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## Component A1 Stocktaking Report

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## ABBREVIATIONS AND ACRONYMS

ARD	Agriculture and Rural Development
BCM	Billion Cubic Meters
CC	Climate Change
CIAP	Inter-Institutional Committee for the Partnership Agreement
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> eq	Carbon Dioxide equivalent
DH	District Heating
EEA	European Environment Agency
EUR	Euro currency
ESCO	Energy Service Company
ETS	Emission Trading Scheme
EU	European Union
ESIF	European Structural and Investment Funds
FMP	Forest Management Plan
FWG	Functional Working Groups
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GoR	Government of Romania
IB	International Body
ICAS	National Forest Research Institute
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
KM	Kilometer
KP	Kyoto Protocol
LULUCF	Land use, Land use change and Forestry
MA	Managing Authority
MARD	Ministry of Agriculture and Rural Development
MECC	Ministry of Environment and Climate Change
MFF	Multi-annual Financial Framework

MoE	Ministry of Economy
MRDPA	Ministry of Regional Development and Public Administration
MT	Ministry of Transport
MW	Megawatt
NAER	National Authority for Energy Regulation
NCCC	National Commission on Climate Change
NRDP	National Rural Development Programme
OP	Operational Program
PA	Partnership Agreement
PASC	Partnership Agreement Steering Committee
PNACC	National Climate Change Adaptation Plan (PNACC)
RAS	Reimbursable Advisory Services
SFM	Sustainable Forest Management
TA	Technical Assistance
TO	Thematic Objective
UNFCC	United Nations Framework Convention on Climate Change

## 1. Introduction

This Report has been prepared by the World Bank for the Government of Romania as an output of the World Bank Advisory Services program on climate change and low-carbon green growth in Romania.

In order to meet the requirements of the EU Multiannual Financing Framework, the Government of Romania has to prepare their 2014-2020 Operational Programs incorporating climate actions and demonstrating that at least 20 percent of the spending goes to climate actions, with a goal of achieving the EU's 20-20-20 targets and addressing the CC challenges and opportunities by laying the foundation for the shift towards a low-carbon economy across all sectors.

To do this, the Government of Romania (GoR) needs to put forward a comprehensive climate change strategy and an action plan with enough details to implement it, develop a strong knowledge base and analytic capacity to assess the cost-effectiveness both the policy and investment options, put mitigation and adaptation activities into action, and build institutional capacity to implement and support it.

To complement the efforts of the EU and other multilateral agencies, and in response to the request of the GoR for analytical and advisory assistance, the World Bank has developed, in conjunction with the Romanian Ministry of Environment and Climate Change, a Reimbursable Advisory Service (RAS) Program. The RAS program focuses on operationalizing its national climate change strategy and action plan, identifying and integrating climate-related actions in new operational programs, building a solid analytical base for impact assessment and climate-related decision making, and enhancing climate-friendly practices and monitoring systems via the following four components:

- Component A: Develop and operationalize a climate change strategy and action plan;
- Component B: Identify and integrate climate actions into the 2014-2020 sectoral Operational Programs;
- Component C: Build a strong and sustainable analytic capacity and suitable knowledge base for in-depth sectoral and macroeconomic analysis of climate change mitigation and adaptation measures; and
- Component D: Support Government institutions in implementing, monitoring, and evaluating climate actions including carbon trading.

To integrate climate actions into new Operational Programs, in the summer of 2013 the Government asked the World Bank to carry out its advisory service and provide climate-related recommendations for consideration in the 2014-2020 EU operational programming period.

In response to the request, the World Bank quickly mobilized a team of sectoral and climate change specialists and conducted rapid assessments in six sectors—energy, transport, urban, water, agriculture, and forestry, which were pre-identified by both the Government of Romania and the World Bank as areas significant to emission mitigation and/or adaptation to climate change. The objective of rapid assessments was to quickly evaluate climate risks and identify climate-change-related investment priorities and necessary implementation support for the 2014-2020 Operational Programs. These rapid assessments were carried out in July-October 2013 and produced six sector reports.

This document is the stocktaking report of component A1. It provides an introductory cover to the literature on CC, baseline for Romania, institutional review of Romania and key EU requirements, as well as available data sets that were identified in the given short-time span. Due to the limited time, the report has drawn on available documents and data sets and it relied mainly on desk-based research and review. It is a quick compilation of the main documents that have been used in the complementary reports and rapid assessments conducted so far. Its purpose is to support the Government as a first stock of key climate and green growth issues for Romania and summarize the current situation.

This document is a living document and it could be subject to further improvement while the overall program progresses. The report might benefit from further improvements as component A and component C outputs are developed, while additional relevant literature might be included in the bibliography as new official documents regarding EU and Romanian legislation are released.

The report is structured as follows: After the introductory section, Section 2 provides the sectoral summary on the country background and characteristics. Section 3 provides the baseline for the climate change and green growth challenges in Romania. Relevant climate dimensions of Europe 2020 and existing EU regulations and policies related to climate change are summarized in Section 4. Section 5 provides an overview of national strategies, regulatory framework and organizational setup for addressing climate change in Romania. Background information on the Romania 2014-2020 ESIF programming and climate change related aspects in the forthcoming ESIF programming report are covered in section 6. Finally, section 7 of the report provides a climate change relevant bibliography for Romania that may serve as a tool for referring to key literature in the field.

## 2. Romania macroeconomic situation and outlook

In the last 20 years, Romania has made considerable progress developing institutions compatible with a market economy. Between 1990 and 2000 Romania's growth stagnated, but following EU accession negotiations in February 2000 growth began to take off and accelerated in 2005 (above 6%) as Romania approached EU membership. Romanian's golden growth years were achieved between 2005 and 2008, as the country moved from having 12% to 25% of the EU average income per capita and FDI increased.

Joining the European Union (EU) in 2007 was a driving force for reform and modernization. The 2008 crisis hit Romania hard and thus growth went from an average of 7% to minus 7%. However, the country made a quick recovery thanks to prudent macroeconomic management. The crisis prompted long-needed reforms, with support from the international financial institutions, in health, education, the financial sector, public financial management, public administration, social insurance, and social assistance. Some of these reforms address short-term responses to the crisis, while others are anchored in a longer-term strategy.

While the implementation of a bold package of macro-stabilization and structural measures - supported by a multilateral program with the World Bank, International Monetary Fund (IMF), and the European Commission (EC) - helped lead the country toward growth in 2011, a series of factors has left Romania vulnerable to exogenous shocks and growth was around zero in 2012.

Challenges to accelerate growth in the country include uncertainty in the Eurozone and exports markets, political developments in the context of local and parliamentary elections, and absorption of EU funds. In the medium term, the key challenge for Romania is to achieve steady economic growth and improve living standards while meeting fiscal targets, and to continue structural reforms and the modernization of the public administration.

Sustainable long-term growth entails that Romania adopt measures that assure compliance with fiscal targets while clearing arrears and improving quality of spending and strengthening tax collections; progress on the structural reform agenda with a focus on energy and transport sectors; and ensure continued financial-sector stability. The National Bank of Romania (NBR) and the government took strong measures to safeguard the stability of financial markets, and banks weathered the stress well. Since the international financial support package, the exchange rate has remained broadly stable.

Romania's energy sector is dominated by state-owned enterprises (SOEs), which the government has initiated measures to improve, as well as to enhance competition, and attract private capital needed to boost competitiveness in the sector.

