.8.1. Primary energy resources

1.8.1. Energy supply

The main sources of energy generation in 2009 are presented in Table 1.8.2.

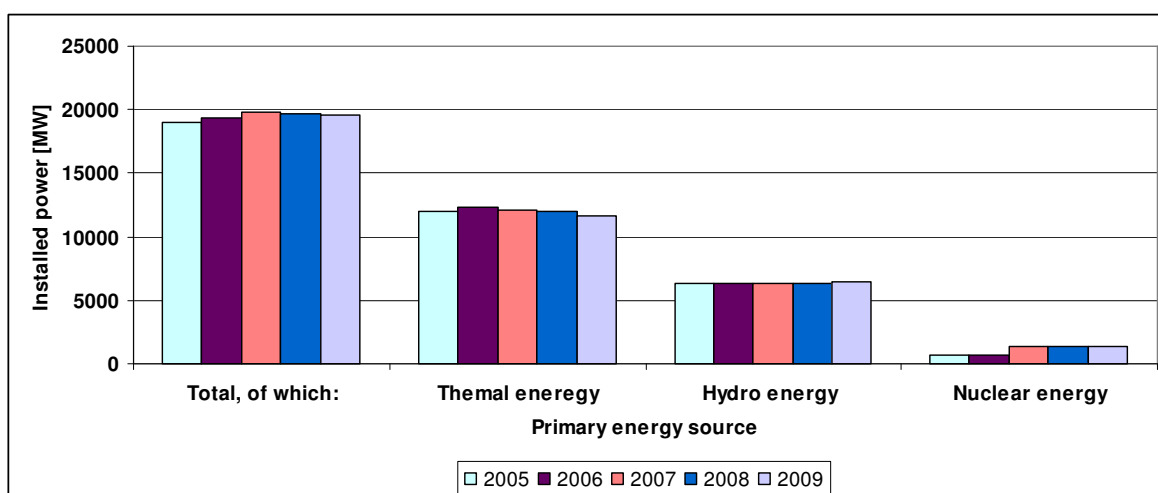
| Resource | Primary energy total | of which | |
|---|----------------------|------------|--------|
| | | Production | Import |
| Resource | 42,729 | 28,034 | 11,235 |
| Coal, out of which: | 8,078 | 6,477 | 640 |
| - Lignite | 6,457 | 5,718 | 36 |
| - Imported coke | 373 | - | 373 |
| Natural gas | 12,443 | 8,964 | 1,614 |
| Crude oil | 11,744 | 4,390 | 6,892 |
| Imported petroleum products | 1,579 | - | 1,579 |
| Fuelwood (including biomass) | 3,963 | 3,838 | 3 |
| Other fuels | 226 | 98 | 78 |
| Hydroelectric and nuclear-electric energy | 4,242 | 4,242 | - |
| Imported electricity | 56 | - | 56 |
| Energy from non-conventional sources | 25 | 25 | - |

Source: INS, 2010

Table 1.8.2. Primary energy sources²⁶ (10³ toe)

²⁶ Time series 1992-2009 online [22]

The installed capacity of the electricity system for the period 2005 – 2009 is presented in Fig. 1.8.2.



Source: INS, 2010

Figure 1.8.2. The installed power capacity in Romania²⁷ (MW)

1.8.2. Energy consumption

In Table 1.8.3 the final energy consumption by sector between 2005 and 2009 is presented.

| | 2005 | 2006 | 2007 | 2008 | 2009 |
|-----------------------------------|--------|--------|--------|--------|--------|
| Total | 25,206 | 25,313 | 24,659 | 25,002 | 22,387 |
| Industry (including construction) | 10,505 | 9,998 | 9,630 | 9,115 | 6,612 |
| Agriculture, forestry, fishery | 237 | 262 | 260 | 293 | 385 |
| Transport | 4,379 | 4,407 | 4,729 | 5,399 | 5,377 |
| Tertiary sector | 2,030 | 2,757 | 2,481 | 2,106 | 1,976 |
| Residential | 8,055 | 7,889 | 7,559 | 8,089 | 8,037 |

Source: INS, 2010

Table 1.8.3. Final energy consumption by sector²⁸ (10³ toe)

1.9. Waste disposal

1.9.1. Solid waste disposal

Municipal waste: In the structure of the municipal waste in Romania, the household wastes have the biggest share (about 81%), while street waste and construction and demolition waste have about the same share - 10%, respectively 9%. Over 90% of these wastes are disposed in landfills.

The local public administrations are responsible for the management of the municipal waste, which consists in their collection, transport, capitalization and disposal, including the monitoring of waste deposits after their closing.

²⁷ Time series 1992-2009 online [22]

²⁸ Time series 1995-2009 online [22]

In 2008, the amount of municipal waste collected through specialized services belonging to municipalities or waste companies was 7.37 million tons (Table 1.9.1). Around 54% of the population is served by the health services at national level, the urban share being 80% and in rural areas only 22%.

| Waste collected | Amount collected (Mt) | % |
|--------------------------------------|-----------------------|------------|
| Household waste | 5.67 | 76.94 |
| Waste from municipal services | 0.89 | 12.07 |
| Waste from construction / demolition | 0.81 | 10.99 |
| Total | 7.37 | 100 |

Source: ANPM, 2010; INS, 2010

Table 1.9.1. Municipal waste collected in 2008

Industrial waste: The amounts of non-hazardous waste by economic activity during the period 2004 – 2008 are presented in Table 1.9.2.