Access to health care in Romania is skewed towards the wealthy. Almost half of the poor do not seek care when needed, and of the public funds allocated for health care, much is wasted on inefficient and unnecessary services or treatments. The current health system is heavily biased towards costly inpatient hospital care. The government's health reforms promote cost-effective outpatient and primary care services, introduce co-payments, rationalize hospital infrastructure, regulate the introduction of new drugs and technologies, and review the basic benefit package reimbursed by the public health insurance system.

One of Romania's key priorities continues to be upgrading the skills of its population to meet Europe 2020 targets and bring the level of achievement of Romanian children in key subjects to current levels found in most European countries. A National Education Law in force since early 2011 promotes changes in virtually all areas of education.

Romania's poverty rate declined between 2000-2008, from 36% in 2000 to 5.7% in 2008. In 2009, poverty declined further to 4.4%, due to increased social protection and insurance spending. However, despite large strides, the poverty rate in Romania is still among the highest in the EU.

Once considered a breadbasket for Europe, agriculture plays an important role in Romania however the sector is underdeveloped. Despite the highest proportion of rural population in the EU (45%), Romania has the highest incidence of rural poverty (over 70%), and one of the largest gaps in living and social standards between rural and urban areas. Romania imports an increasing proportion of its food needs, even though almost 30% of employment is in agriculture.

Romania has not yet taken advantage of EU Structural Funds for Environmental Protection and Climate Change. However, Romania is committed to achieving the EU's 20-20-20 climate and renewable energy targets, which are designed to reduce carbon dioxide emissions by 20%, increase the renewable energy share of the energy mix to 20%, and improve energy efficiency by 20%, all by 2020. To do so the country needs to prepare a comprehensive program for funding climate change and green growth under the next programming period for EU financing (2014-20), among many other things.

Successfully accessing EU financing mechanisms under the climate change umbrella will enable Romania a shift towards a low-carbon economy and will promote climate change adaptation, risk prevention and management. Moreover, this will help integrate climate change goals with other economic and social goals and will enable a balanced development in all regions and the modernization of transport infrastructure and environment, ensure a sustainable rural development, will create new opportunities for employment, especially in rural areas, promoting social policies which will lead to standards of life quality. This ultimately leads to improvement in quality of life; promotes research, technology development and innovation, and encourages the use of large-scale business means of communication and information technology.

### 3. Sector Background, Characteristics and Climate Change Challenges

Global warming has become a key issue on the international agenda in the past decades. The average global temperature has continuously risen, despite global efforts to tackle this trend. The rise in greenhouse gas (GHG) emissions caused by human activities has been a major contributor to the increased warming with threatening impact on the earth's climate patterns, human lives and economic development. Regional and local climate change influences ecosystems and leads to extreme weather events such as droughts, floods or other natural calamities. Rising temperatures lead to increased risk of damages and thus there is an increased urgency to address this issue; efforts must be orchestrated at all levels - local, regional and international.

Changes in climate patterns—including an increase in temperature, changes in precipitation, and decreases in ice and snow—have led to a wide range of observable effects such as (i) biodiversity loss: the survival of certain species will be threatened or become extinct because of disappearing habitat, changing ecosystems, and acidifying oceans; (ii) rising seas: resulting from melting glaciers and the thermal expansion of oceans, both of which increases the risk of flooding; (iii) extreme weather: more frequent extreme weather events causing heat waves, surges in wildfires, increased flooding and drought, more severe hurricanes; and (iv) human health threats: the spread of disease and decrease in air quality as well as possible death arising from devastating heat waves<sup>1</sup>.

The World Bank Report, “Turning down the Heat” (World Bank 2012), explains that there is a 20% probability of increased global warming by 4°C by 2060, and an 80% chance of it by 2100. In spite of the international community's efforts to hold warming below 2°C, it is expected that a greater than 3°C warming will occur. This is significantly above the preindustrial level of 0.8 °C.<sup>2</sup>

Europe has also been affected by climate change effects, experiencing overall rise in sea levels in most coastal areas; changes to freshwater systems such as a decrease in river flows in the south and east; increase in reported flood events and in the frequency and intensity of droughts, especially in southern Europe; changes to terrestrial biodiversity and ecosystems; reduction in forest growth due to storms, pests and diseases, a reduced demand for heating and an increased demand for cooling due to the rise in temperature, and effects on human health. Moreover, the average temperature over land in Europe was 1.3°C above pre-industrial levels, making it the warmest decade on record<sup>3</sup>.

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<sup>1</sup> <http://www.edf.org/climate/climate-change-impacts>

<sup>2</sup> World Bank, (2012), “Turn down the heat. Why 4 degrees warmer world must be avoided. A Report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics” November 2012

<sup>3</sup> European Environment Agency, (2013), [Global and European temperature \(CSI 012/CLIM 001/CLIM 003\) - Assessment published Aug 2013](http://www.eea.europa.eu/data-and-maps/indicators/global-and-european-temperature/global-and-european-temperature-assessment-6), <http://www.eea.europa.eu/data-and-maps/indicators/global-and-european-temperature/global-and-european-temperature-assessment-6>

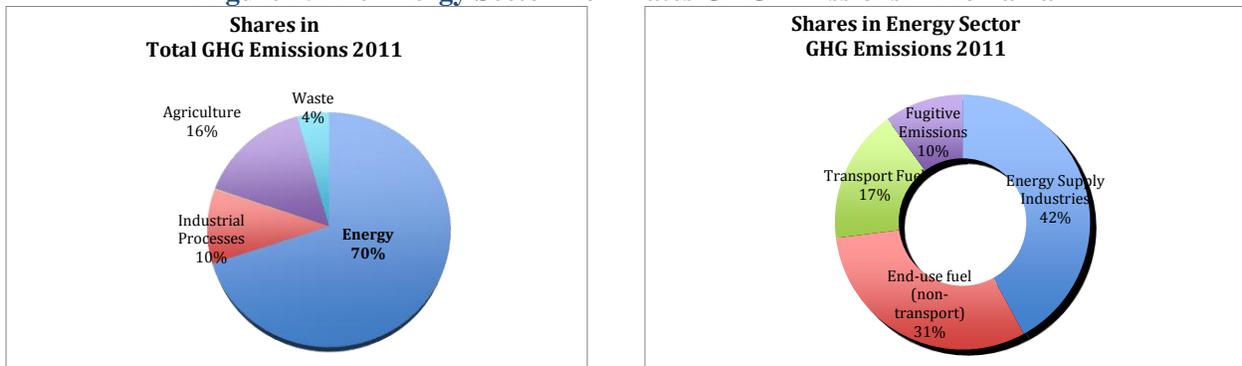
In Romania the effects of climate change are clearly observable; 2007 was the warmest year in two decades (average temperature 11.5° C), while the coldest average temperature (8.4°C)<sup>4</sup> happened in 1985. In 2005, Romania suffered historic floods which caused 76 deaths and significant property damage, and 2007 brought the country’s most severe drought in the last 60 years<sup>5</sup>. The effects of these extreme weather events adversely affected the country through significant economic loss in agriculture transport, energy supply, and water management.

Total CO<sub>2</sub> emissions for Romania were 78 million tons in 2009, accounting for 2 percent of the total EU emissions. Romania has the lowest energy consumption per capita in the EU, but one of the highest energy intensities<sup>6</sup>. The low rate of energy consumption stems from a slowdown period in the GDP and also from the shutting down of many large, inefficient energy- intensive industries which were the main contributor to the nation’s economy during the country’s period of centralized economy. Despite the low energy consumption, Romania continues to lag behind in energy conservation and efficiency, which has resulted in the country having one of the highest energy intensities in Europe.

### 3.1 Energy

In Romania, the energy sector is responsible for 70% of total greenhouse gas (GHG) emissions (excluding LULUCF<sup>7</sup>). Power and heat generation and non-transport fuel use contribute three quarters of energy sector GHG emissions (Figure 1). The de-carbonization of the energy sector, through low-carbon power and heat supply options and by improving efficiency in energy conversion, transmission, distribution and consumption, is essential to the success of climate change mitigation in Romania.

**Figure 1: The Energy Sector Dominates GHG Emissions in Romania**



Source: MECC 2013

<sup>4</sup> 5th National Communication of Romania, (2010), Ministry of Environment and Forests, Bucharest

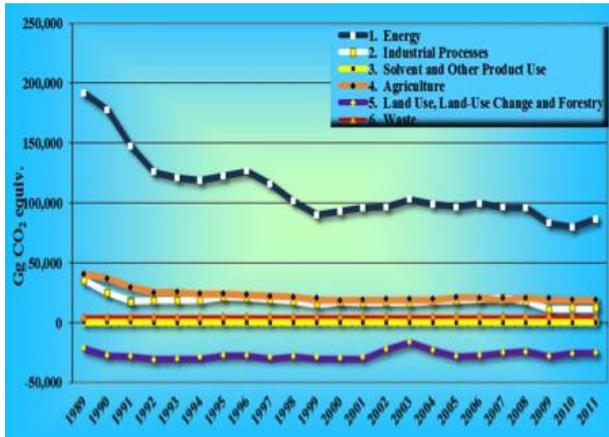
<sup>5</sup> Ibid

<sup>6</sup> International Energy Agency (IEA Statistics © OECD/IEA, <http://www.iea.org/stats/index.asp>), Energy Statistics and Balances of Non-OECD Countries.

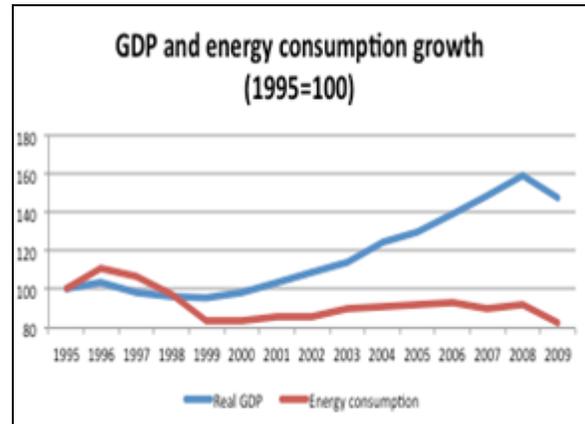
<sup>7</sup> LULUCF has been a net sink of GHG in Romania since the record keeping began in 1989 (Figure 2).

From 1989 to 2011 total GHG emissions in Romania have been reduced by almost half (Figure 2). Most of this decline is due to drastic reduction of industrial activities in the new free market context and structural changes in the economy. Energy consumption and GDP growth have decoupled since the late 1990s (Figure 3). Further mitigation opportunities stem from energy efficiency improvements.

**Figure 2: Romania: GHG emission trends, 1989-2011** **Figure 3: Decoupling of energy and GDP growth**



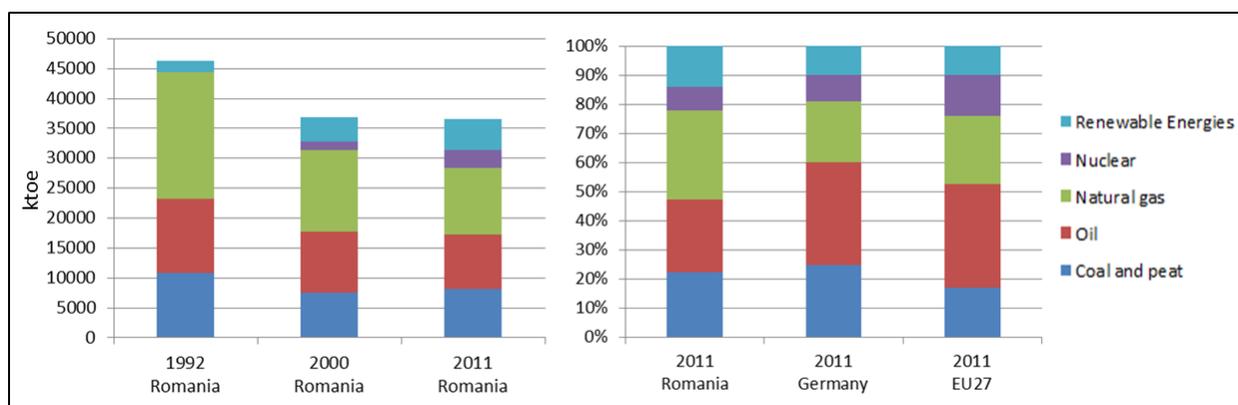
Source: MECC 2013



Source: Eurostat

After declining significantly in the 1990s Romania’s primary energy consumption remained flat in the 2000s and was 36.35 Mtoe in 2011. Romania has decreased its production of dwindling domestic oil and gas resources and increased its reliance on non-GHG emitting energy sources – nuclear, hydro and biomass. Domestic lignite continues to play a large role, particularly in power and heat production (Figure 4). It is notable that biomass (included in renewable energies) accounts for about 10 percent of Romania’s primary energy and an even higher share in end use due to a large rural population relying primarily on biomass for space heating. A significant number of the rural population relies on the use of ceramic stoves and heaters, warming the interior space through radiant heating, by capturing the heat from periodic burning of wood and then radiating the heat at a fairly constant temperature for a long period. Total biomass consumption increased by nearly 30 percent from 2000 to 2011. Even though biomass is renewable and is more climate-friendly as compared to non-renewable energy, its use for space heating also involves some environmental costs and short-lived climate pollutants.

**Figure 4: Romania: primary energy consumption by fuel, and compared with Germany and EU27**



Source: Eurostat

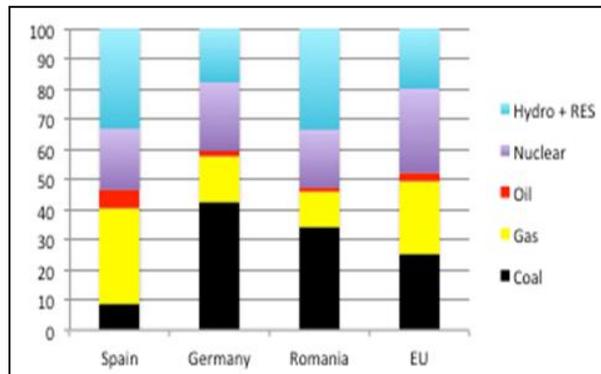
Space heating energy demand will be determined by the pace and depth of thermal retrofit, efficiency of DH systems, pace of tariff reform for heat and gas, and potential rise in thermal comfort level. Thermal retrofit of residential buildings is a huge challenge both financially, and implementation-wise. Only about 1 percent of the 150 million m<sup>2</sup> or so apartment buildings determined in need of thermal retrofit had been retrofitted as of 2012. Despite very high capital subsidies (up to 80 percent) provided by the national and local governments, many low income households remain reluctant to participate. At about EUR80/m<sup>2</sup>, the total investments for retrofitting the entire stock amounts to EUR 12 billion. Turning this huge cost into a big economic opportunity is perhaps the most challenging energy efficiency agenda in Romania.