| Economic activity | Amount (thousand tons) | | | | |
|---|------------------------|-------------------|-------------------|------------------|------------------|
| | 2004 | 2005 | 2006 | 2007 | 2008 |
| Processing industry | 11,323.6 | 20,460.90 | 8,964.15 | 18,860.39 | 10,678.66 |
| Production, transportation and distribution of electricity, gas and water | 15,784.8 | 105,606.09 | 102,551.84 | 36,465.59 | 7,055.92 |
| Water collection, treatment and supply | 256.7 | 187.41 | 220.82 | 10.96 | 20.58 |
| Other activities | 219.8 | 595.96 | 483.92 | 1,494.34 | 506.52 |
| Total | 27,584.9 | 126,850.36 | 112,220.73 | 56,831.28 | 18,261.68 |

Source: ANPM, 2010; INS, 2010

Table 1.9.2. Non - hazardous waste by main economic activities

The amounts of hazardous waste by economic activity during the period 2004 – 2008 are presented in Table 1.9.3.

| Economic activity | Amount (thousand tons) | | | | |
|---|------------------------|-----------------|-----------------|---------------|---------------|
| | 2004 | 2005 | 2006 | 2007 | 2008 |
| Mining | 1,214.4 | 997.18 | 497.59 | 11.24 | 31.11 |
| Oil processing industry, coking coal | 431.1 | 419.72 | 226.35 | 37.89 | 114.53 |
| Production of chemicals and chemical products | 55.8 | 41.95 | 47.11 | 53.33 | 54.02 |
| metallurgy | 383.5 | 95.43 | 168.76 | 121.62 | 150.78 |
| Machinery and equipment | 39.8 | 14.83 | 33.05 | 26.67 | 28.58 |
| Transport means | 23.5 | 30.72 | 26.19 | 31.06 | 13.33 |
| Other activities | 23.4 | 74.39 | 53.76 | 137.28 | 42.59 |
| Total | 2,262.8 | 1,733.97 | 1,052.81 | 419.08 | 434.94 |

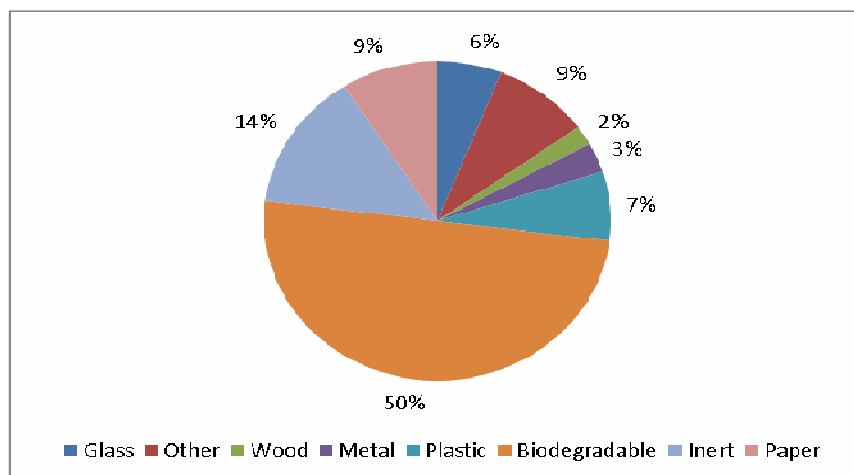
Source: ANPM, 2010; INS, 2010

Table 1.9.3. Hazardous waste by main economic activities



In the last years, the quantities of household waste per capita increased from 283 kg/inhabitant/year in 2002 to 430 kg/inhabitant/year in 2008, meaning an average of about 380 kg/capita/year.

The average composition of municipal waste in 2008 is presented in Fig. 1.9.1.



Source: ANPM, 2010

Figure 1.9.1. The average composition of municipal waste

As regards the households waste collection the traditional method is the most frequent with a share of about 96% of the collected wastes. The implementation of the selective waste collection was planned to be approached in three phases:

- 2004 – 2006: pilot projects; population awareness;
- 2007 – 2017: extension of selective collection at national level;
- 2017 – 2022: implementation of selective collection at the most difficult areas (collective households, dispersed rural areas, mountain areas).

The amounts of collected waste at national level in 2009 are presented in Table 1.9.4.

| Selective collection | | | | | | |
|--|------------|----------------|------------------------|--------------|--------------|-------------|
| The total amount of packaging collected (tons) | PET (tons) | Plastic (tons) | Paper/Cardboard (tons) | Glass (tons) | Metal (tons) | Wood (tons) |
| 28,261.868 | 7,073.876 | 3,395.287 | 15,998.545 | 1,326.763 | 278.392 | 189.005 |
| Pilot projects | | | | | | |
| The total amount of packaging collected (tons) | PET (tons) | Plastic (tons) | Paper/Cardboard (tons) | Glass (tons) | Metal (tons) | Wood (tons) |
| 5,002.030 | 744.285 | 587.663 | 3,343.580 | 143.272 | 13.130 | 170.000 |

Source: ANPM, 2010

Table 1.9.4. Quantities of waste collected at national level

1.9.2. Wastewater treatment

Information about the waste water treatment plants is presented below in Table 1.9.5.

| Year | | 2006 | 2007 | 2008 | 2009 |
|--|--|------|------|------|------|
| Urban waste water treatment plants | | | | | |
| Primary Stages | | 268 | 465 | 286 | 281 |
| Secondary Stages | | 210 | 235 | 160 | 160 |
| Tertiary Stages | | - | - | 7 | 16 |
| Industrial waste water treatment plants | | | | | |
| Primary Treatment | | 215 | 451 | 521 | 449 |
| Secondary Treatment | | 57 | 118 | 135 | 135 |
| Tertiary Treatment | | 1 | 8 | 12 | 15 |
| Independent waste water treatment plants | | | | | |
| Primary Treatment | | 214 | 215 | 278 | 277 |
| Secondary Treatment | | 38 | 36 | 52 | 67 |

Source: INS, 2011

Table 1.9.5. Number of waste water treatment plants²⁹

Regarding the sewage sludge management, Table 1.9.6 presents the quantities and the used methods for 2008.

| Management methods | Quantities (tons) |
|----------------------------------|-------------------|
| Stored in landfills or own stock | 124,073 |
| Incineration and other disposal | 0 |
| Scattered on the ground | 353 |

Source: ANPM, 2010

Table 1.9.6. Management of sludge from municipal treatment plants

To encourage sludge recycling in agriculture it must be taken into account that the development of sludge recycling in agriculture largely depends on the possibilities of improving the quality of sludge. This involves preventing wastewater pollution at source by reducing the access of possible sources of heavy metals or organic compounds into the sewage system, improving the methods of sludge treatment and sludge quality assurance monitoring. These technical solutions require major investment of wastewater treatment companies or local authorities in changing the methods of wastewater treatment.

²⁹ Time series 2006-2010 online [10]

2. The national GHG inventory

2.1. Developing a national GHG-inventory system

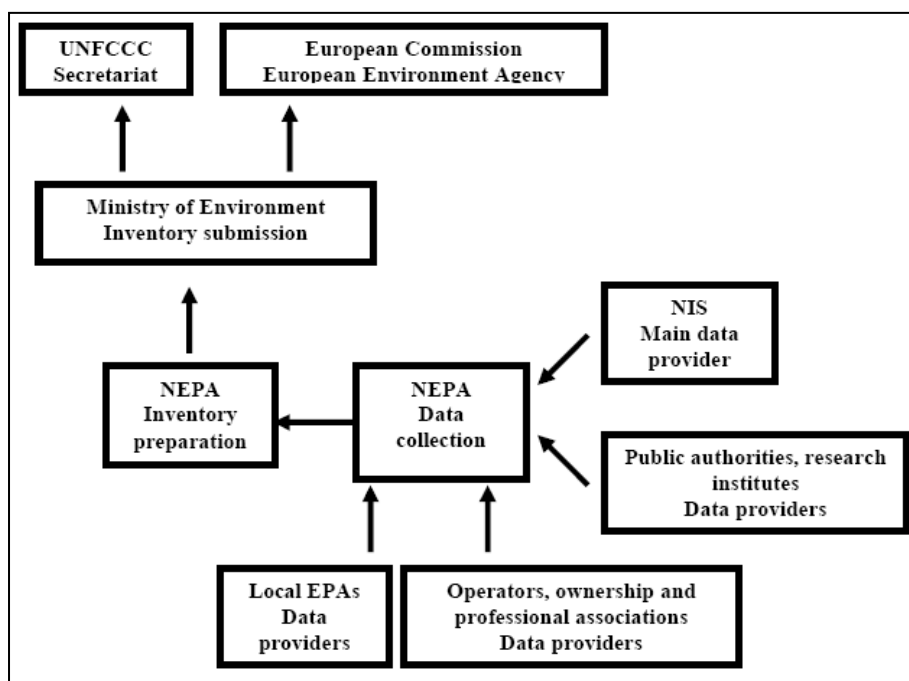
Based on Article 5 of the Kyoto Protocol, Romania established a National System for estimating the anthropogenic emissions for all greenhouse gases not covered by the Montreal Protocol. The system complies with the provisions of the subsequent decisions of the CMPs of the Kyoto Protocol and with provisions of the Decision 280/2004/EC of the European Parliament and of the Council and of the Decision 166/2005/EC of the European Commission concerning a mechanism for monitoring Community GHG emissions and for implementing the Kyoto Protocol.

The Governmental Decision no. 1570 for establishing the National System for the estimation of anthropogenic greenhouse gas emissions levels from sources and removals by sinks, adopted in 2007, and the subsequent relevant procedures are regulating all the institutional, legal and procedural aspects for supporting the Romanian authorities to estimate the greenhouse gas emissions levels, to report and to archive the National GHGI information.

The procedures subsequent to the Governmental Decision no. 1570/2007 comprise:

- Ministry of Environment and Forests Order 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;
- Ministry of Environment and Forests Order no. 1474/2008 for approving the Procedure on processing, archiving and storage of data specific to the NGHGI;
- ANPM'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;
- ANPM's President Decision no. 24/2009 for approving the QA/QC Procedure related to the NGHGI

The inventory system currently used in Romania is presented in Fig. 2.1.1.



Source: ANPM, 2011

Figure 2.1.1. Current national GHG inventory system description

2.1.1. Governmental authorities responsible for collecting GHG data

The competent authority, which is responsible for administrating the National System, is the National Environmental Protection Agency (ANPM), under the subordination of the Ministry of Environment and Forests.

ANPM has also the obligation of the preparation and management of the GHGI; in this sense, the Governmental Decision no. 1570/2007 and the subsequent relevant procedures supports ANPM by defining a legal, institutional and procedural framework to involve actively all the relevant responsible public authorities, different research institutes, economic operators, and professional associations.

The Ministry of Environment and Forests submits officially the national GHGI to the UNFCCC Secretariat, the European Commission and the European Environment Agency taking into account the specific deadlines.

2.1.2. Supporting institutions

Central public authorities and the institutions under their authority, in their coordination or subordination, different research institutes, and the economic operators have the responsibility for submitting activity data needed for the GHG emissions/removals calculation.

The main activity data supplier is the National Institute for Statistics (INS) through the yearly published documents like the National Statistical Yearbook and the Energy Balance. In 2002, the Ministry of Environment and Forests and INS signed a protocol of co-operation. Under this protocol, INS agreed to provide, besides its yearly publication, additional data, necessary for the inventory preparation.

2.1.3. Measurement methodology

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). Emissions/removals by sinks in LULUCF sector are estimated using IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry (IPCC GPG 2003).

The sources of the emission factors/increment rates used are: IPCC 1996, IPCC GPG 2000, IPCC GPG 2003, national research institutes and plants, in a very limited number. The methods used to estimate emissions/removals and the sources of emission factors are mostly Tier1, Tier2 for some industrial processes and CORINAIR methodology in case of solvent and other product use.