District Heating systems are a prominent feature of many Romanian cities, but their use is declining. The 300 systems operating in 1995/96 had declined to 100 by 2011, of which 83 are in urban areas. The customer base of these systems has declined over time from 2.2 million apartments in 1990 to 1.4 million by 2012. In 16 of the 31 district heating systems with more than 10,000 customers, the number of customers has declined by more than 50%. In many cities, district heating has become a serious drain on public finances because tariffs for residential consumers are highly subsidized, on average about 50%.

Service quality, cost, and concern over high pollution levels are among the primary reasons for declining demand. Most of the old inefficient cogeneration units and heat-only boilers have still not been upgraded or replaced with modern generation equipment, nor are they equipped with adequate burning equipment, resulting in SO<sub>2</sub> and NO<sub>x</sub> emissions that exceed the EU norms. With an average of 275 tons of CO<sub>2</sub> per Gcal, Romania's district heating producers rank among the most polluting service suppliers in the EU. Heat distribution networks suffer an average of 30% heat and water losses, compared to 5-10% for newer networks. As a result of those inefficiencies, the cost of district heating is about 18-20% higher than in some other EU countries.

Total electricity generation increased by 1.6 percent annually from 51.93 TWh in 2000 to 62.22 TWh in 2011. This compares with a GDP growth rate of 4 percent per annum in the same period. Although coal-fired thermal plants still provide about one third of electricity supply, the share of low-carbon power generation (hydro, wind, solar and nuclear) is increasing and higher than EU average. The share of coal-fired power generation is also higher than EU average (Fig 5).

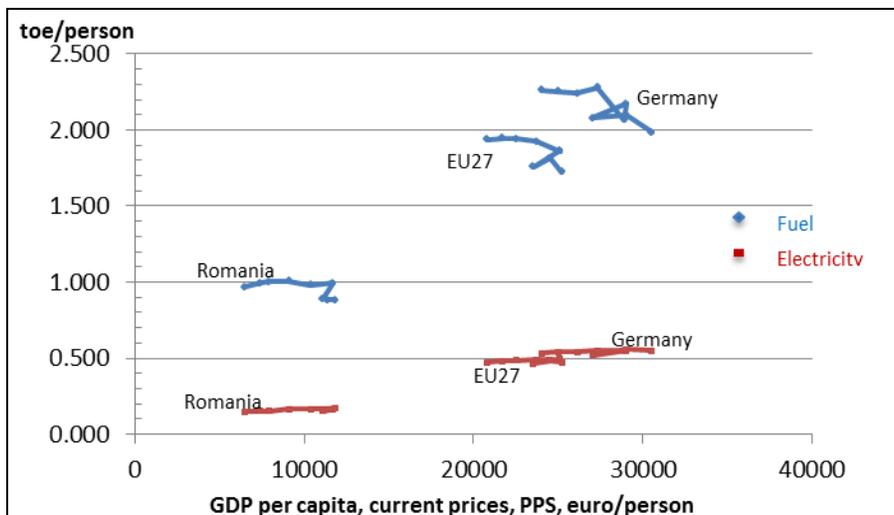
**Figure 5: Romania: electricity generation mix by fuel, 2011, compared with Spain, Germany and EU**



Source: Eurostat

Among EU27 countries, Romania has the lowest per-capita energy consumption (Figure 6) – a disadvantage which can be turned into an advantage in view of decarbonizing energy. Per capita fuel and electricity consumptions in 2011 were 51 and 47 percent of the EU27 average, respectively. Even with continued improvement in energy efficiency, energy demand is likely to grow significantly as Romania catches up with the high-income countries.

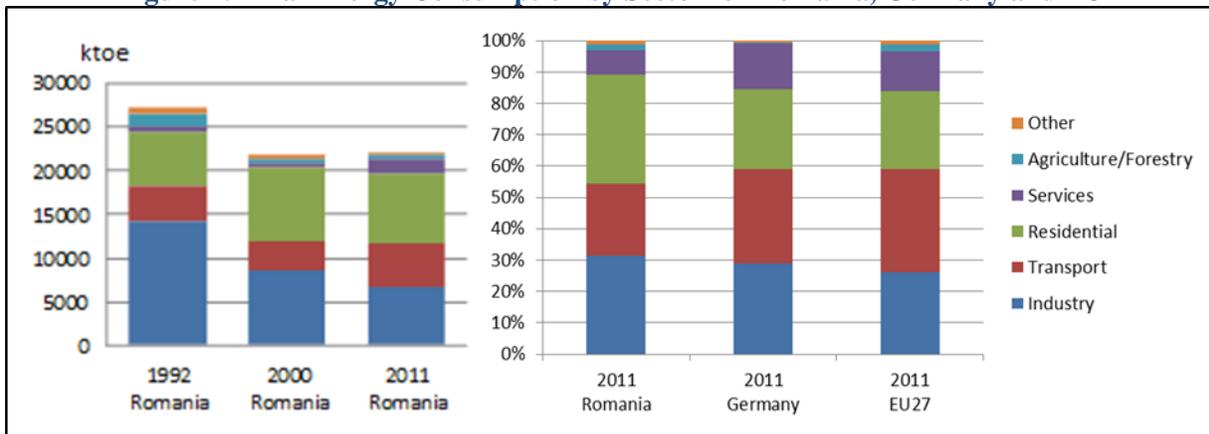
**Figure 6: Romania consumes significantly less energy per capita than high-income EU countries: Per capita final fuel and electricity consumption vs. per capita GDP in PPP, 2003-2011**



Source: Eurostat

Final energy consumption remained flat during 2000-2011 (Figure 7). A decline in final fuel consumption was offset by increased demand for electricity. Consumption reduction in the industrial and residential sector was offset by demand growth in transport and services. Industrial energy consumption decreased by 21% during this period. Household energy consumption also declined by 6% during 2000-2011 in large part due to an 57% drop in consumption of district heat, a reflection of the general and dramatic decline of district heating services in urban areas. Energy demand of the services sector surged by 2.6 times from 2000 to 2011, albeit from a relatively small basis. Transport energy demand also grew by 25 percent during the same period. Final energy consumption patterns in Romania are expected to converge toward those of the largest EU economies in the long-term, indicating significant increases in quantity and share of energy for the transportation and services sectors.

**Figure 7: Final Energy Consumption by Sector for Romania, Germany and EU27**

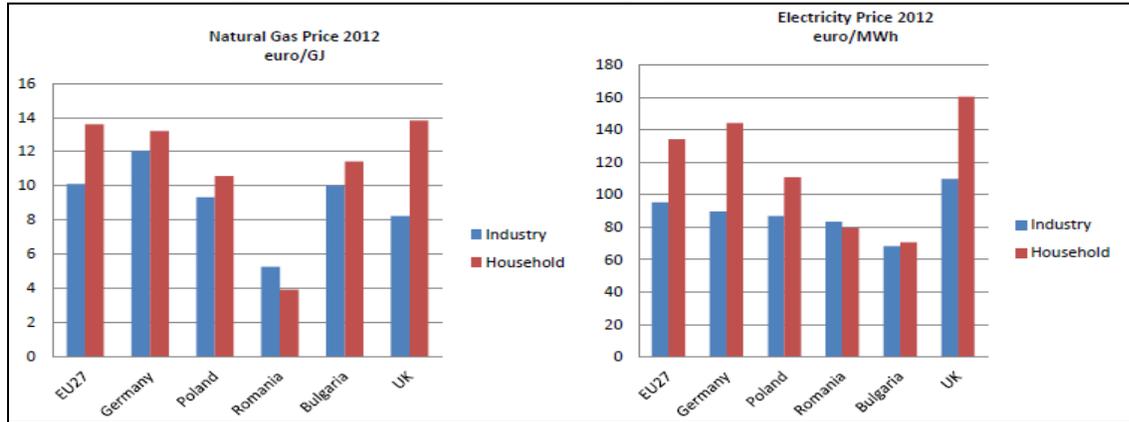


Source: Eurostat

Both electricity and natural gas prices are below EU averages (Figure 8). Electricity prices are largely recovering costs (with the exception of nuclear and hydro prices for regulated consumers who are subsidized). Natural gas prices are the lowest of any EU country due to regulatory distortions. Under legislation passed in 2012 and 2013,<sup>8</sup> regulated electricity and gas prices for non-households will be fully liberalized by January 2014 and January 2015, respectively, and regulated electricity and gas prices for households will be liberalized by January 2018 and January 2019, respectively. No definite timeline has been given to removing district heat subsidies.

<sup>8</sup> For electricity, article 22 (8) of the Law No. 123/2012, and for natural gases, GD No. 22/2013.

**Figure 8: Electricity and natural gas prices, Romania and EU, 2012**

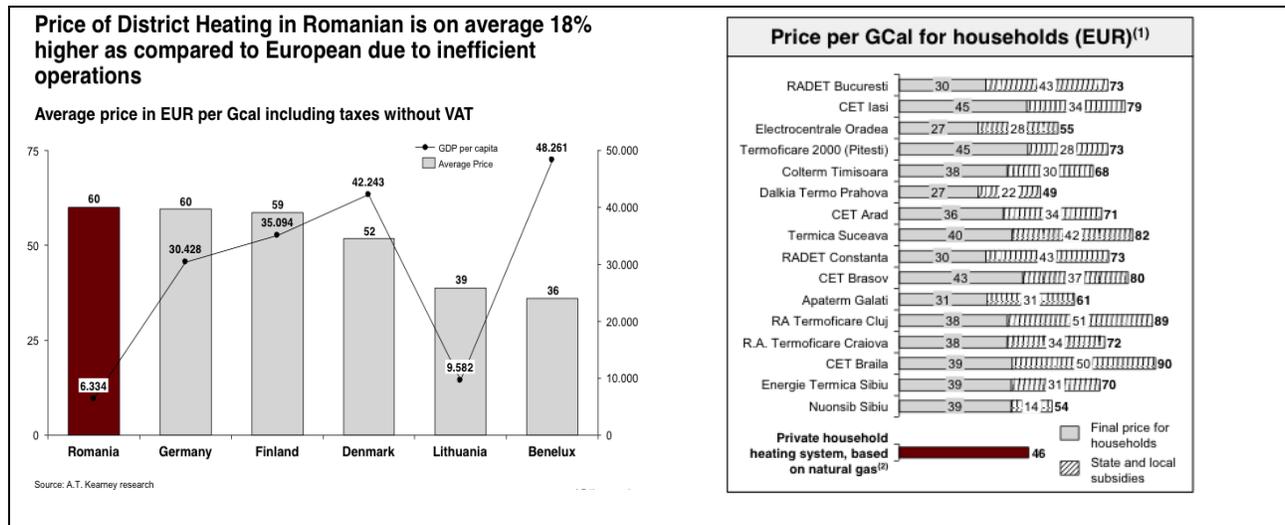


Source: Eurostat

The supply cost of district heating (DH) is among the highest in the EU due to inefficient production and high network losses. But tariffs for residential consumers are highly subsidized, on average about 50% (Figure 9). Low gas tariffs for residential consumers and dissatisfaction with DH services have caused many consumers to disconnect from DH. Since 1990 the number of households connected to DH, mostly in multi-apartment buildings, went down by about 0.8 million to 1.4 million in 2012 (ANRSC). Since residential natural gas consumption only increased marginally by about 3 percent during the same period, it is likely that many of the households disconnected from the DH systems are under-heated and/or rely on other types of fuels (biomass or electricity). Fuel-poor households are frequently forced to limit their energy consumption to sub-optimal levels because of financial hardship. Because of this suppressed demand<sup>9</sup>, energy efficiency improvements may not result in an equivalent reduction in consumption – instead, the benefits may be taken in the form of increased comfort (UNDP 2011).

<sup>9</sup> Based on INS household survey data from 2008 there is some evidence of underheating (“suppressed demand”): expenses of poorer households for heating (per m2) are about 20-25% lower than those of wealthier households. This relatively low level of underheating can be attributed to targeted heating subsidies for poor households. UNDP 2011, p. 153.

**Figure 96: District heating cost in Romania is high and tariffs are highly subsidized**



Source: AT Kearney, 2009

Over EUR 2 billion financing were available for energy efficiency investments during 2007-2013, including about EUR 800 million in EU funds. While this has been far from sufficient to address the large energy efficiency financing needs in Romania, the institutional support and technical capacity to implement and deliver energy efficiency investments does not appear to be adequate at either the national or the local levels. This is caused by a lack of incentives and information, and necessary skill upgrades and administrative improvements, such as strategic planning, prioritization, systematic evaluations, and coordination between the different levels of government. The implementation and delivery challenges will only grow in the next seven years.

### 3.2 Transport

Climate change is expected to have a significant impact on transportation, affecting the way transportation professionals plan, design, construct, operate, and maintain transportation systems. According to the 2013 Intergovernmental Panel on Climate Change (IPCC) synthesis report of impacts, adaptation and vulnerability of potential transportation-related impacts and sensitivities, “Transport infrastructure is vulnerable to extremes in temperature, precipitation/river floods, and storm surges, which can lead to damage in road, rail, airports, and ports”.<sup>10</sup>

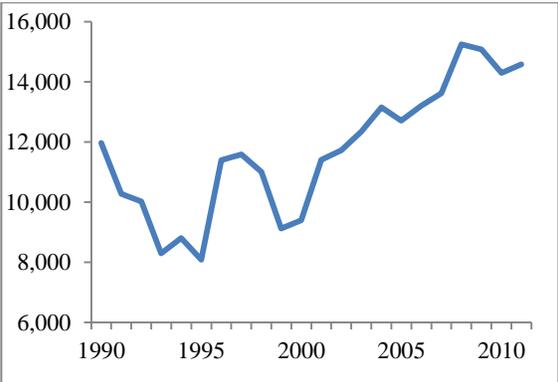
The transport sector is a significant emitter of greenhouse gas (GHG) emissions. In the EU countries, transport is responsible for around a quarter of their greenhouse gas emissions making

<sup>10</sup> IPCC (2013), Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change, Cambridge University Press. Available at: [http://www.ipcc.ch/pdf/special-reports/srex/SREX\\_Full\\_Report.pdf](http://www.ipcc.ch/pdf/special-reports/srex/SREX_Full_Report.pdf)

it the second biggest greenhouse gas emitting sector after energy. While emissions from other sectors are generally falling, those from transport have increased 36 percent since 1990. Most of transport-related greenhouse gas emissions are from road transport. However, there are also significant emissions from the aviation and maritime sectors and these sectors are experiencing the fastest growth in emissions, meaning that policies to reduce greenhouse gas emissions are required for a range of transport modes.