2.1.4. Activity data

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

| Sector | Data sources |
|----------------------|---|
| Energy | <ul style="list-style-type: none">• National Institute for Statistics - Energy Balance and other additional data• Energy producers through 42 Local / Regional EPAs• Ministry of Economy• Romanian Civil Aviation Authority• Transgaz SA |
| Industrial Processes | <ul style="list-style-type: none">• National Institute for Statistics- Statistical Yearbook and other additional data• Industrial operators through through 42 Local/Regional Environmental Protection Agencies• Direct information from industrial operators |



| | |
|-------------------------------|--|
| Solvent and other product use | <ul style="list-style-type: none"> • National Institute for Statistics • Industrial operators through 42 Local/Regional Environmental Protection Agencies |
| Agriculture | <ul style="list-style-type: none"> • National Institute for Statistics |
| LULUCF | <ul style="list-style-type: none"> • 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) • National Forest Administration |
| Waste | <ul style="list-style-type: none"> • 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: ANPM, 2011

Table 2.1.1. Data sources for activity data

2.1.5. Conformity with data exchange standards

The website for Romanian Registry³⁰ including the information based on the requirements in the annex to decision 13/CMP concerning the publicly accessible information is periodically updated.

The Romanian registry is tested by the Member States registry administrator in order to demonstrate the ability of the registry to perform the processes required under the ETS and its good operation in conjunction with the Community Independent Transaction Log and in accordance with Art. 72 of Commission Regulation (EC) No 2216/2004 for a standardized and secured system of registries pursuant to Directive 2003/87/EC of the European Parliament and of the Council and Decision 280/2004/EC of the European Parliament and of the Council, as amended by Commission Regulation (EC) No 916/2007 and by Commission Regulation (EC) No 994/2008. Also, the conformity of the tested registry software is verified against the requirements elicited in the Data Exchange Standards for registry systems under the Kyoto Protocol - Technical Specifications (Version 1.1), document containing the description of the processes, transaction types and supplementary transaction types applicable to the EC registry system.

No changes of the Romanian national registry occurred compared to the description provided in the 2010 submission of the NIR.

2.2. Systematic observations

2.2.1. Measurements of meteorological parameters and instrumentation deployed

The main organization performing systematic observations on climate (and climate change) is the National Meteorological Administration (ANM); the observations are performed through the National Meteorological Network (structure within the ANM) designed for carrying out 176 measurements and observations, primary validations and data transfer. It is managed by 7 Regional Meteorological Centers and by 2006 comprised 160 operational weather stations, 89 of them being automatic weather stations (MAWS). Measurements and observations at 281 rain gauging stations are made on a voluntary basis. From the 160 weather stations, 120 are full-time operational and 40 are part-time operational. 55 weather

³⁰ <http://rnges.anpm.ro/>



stations perform a special agro-meteorological measurements program and radiometric measurements are performed at 8 stations.

The programme of meteorological upper-air measurements is carried out at the Aerologic Observatory of Bucharest, including two daily radio soundings (at 0000 and 1200 UTC) and at the aero-synoptic station in Cluj, including one daily radio sounding (at 0000 UTC). Daily wind soundings with PILOT balloon at 0600 UTC are also carried out at these two stations.

ANM participates in the international meteorological data exchange with a number of 23 stations in RBSN (Regional Basic Synoptic Network) and 14 stations in RBCN (Regional Basic Climatological Network).

In year 2003 the operational National Meteorological Integrated System (SIMIN) was established. Within this project the national radar network was finalized and modernized. In 2003 the national meteorological radar network became operational, exclusively composed of 7 modern Doppler equipments. The national radar network is one of the newest in Europe and it integrates three types of equipment produced by several companies (EEC, Gematronic and Metstar-Lockheed Martin). The radar information from all equipment is combined into a unique product – the national radar mosaic (available in 3 versions every 10 minutes). Given that most systems are placed very close to the Romanian borders, the radar information is also useful to the neighbouring countries.

Observations from meteorological satellites refer to receiving and primarily processing in real time digital images and data from geostationary satellites METEOSAT-7 and MASG-1 in 3, and 12 spectral channels, respectively. The operative running of EUMETSAT/SAFNWC model started in February 2005, obtaining 8 of the 12 now-casting products, every 15 minutes, which are transmitted to the National Forecasting Centre.

Data on the electrical activity in the atmosphere are provided by the national detection network SAFIR-3000 at 7 sites, which are also used in now-casting.

2.2.2. Oceanic observations

The “Grigore Antipa” National Institute of Marine Research (INCDM), established under the authority of the Ministry of Environment and Forests, is the institution responsible for oceanic observations of the Black Sea, including activities such as:

- integrated monitoring of marine and coastal environment (under the coordination of MMP);
- conservation of the marine ecosystem and the promotion of its sustainable use;
- protection and sustainable development of the marine living resources;
- protection and conservation of dolphins in the Romanian marine waters;
- monitoring the marine radioactivity and radiology.

All necessary data is available on the INCDM website: <http://www.rmri.ro/menu.ro.html>

2.2.3. Terrestrial observations

The National Research Institute for Earth Physics (INCDFP), currently under the coordination of the National Authority for Scientific Research of the Ministry of Education, Research, Youth and Sports, is responsible for terrestrial observations. Its activities include, among others:

a) Fundamental and applied research regarding:

- earthquake monitoring;
- seismic source physics;
- structure and dynamics of the lithosphere;
- seismic hazard assessment and prediction of earthquakes;
- seismology engineering.

b) Standards development in the following fields:



- seismic zoning (seismic hazard map for Romania);
- seismic zoning of densely populated areas (local seismic hazard maps).