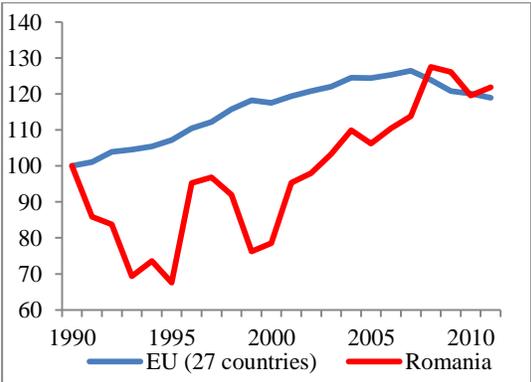
In Romania, as a percentage of total GHG emissions across all sectors, the transport sector accounts for 11.8 percent (2011 figures). While this is smaller than the EU’s average of 20.2 percent, it is rising more quickly than the EU average. The steady upward trend since the turn of the century is particularly noteworthy. The figures below show the increases over time as well as how these compare to the EU-27. Among the different transport modes, road transport is the source of the great majority of GHG emissions in the transport sector, being responsible for 93 percent of domestic transport emissions. This is a similar proportion to the EU-27 average of 94 percent.

GHG Emissions from Domestic Transport in Romania (1,000 tons CO<sub>2</sub>)



Source: EEA.

Trends in Emissions Compared to EU-27 (2000=100)



Source: EEA.

Transport statistics shows a marked rise in mode share of the private cars and a significant decline in rail mode share in passenger transport (with 2011 rail mode share being approximately one third of the 2000 figure). Bus and coach travel mode share has grown slightly between 2000 and 2011. Private car mode share is now approaching the EU average, having been considerably lower at the turn of the millennium. Rail mode share is lower than the EU average, having been above average in 2000. Although car mode share in Romania is at a similar level to the EU average, the motorization (or car ownership) rate in Romania is the lowest in the EU at 201 cars

per 1000 inhabitants in 2010,<sup>11</sup> but has grown significantly in recent years, up from 150 cars per 1000 inhabitants in 2004.<sup>12</sup> Experience across the world suggests that as the Romanian economy grows, it will continue to grow in future. Without intervention to provide better transport alternatives and encourage their use, as car ownership grows, car use is also likely to grow. The reasons for the decline in rail passengers are linked to the decaying state of the Romanian railway system. Domestic air passenger transport activity (internal within Romania) forms a small part (7 percent) of total passenger movements through Romanian airports. This is a relatively low level compared to other EU countries (the EU-27 average is 18 percent), although it has increased in recent years.

The modal split for freight movements in Romania (in terms of ton-km) has also changed in recent years. This shows a marked fall in rail freight mode share in recent years, together with a marked rise in road freight mode share. Also notable is the much larger waterborne freight mode share since 2009. The reasons for the decline in rail freight and transfer to road and inland waterways are likely to be similar to those set out above for passenger transport. Rail freight mode share is higher than the EU average, in spite of its decline. Inland waterborne freight also has a much higher mode share than the EU average, while road freight is still below the EU average, despite its recent growth.

Urban transport forms a major part of overall transport movements in Romania. Some 54 percent of the country's population lives in towns and cities, according to the 2011 national census<sup>13</sup>. Transport within urban areas forms a vital part of the functioning of those areas as economic and social entities. There are nine cities in Romania with populations in excess of 200,000. However, readily available quantitative information on the urban transport situation across Romania is limited. Traffic congestion is reported to be an increasing problem in a number of cities, as vehicle ownership grows. Although data is hard to obtain, it is understood that public transport patronage in many Romanian towns and cities is in decline, with a corresponding increase in private traffic levels. For example, in Ploiesti, public transport patronage fell from 7 million trips per month in 2011 to 6.7 million in 2012. Some cities are making concerted efforts to reverse this trend through modernization of infrastructure and services, although lack of funding remains a serious constraint. In terms of cycling, good cycling infrastructure exists in some cities but it is generally patchy and does not form a coherent network, and is often poorly maintained.

Higher temperatures and more frequent heat waves (particularly in the south and south-east) are likely to cause problems with road and rail infrastructure. Asphalt roads may become soft and deform more under the weight of vehicles, causing traffic restrictions to be put in place (particularly for heavy vehicles). This issue is already recognized by the Romanian national

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<sup>11</sup> Energy, transport and environment indicators. Eurostat Pocket Books 2012 Edition. European Commission.

<sup>12</sup> Study on Strategic Evaluation on Transport Investment Priorities under Structural and Cohesion funds for the Programming Period 2007-2013. Country Report Romania by Ecorys for European Commission DG Regio, 2006.

<sup>13</sup> <http://www.recensamantromania.ro/rezultate-2/>

roads company, with use of adjusted material standards and design norms in vulnerable areas to cope with higher temperatures and minimize deformation. Similar issues may also arise with asphalt surfaces (e.g., runways) at Romanian airports. Railway lines also buckle under high temperatures, which can again lead to speed and usage restrictions.

Rail, road and waterborne transport infrastructure are potentially vulnerable to the effects of more intense rainfall and increased frequency of flash floods. Bridge abutments, piers, road and rail embankments and riverbanks are potentially vulnerable to such flash floods unless measures are taken to protect them. Some roads and railways may also be more prone to flooding, unless drainage and flood protection measures are implemented. Intense rainfall can also have adverse impacts on road safety, although in some areas a reduction in icy and snowy days may counterbalance this.

Reduced precipitation, droughts and the associated reduced runoff may affect river navigation on the major waterways such as the Danube. This is something that is already being seen, according to the Lower Danube River Administration, with reduced water depths, meaning that the number of days on which navigation restrictions are implemented is increasing. On the other hand, the navigability of several shipping channels and inland waterways are likely to be affected due to expected lower water levels. Some channels may be more accessible to shipping farther inland because of sea level rise. The navigability of shipping channels is likely to change and needs to be properly reassessed (Romania's Danube-Black Sea Canal).

### **3.3 Urban**

There is little known about how Romanian cities will be affected by climate change, as there has been very little research undertaken to statistically 'downscale' global climate models to provide a more granular, local picture of how circumstances will change in the coming decades. In terms of climate adaptation/resilience, planning activity has largely taken the form of disaster planning required under national law, although the quality or breadth of these plans is quite unclear. In other words, there is much work to be done in Romania on urban climate matters.

With regards to the urban solid waste, the GHG emissions associated with Municipal Solid Waste disposal in Romania total approximately 2% of the country's overall emissions collectively. The majority result from the country's overwhelming reliance on landfilling as its primary waste management strategy. Organic waste entombed in a landfill decays anaerobically, produces methane, a GHG with 25 times the heat trapping potential of carbon dioxide. Unless the landfill is designed to capture the methane via a series of pipes embedded in the garbage, the gas will slowly leak out of a landfill for many years, including long after a landfill is formally closed. Very few landfills in Romania have the ability to capture or flare this gas, meaning most methane is released directly to the atmosphere.