All necessary data is available on the INCDFP website: <http://www.infp.ro/>

2.2.4. Air-quality monitoring

In accordance with the provisions of Law 265/2006 for the approval of GO 195/2005 on environmental protection, the environmental protection authorities are responsible for air quality monitoring in Romania. In this respect, the National Network for Air Quality Monitoring (RNMCA) has been created.

The monitored pollutants, measurement methods, limit values, alert and information thresholds, as well as the criteria for the location of monitoring points are established by national legislation on air protection and are in compliance with the requirements of European regulations.

Currently, RNMCA is doing continuous measurements of sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), ozone (O₃), particulates (PM₁₀ and PM_{2.5}), benzene (C₆H₆) and lead (Pb). Air quality in each monitoring station is represented by suggestive quality indicators, based on the measured values of key air pollutants concentrations.

Today in Romania there are 142 air quality monitoring stations with automatic equipment for measuring the key air pollutants concentrations. RNMCA includes 41 local centers that collect and send the data from the monitoring stations to the public information panels and after primary validation they send them for certification to the Bucharest National Reference Laboratory (LNR).



3. Reporting

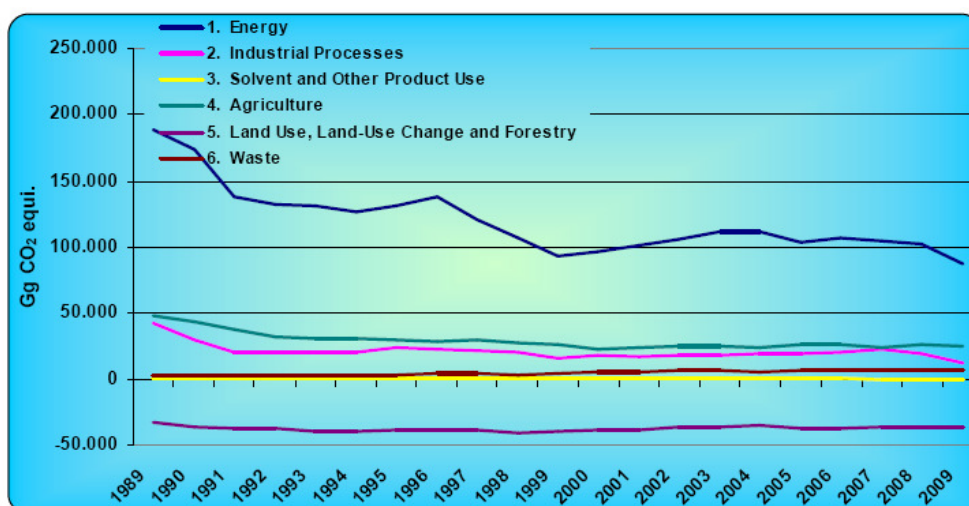
As a Party to the United Nations Framework Convention on Climate Change (UNFCCC), and its Kyoto Protocol, Romania is required to elaborate, regularly update and submit the National GHG Inventory (NGHGI).

The last Romanian inventory NIR-2011 covers all sectors and all gases in the period 1989-2009 and it is complete in terms of geographical coverage. Emissions are presented by sector, by sub-sector and by gas. Due to the lack of the activity data, there are still some gaps in the inventory, such as the estimation of emissions from asphalt roofing and road paving with asphalt, and the estimation of emissions/removals from Cropland, Grassland, Wetlands, Settlements and Other land within LULUCF.

3.1. GHG emissions per sector

The inventory covers all sectors according to the UNFCCC reporting guidelines on annual inventories (FCCC/SBSTA/2004/8): Energy, Industrial processes, Solvent and other product use, Agriculture, Land use, Land use change and Forestry (LULUCF) and Waste.

Fig. 3.1.1 presents the evolution of GHG emissions by each sector during the period 1989 – 2009. The GHG emissions are expressed in Gg CO₂ equivalent.



Source: ANPM, 2011

Figure 3.1.1. GHG emissions trends by sector [Gg CO₂ equivalent]

Energy represents the most important sector in Romania. The Energy sector accounted for 66.44% of the total national GHG emissions in 2009. The GHG emissions resulted from the Energy sector decreased with 53.87% compared with the base year.

Industrial Processes contributes to total GHG emissions with 9.05%. A significant decrease of GHG emissions was registered in this sector (72.32% decrease in 2009 compared to the level in 1989) due to the decline or the termination of certain production activities.

Solvent and Other Product Use the trend of emissions resulted from this sector follows the general trend: emissions have decreased seriously after 1989, then the emissions were relatively stable from 1992 to 2002; after 2002, emissions started to increase, due to the revitalization of the relevant economic activities (automobile manufacture, construction and buildings).

The GHG emissions level decreased in 2009 by 81.06% in comparison with the level recorded in 1989.

Agriculture GHG emissions have also decreased. The GHG emissions in 2009 are 47.78% lower in comparison with the 1989 emissions due to:



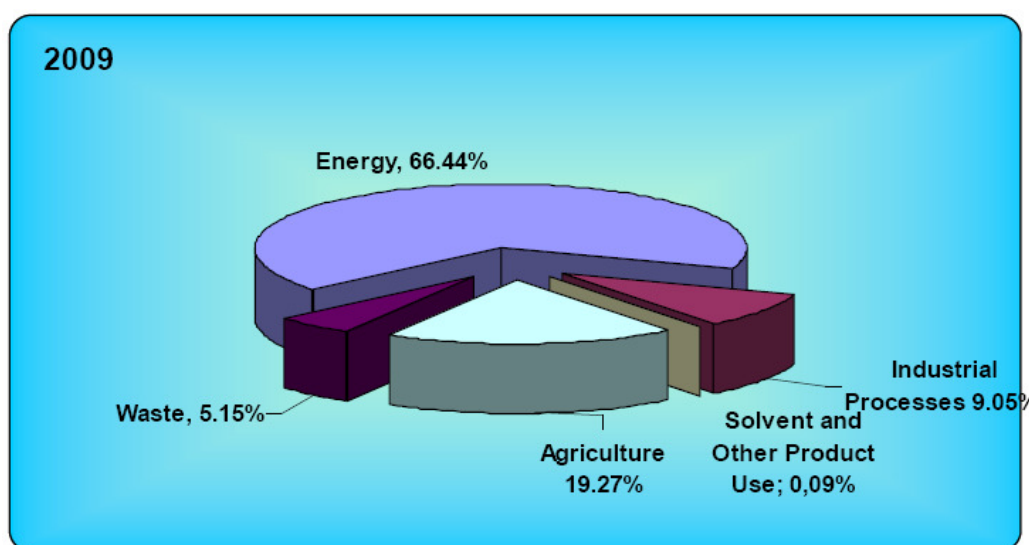
- the decline of livestock;
- the decrease of rice cultivated area;
- the decrease of crop productions level;
- the decline of N synthetic fertilizer applied amounts.

In 2009, 19.27% of the total GHG emissions resulted from the agriculture sector.

LULUCF The net GHG removals/emissions level is 12.64% higher in 2009 in comparison with the level in the base year. The Romanian land use sector acts as a net sink, at an average uptake of 37,428 Gg/year, being relatively stable over the last 21 years.

Waste sector emissions have increased in 2009 with 130.98% in comparison with the level in 1989. The contribution of the waste sector to the total GHG emissions in 2009 is 5.15%.

The participation of sectors to GHG emissions (excluding LULUCF) is presented in the Fig. 3.1.2.



Source: ANPM, 2011

Figure 3.1.2. Sectoral GHG emissions in 2009 (%)

3.2. GHG emissions per type

The direct GHGs (including groups of gases) included in the last national inventory are: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF₆). The report also contains data on calculations of emissions of the indirect GHGs: NO_x, NMVOC, CO and SO₂, which should be included according to the reporting guidelines.

All GHG emissions, except HFCs and SF₆, decreased comparing with the base year. The shares of GHG emissions have not significantly changed during the period. The largest contributor to total GHG emissions is CO₂, followed by CH₄ and N₂O. In the base year, the shares of GHG emissions were: 68.30% CO₂, 16.40% CH₄, 14.11% N₂O, 1.18% PFCs. In 2009, the shares of GHG emissions were: 65.65% CO₂, 20.04% CH₄, 13.93% N₂O, 0.37% PFCs. The F gases started to be used as substitutes for ODS in refrigerating and air conditioning systems since 1995. In 2009, the contribution of these gases to the total GHG emissions is negligible: 0.0192% HFCs and 0.00564% SF₆. Table 3.2.1 presents the trend of the aggregated emissions, split by gas.

| Year | CO ₂ emissions including net CO ₂ from LULUCF | CO ₂ emissions excluding net CO ₂ from LULUCF | CH ₄ emissions excluding CH ₄ from LULUCF | N ₂ O emissions excluding N ₂ O from LULUCF | HFCs | PFCs | SF ₆ |
|------|---|---|---|---|-------|----------|-----------------|
| 1989 | 160,849.62 | 193,282.78 | 46,421.14 | 39,938.90 | NO | 3,349.56 | NO |
| 1990 | 136,578.01 | 172,162.41 | 42,567.14 | 33,241.15 | NO | 2,115.83 | NO |
| 1991 | 95,512.13 | 132,554.26 | 37,320.19 | 28,173.93 | NO | 1,942.09 | NO |
| 1992 | 89,960.08 | 127,807.72 | 33,900.41 | 24,705.85 | NO | 1,352.13 | NO |
| 1993 | 88,133.04 | 127,265.37 | 32,180.19 | 25,036.93 | NO | 1,409.43 | NO |
| 1994 | 84,354.96 | 124,090.13 | 31,188.54 | 23,937.88 | NO | 1,490.97 | NO |
| 1995 | 84,354.96 | 124,090.13 | 31,188.54 | 23,937.88 | NO | 1,490.97 | NO |
| 1996 | 97,541.16 | 135,544.40 | 32,970.11 | 23,565.96 | 0.73 | 1,769.07 | 0.06 |
| 1997 | 82,711.20 | 121,101.07 | 29,280.71 | 23,694.57 | 1.22 | 1,788.82 | 0.02 |
| 1998 | 66,883.20 | 107,364.34 | 26,867.21 | 21,414.41 | 2.65 | 1,757.16 | 0.01 |
| 1999 | 52,474.67 | 91,683.45 | 26,116.54 | 21,120.27 | 2.84 | 1,608.37 | 0.05 |
| 2000 | 57,337.08 | 95,345.32 | 26,713.85 | 18,755.11 | 3.41 | 1,299.54 | 0.00 |
| 2001 | 61,326.85 | 100,336.59 | 26,523.44 | 19,926.55 | 3.53 | 1,054.32 | 0.00 |
| 2002 | 69,837.60 | 106,382.65 | 27,275.46 | 20,179.61 | 4.22 | 730.99 | 0.01 |
| 2003 | 75,273.68 | 111,449.31 | 28,253.58 | 21,027.76 | 6.41 | 471.95 | 17.83 |
| 2004 | 76,710.32 | 112,202.61 | 27,623.97 | 19,746.00 | 8.93 | 513.45 | 22.64 |
| 2005 | 68,719.11 | 105,900.73 | 27,771.07 | 21,440.57 | 6.62 | 569.64 | 49.56 |
| 2006 | 73,920.51 | 111,122.69 | 27,871.19 | 20,709.94 | 22.61 | 609.65 | 67.76 |
| 2007 | 73,753.54 | 109,875.35 | 26,901.42 | 18,736.49 | 17.66 | 625.58 | 58.39 |
| 2008 | 68,262.19 | 104,678.86 | 27,708.27 | 20,363.77 | 20.52 | 630.90 | 16.33 |
| 2009 | 49,348.21 | 85,884.04 | 26,213.17 | 18,220.49 | 25.12 | 478.08 | 7.38 |

Source: ANPM, 2011

Table 3.2.1. Trends by gas [Gg CO₂ equivalent]

The most significant anthropogenic greenhouse gas is CO₂. The decrease of CO₂ emissions (from 193,282.7811 Gg in 1989 to 85,884.04 Gg in 2009) 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 constructions sectors) as a consequence of activity decline.

The CH₄ emissions, related mainly to the Fugitive emissions from fossil fuels extraction and distribution and to the livestock, decreased in 2009 by 43.53% compared with the levels in 1989. The decrease of CH₄ emissions in Agriculture is due to the decrease of the livestock level.

The N₂O emissions are mainly generated within the Agricultural Soils activities in the Agriculture sector and within the Chemical industry activities in the Industrial Processes sector. The decline of these activities (decline of livestock, decline of N synthetic fertilizer applied on soils amounts, decrease of the crop productions level) is reflected in the N₂O emissions trend. The N₂O emissions in 2009 decreased with 54.38% in comparison with the level in the base year.

The F-gases (HFCs, PFCs, SF₆) started to be used as substitutes for ODS in refrigerating and air conditioning systems since 1995; therefore the emissions resulted as a consequence of the use of these substances and are estimated beginning with the same year. The PFCs emissions generated in the production of the primary aluminium are reported for the entire analyzed period (1989-2009) and have decreased with 85.73% in 2009 comparing with the level in 1989).



3.3. *Information publicly available*

The information based on the requirements in the annex to decision 13/CMP is publicly available on the Romanian registry website: <http://rnges.anpm.ro>.

As requested by the European Commission Regulation no. 2216/2004, Annex XVI, data publicly available (excluding confidential data) posted on the Romanian Registry site are the following:

- persons holding accounts: contact data;
- operators holding accounts: PAR/SAR contact data;
- national accounts administrator contact data;
- National Allocation Plan, and list with installations accessing the New-Entry Reserve;
- Number of units (ERUs, CERs and AAUs) cancelled and retired;
- Operators verified emissions for 2008.



4. Verification

4.1. Methods for QA/QC analyses

The QA/QC Programme and the QA/QC Procedure comprise information on:

- the national authority responsible for the coordination of QA/QC activities;
- the objectives envisaged within the QA/QC framework;
- the QA/QC Plan;
- the QC procedures;
- the QA procedures.

According to the provisions of GD no. 1570/2007 establishing the national system and to those of the ANPM's President Decision no. 24/2009, ANPM represents the competent authority responsible with the implementation of the QA/QC activities under the NGHGI. For this purpose, ANPM is in charge with the following activities:

- ensures that specific QA/QC objectives are established;
- develops and regularly updates a QA/QC plan;
- implements the QA/QC procedures.

Considering the provisions of relevant regulations, ANPM designated a QA/QC coordinator.

The overall objective of the QA/QC programme is to develop the NGHGI in line with the requirements of the IPCC 1996, IPCC GPG 2000 and IPCC GPG 2003 and with the provisions of the Decision 280/2004/EC of the European Parliament and of the Council and Decision 166/2005/EC of the European Commission.

Romania's QA/QC plan closely follows the definitions, guidelines and processes presented in Chapter 8 – Quality Assurance and Quality Control of the IPCC GPG 2000. The QA/QC plan constitutes the heart of the QA/QC procedures. It outlines the current and planned QA/QC activities. The specific QA/QC activities are performed during all stages of the inventory preparation.

The QA/QC plan is reviewed periodically, if needed, and can be modified as appropriate when changes in processes occur or based on the advice from independent reviewers.

QC activities

The following QC activities are conducted annually before and during the preparation of estimates (15 September - 30 October):

- checking the specific requirements regarding the reporting deadlines;
- verification of the collection of data against the information needed;
- checking the correct transcription of input data from the format they were provided into the calculation sheets;
- checking the correctness of conversion factors to be used in calculation;
- checking the data structures integrity and the disaggregation of activity data at calculation sheets level;
- checking the concordance between the measurement units of data in the calculation sheets and the equivalent data in the CRF Reporter format;
- checking the consistency and the data values magnitude order used in the AD and EF series, at the calculation sheets level;
- identifying parameters common to multiple source or sink categories and checking the values consistency between source or sink categories;
- checking the emissions/removals calculation into the calculation sheets by reproducing a representative sample calculation;



- checking the correctness of the aggregation of estimated emissions/removals at the calculation sheets level.

The following QC activities are conducted annually during and after the preparation of estimates (15 October -10 January-10 March):

- checking the emissions/removals estimates existence for all sources and sinks and for the entire time series;
- checking the explanations existence when the emissions/removals estimates are lacking;
- checking the correctness and consistency of choosing the AD, EF and methods used along the entire time series;
- checking the trends for identifying the outliers and re-analyze the values;
- checking the correctness of recalculations and the existence of explanations;
- checking the recording and archiving of AD, EF and methods used;
- checking the correctness and the completeness of the data transcription from the calculation sheets level to the CRF Reporter level;
- checking the correctness and the completeness of the data transcription from the CRF Reporter level to the CRF tables level;
- checking the data used in the NIR against the CRF tables and calculation sheets;
- checking the correctness of applied methods descriptions, at the NIR's level;
- checking the references completeness at the NIR's level;
- checking the archiving of the CRF tables, NIR, CRF Reporter's specific databases and the calculation sheets;
- checking the key categories persistency along the time series;
- checking the adequate qualification of individuals providing expert judgments on the uncertainty estimates and the archiving of documentation regarding the qualification and the expert judgments;
- checking the uncertainty calculation correctness by partially replying the Monte Carlo analysis;
- verification of the ERT recommendations implementation;
- checking the completeness of the QA/QC documentation archiving: QA/QC programme, checklists, ERT report, improvements lists;
- checking the QA/QC programme performance and propose improvements.