Thanks to extensive Operating Program support during the 2007-2013 period, Romania's EU-mandated efforts to close and replace poorly managed solid waste dumpsites with sanitary landfills are well underway, but efforts to address existing methane leakage are unclear. The EU accession agreement has already established a timetable for this to be achieved, requiring 65% of all biodegradable waste generated in Romania to be diverted from landfills by 2020. Romania's performance thus far is relatively weak, but achieving this target and other recycling requirements could cut solid waste GHG emission levels by 50% or more. To succeed, cities around Romania will likely have to engage in some type of separate collection of waste materials or otherwise support the development of facilities focused on organic waste processing and markets ready to consume the resulting high quality soil amendment. There are several city-based programs around the world that can serve as models for these efforts. The impact that climate change will have on solid waste facilities and programs around Romania is unknown; more work must be undertaken to analyze this issue.

Significant concerns also arise in terms of protecting Romania's urban water supply and treatment network from the impacts of climate change. Romania's water supply picture is already relatively poor compared to most other countries in Europe, with some parts of the country already enduring supply constraints during the summer. This situation is likely to get worse going forward. Climate impact studies looking at future hydrological conditions in three of the country's 11 river basins project the demand-supply gap in these regions is expected to be manageable for the next 15-20 years, but significant demand reduction measures or new supply capacity will be needed after that. Additional research is needed in the other water basins, as well as localized climate impact studies, to provide a comprehensive picture of the challenges certain cities might face in decades to come.

Urban water systems tend to receive comparatively little attention in most city or national level climate mitigation plans, compared to sectors like buildings and transport. This lack of attention to the link between water systems and climate change is proportional to the relatively small extent to which water supply and treatment systems contribute to overall urban GHG emissions. In Romania, this was estimated to total 2.34% of overall GHG emissions in 2009.

There is nonetheless room for improvement in terms of the efficiency of utility operations, reducing current high water loss levels and reducing methane emissions from wastewater treatment facilities. Some system upgrades have occurred during the 2007-2013 Operating Program period, when a sizable amount of funds were allocated to help Romania address its historically poor surface and ground water quality. Significant gains have been made at these new facilities, but much work remains to be done, meaning water system upgrades should continue as a high investment priority in the next Operating Program. At the same time these investments are being pursued for environmental quality and cost efficiency reasons, these system upgrades deliver climate change mitigation benefits at little or no additional cost. The Romanian Government can position these projects as climate-related investments, helping satisfy

Romania's obligation to spend no less than 20% of its operating program funds on climate-related investments.

### 3.4 Water

The total surface water potential of Romania amounts to 127 Billion Cubic Meters (BCM)/year, with internal river basins contributing 40 BCM and 87 BCM available from the Danube basin. The groundwater potential is estimated at 10 BCM/year. The utilizable fraction of the total (surface and ground) water resources, as defined by the existing capacity to extract and use water, is 40 BCM/year. In contrast the total water demand stands at 8 BCM/year.

With a current population of 20 million, the average water availability in Romania amounts to 2000 cubic meters per capita per year. While this value is above the threshold generally defined for water stress (1700 cubic meter per capita per year), it is lower than the average value for Europe (approx. 4500 cubic meters per capita per year), and underscores the need for good management to ensure resource conservation and sustainability.

A significant inter-annual variation exists in water resources availability. In the driest years the water availability has fallen to 20 BCM. There is also a significant variation within Romania, with the basins of Jiu, Arges-Vedea, Buzua-Ialomita, Siret, Prut-Barlad, and Dobrogea-Littoral facing the most serious scarcities of water.

Currently, water demand is based on industry (67%), agriculture (18%), and municipal (15%) use. Demand for water has steadily decreased since the 1990s, because of structural changes in the economy, including reduction in industrial activity, shut-down of economically unviable irrigation schemes, introduction of metering and tariffs in domestic water supply, and reducing system losses. The total demand has decreased from approx. 20 BCM/year in the early 1990s to 8 BCM/year now. As a result currently the system has a degree of over-capacity the national level.

Almost 80% of the water bodies in Romania meet the EU Framework Directive's water quality designation of good ecological status/potential, which is based on multiple quality elements (biological, physio-chemical, and specific pollutants). However, there is a significant variation between the basins: in Tisa and Somes basins 93% of water bodies are found to be in good ecological condition, but in Vedea basin it is only 7%.

Precipitation has decreased at a rate of about 30 mm per decade in Romania, between 1961 and 2006. Continental-scale studies for Europe project that the annual mean precipitation will decrease by 5-20% in southern Europe and the Mediterranean between the years 2071-2100, compared to that documented from 1961-1990. In line with the precipitation changes, annual river flows are increasing in the north and decreasing in the south, and this trend is projected to

increase in the future. Large changes in seasonality are also projected, with Romania anticipating lower flows in summer and higher flows in winter. As a consequence, droughts and water stress are expected to increase, particularly in summer. Flood events are projected to occur more frequently in many river basins, particularly in winter and spring, although estimates of changes in flood frequency and magnitude remain uncertain. In general, the impact of climate change is likely to cause an increase in cold spells, heat waves, heavy floods, landslides, the formation of ice-dams on watercourses, damaging frost, and avalanches.

Four river basins of Romania- Buzau, Ialomita, Arges, and Mures—have been studied with the objective of quantifying the impact of climate change. The results for Buzau and Ialomita basins indicate a reduction of mean annual flow, of 15-20 % for the period 2021-2050, and of 30-40 % for the period 2070-2100. Also predicted are earlier occurrence of floods produced by snow-melt, and amplification of extreme phenomena. An analysis of changes in demands shows that the demand-supply gap will be manageable for the next 15-20 years, but that significant measures will be needed to address vulnerability in the time period that follows. The results for Arges and Mures basins indicate a reduction of mean annual flow in these basins of 10-15 %. More frequent winter floods are expected, and while torrential flood events will occur more often, the frequency of floods with a long duration and large volume is expected to decrease.

The following are some of the key vulnerabilities to climate change that are identified in various water-related sectors:

- Water supply will be adversely affected because the warmer and shorter winters will lead to the decrease of the seasonal snow volume and to the early and fast snow melting, leading to shortages in summer months.
- Hotter and drier summers will also cause a qualitative deterioration of water resources, thereby effectively reducing the supply.
- Supply will also suffer from a lowering of the groundwater table in summer months, due to reductions in the surface flow regime.
- Higher summer temperatures will lead to increased evapo-transpiration and therefore higher water demands in agriculture, during the same period when supplies will suffer a shortfall. The domestic water demands and supply will experience the same (but less pronounced) effect.
- Wastewater treatment will be more frequently impaired by floods, due to storm-water infiltration in sewer systems, and also to the direct inundation of treatment facilities.
- The flora and fauna in the aquatic ecosystems (rivers and lakes), as well as in those dependent on precipitation and river flows (such as wetlands), will suffer from a quantitative reduction in summer water flows, and from the increased frequency of floods and droughts.

- Higher summer temperatures leading to water quality degradation (through decreases in dissolved oxygen, eutrophication and algal blooms) will also adversely affect the environment.
- Changes in aquifer levels will also adversely affect the water balance in wetlands, which are sustained by groundwater in the low flow season.
- The summer generation from hydropower plants will be adversely affected in dry years. The hydropower facilities will also face the increasing threat of intensive floods, and operations will need to provide sufficient flood cushion in storage reservoirs.

### 3.5 Agriculture and Rural Development

The total area of agricultural land in Romania is 15.9 million hectares, of which around 13.3 million ha (approximately 56% of total territory) is currently being used. Around 1.5 million ha of utilized agricultural covered by economically viable / marginally viable irrigation systems, although only about 800 000 ha is currently functional. Compared to other EU Member States, the ARD sector in Romania is an extensive sector occupying 87.1% of total territory and providing a home to 44.9% of the total population. The greatest proportion of national Gross Added Value (75.2%) and employment (88.0%) is also generated in rural areas.