The results of all checks outlined above are documented in the annual QC checklists for inventory preparation. For this purpose QC checklists are used consistently throughout the years by all experts involved in the inventory preparation.

QA activities

By becoming an European Union Member State from the 1st of January 2007, Romania is obliged to prepare and submit the NGHGI according to the Decision 280/2004/EC of the European Parliament and of the Council and Decision 166/2005/EC of the European Commission, which provides for a QA activity after the first submission of data on 15th of January and a final QA for all 27 EU Member States during first half of March, for the preparation of the EC inventory. In this respect, starting with 2007, Romania has the possibility to verify the inventory twice before the official submission to the UNFCCC Secretariat.

In order to get an objective assessment of the inventory quality and for identifying areas where improvements can be made, ANPM involve third party reviewers at the QA activities level according to the provisions in IPCC-GPG, depending on the availability of resources. In this scope, ANPM is developing the specific procedural arrangements. MMP through its international contacts and bilateral agreements supports ANPM in identifying the available processes for ensuring the implementation of QA activities.

Until now, ANPM was the beneficiary of technical support provided by the Austrian Environment Agency (as part of the twinning project RO/2006/IB/EN/09). One of the most important activity performed within this framework was the review of different sectors of the NGHGI. Austrian experts provided specific recommendations comprising:



- improvement of transparency at sectorial level considering the trend and recalculations description;
- improvement of transparency at sectorial level by providing a cumulative table on the status of emissions/removals estimation for every sub-sector;
- improvement on knowledge on practical ways of performing and documenting the QA/QC activities;
- improvement of the NGHGI archiving structure.

Until first half of 2011, NGHGI team is the beneficiary of a Netherlands Government to Government (G2G) project. One of its main aims is to develop the reporting capacity of the NGHGI team also by assessing the possibility to use higher tier methods. Specific activities comprised:

- advices on improving the GHG Inventory sectorial data documentation (through the use of the documentation list);
- training courses/presentations on use of data specific to other reporting mechanisms at the GHG Inventory level:
 - use of ETS data;
 - use of COPERT model.
- discussions/advices on methodological issues (data collection, emissions estimation) on GHG emissions recovery within the Industrial Processes and Waste activities;
- advices on moving to higher Tier levels in the Energy Sector:
 - calculation of specific emission factors;
 - use of COPERT model in estimating the Road Transport emissions.
- advices on using national data for the calculation of natural gas transit fugitive emissions;
- advices on moving on Tier 2 at the Enteric Fermentation, Manure Management and Agricultural Soils levels:
 - precise identification of activity data needs;
 - workshop on elaborating the specific requirements for a emission factors/other parameters study development;
 - other relevant advices.
- advices on moving on First Order Decay method at the Solid Waste Disposal Sites level;
- other advices relevant to the Waste Sector;
- identification of the practical ways to complete the estimation of emissions/removals specific to Kyoto Protocol's Art. 3.3 and 3.4 activities: afforestation/reforestation/deforestation, forest management and re-vegetation.

National inventory submissions to the UNFCCC Secretariat are subject to the review procedures defined in the relevant COP/MOP decisions.

All recalculations planned and done (including those following the UNFCCC ERT review) are mentioned in the improvements lists.

The results of QA checks (excepting those of checks performed by ERT) are documented in the annual QA checklists for inventory preparation. For this purpose, QA checklists are used consistently throughout the years by all inventory experts involved in the inventory compilation.

4.2. *Data verification indices*

Verification activities are done separately for each sector. Several verification activities are performed by the NGHGI team, as follows:

- Industrial Processes - comparison of data sets used with data provided by the Ministry of Economy/INS;
- Agriculture - comparison of data sets used with relevant data on FAO/Eurostat;
- Waste - comparison of data sets used with Eurostat data.



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Acronyms and abbreviations

| | |
|-----------------|---|
| AAU | - Assigned Amount Unit |
| ANM | - National Meteorological Administration |
| ANOFM | - National Agency for Employment |
| ANPM (aka NEPA) | - National Environmental Protection Agency |
| ARIS | - Romanian Agency for Foreign Investments |
| CER | - Certified Emission Reduction |
| CNP | - Romanian National Commission for Forecasts |
| EPA | - Environmental Protection Agency |
| ERU | - Emission Reduction Unit |
| EU-ETS | - European Union-Emission Trading Scheme |
| FAO | - Food and Agriculture Organization |
| GD | - Government Decision |
| GHG | - Greenhouse gas |
| GNI | - Gross national income |
| GO | - Government Ordinance |
| GVA | - Gross value added |
| INCDM | - “Grigore Antipa” National Institute for Marine Research and Development |
| HDI | - Human Development Index |
| INS (aka NIS) | - National Institute for Statistics |
| IPCC | - Inter-governmental Panel on Climate Change |
| JI | - Joint Implementation |
| LULUCF | - Land use, land-use change, forestry |
| MADR | - Ministry of Agriculture and Rural Development |
| MMP | - Ministry of Environment and Forests |
| NCCC | - National Commission on Climate Change |
| NGHGI | - National GHG Inventory |
| NIR | - National Inventory Report |
| ODS | - Ozone depleting substances |
| PAR | - Primary Authorized Representative |
| QA | - Quality assurance |
| QC | - Quality control |
| RNMCA | - National Network for Air Quality Monitoring |
| SAR | - Secondary Authorized Representative |
| Toe | - Tonne oil equivalent |
| UNDP | - United Nations Development Programme |