The ARD sector in Romania is also diverse and complex with much variability in socio-economic context and human / institutional capacity. The ARD sector is comprised of two distinct and clearly defined sub-sectors with i) around one half of the agricultural land managed by a small number of very large-scale, capital intensive and technologically advanced farms, and; ii) the other half of agricultural land occupied by communities of very small-scale farmers practicing more traditional farming methods and largely producing for their own consumption.

There are a total of 3.86 million agricultural holdings in Romania, of which 96.6% fall into this “small-scale, subsistence farm” sub-sector. These small farms provide an important socio-economic buffer and basic livelihood for a significant proportion of the rural population. They also have an important role to play in maintaining the vitality of rural communities and providing important social, cultural and environmental services to the wider Romanian society.

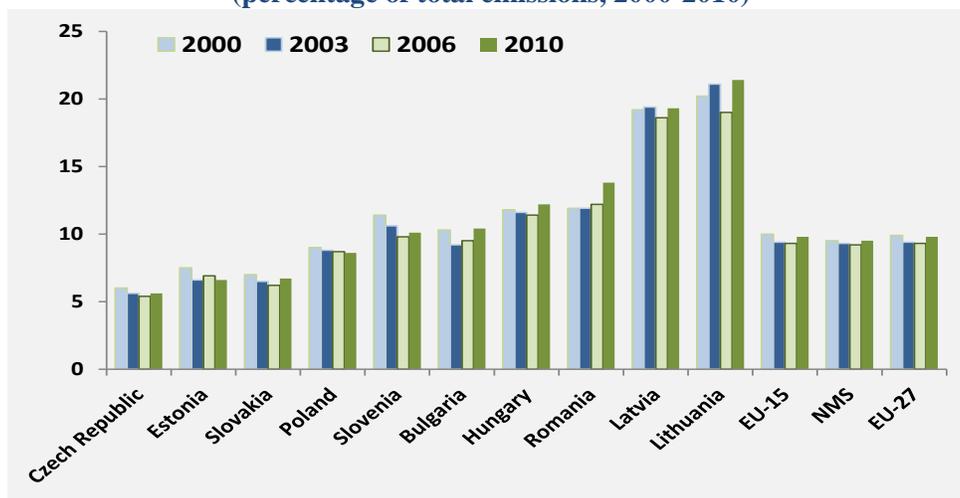
Romania has a diverse rural environment and an abundance of natural resources. There is no shortage of water resources, but the availability of water is characterized by high variability in space and time. Consequently, a large amount of water available annually in Romania is not utilized, either because much of it flows during floods period or there is insufficient storage capacity to allow for an efficient multi-annual management of water stock.

Pollution of groundwater with nitrates continues to be a serious problem and is largely associated with the poor management of livestock manure, despite that rapid and continuous declining of

livestock production (except for poultry) in Romania following the collapse of the socialist regime.

The agriculture sector is a significant contributor to the country's GHG emissions. According to *Romania's Greenhouse Gas Inventory 1989-2011* (MECC, 2013), the agriculture sector accounted for 14% (16 679.72 Gg CO<sub>2</sub> equivalent) of the total GHG emissions estimated for Romania in 2010. This slightly exceeds the regional and EU averages (see figure 10 below) which are around 10%. N<sub>2</sub>O emissions account for the largest proportion (52%) of Romanian agriculture's total CO<sub>2</sub> equivalent emissions, followed by the CH<sub>4</sub> emissions that account for the remaining 48%.

**Figure 10: GHG emissions from agriculture in the countries of Central and Eastern Europe (percentage of total emissions, 2000-2010)**



**Source:** Eurostat

N<sub>2</sub>O emissions are derived from i) manure management (production and storage), and; ii) agricultural soils (notably due to denitrification following the application of inorganic fertilisers or manure). Domestic livestock are the major source of CH<sub>4</sub> emissions from agriculture, both from enteric fermentation and manure management. Some N<sub>2</sub>O and CH<sub>4</sub> emissions are also derived from the field burning of agricultural residues (this is also a source of NO<sub>x</sub> and CO emissions).

On the plus side, agriculture's GHG emissions were 53% in 2010 lower compared to emissions in 1989 due to:

- the decline in livestock numbers;
- the reduced area of rice cultivation (another potential source of CH<sub>4</sub> emissions);
- the decreased intensity of crop production, notably the reduction in the application of inorganic nitrogen fertiliser applied.

Although there has been a significant reduction in GHG emissions from agriculture in Romania in recent years, there remains the very real possibility that GHG emissions will increase again as

the agricultural economy improves – especially if livestock numbers increase and / or crop production becomes significantly more intensive again.

With regards to climate impacts, Romania's temperate continental climate is changing and is predicted to be significantly different in the next 50-100 years. The average annual air temperature is increasing and Romania should expect a continued steady increase in annual average temperature similar to that projected for the whole of Europe. There is some variation in the projections of the different models used, but compared to the period 1980-1990 further rises in annual average temperature should be expected of between: 0.5°C – 1.5°C by 2029, and 2.0°C – 5.0°C by 2099 (depending upon global scenario).

The total amount of annual precipitation is decreasing and a continued reduction in mean annual precipitation of 10-20% should be expected by the end of the century, although this is likely to vary greatly between the north and south of the country. The pattern of precipitation is also expected to continue to change with a greater frequency of shorter, more intense and localized rainfall events. Rainfall patterns may also become more chaotic and difficult to predict.

Overall the ARD sector appears highly vulnerable to the impacts of climate change and it is expected that the livelihoods of many rural people will be more and more affected by the changing climatic conditions that are predicted. The risk of impact is not equally distributed. There are regional differences in the likelihood of negative impacts such as drought and extreme rainfall events, as well differences in the vulnerability, resilience and adaptive capacity of rural actors and communities to climate change. Differences which are further accentuated by the huge polarity in farm size and structure that is characteristic of the ARD sector in Romania. Probably one of the most affected groups of producers will be subsistence farmers in the lowlands, especially in southern and south-eastern Romania.

### 3.6 Forestry

Romania's forests cover 6.515 million ha (27.3%) of the country land surface (MECC, 2012), of which 225,000 ha are listed as primary forests (MECC, 2011) and the rest as secondary forests. Forests in Romania are distributed across the mountains (52%), hills (37%) and plains (11%). Romania is relatively rich in biodiversity with 3,700 plant species<sup>14</sup>; 33,792 animal species have been identified, out of which there are 33,085 invertebrates and 707 vertebrates<sup>15</sup>.

Based on the provisions of Forest Management Plans (FMP), 53.3 % of Romania's forests are included in the functional protection forests category, of which 43% serves soil protection, 31% water protection, 5% flood protection, 11% includes forests with recreational functions and 10% are forests with scientific interest. The remaining 46.7 % of the surface is production forest

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<sup>14</sup> Of these 74 are extinct species, 39 are endangered species, 171 are vulnerable species and 1253 rare species.

<sup>15</sup> Ministry of Environment and Forestry, 2010 as cited in <http://www.climateadaptation.eu/romania/biodiversity/>

(MECC, 2012). The Romanian Network of Protected Areas (including areas of national importance, reserves, parks and Natura 2000 sites) covers approximately 23 % of the land area.

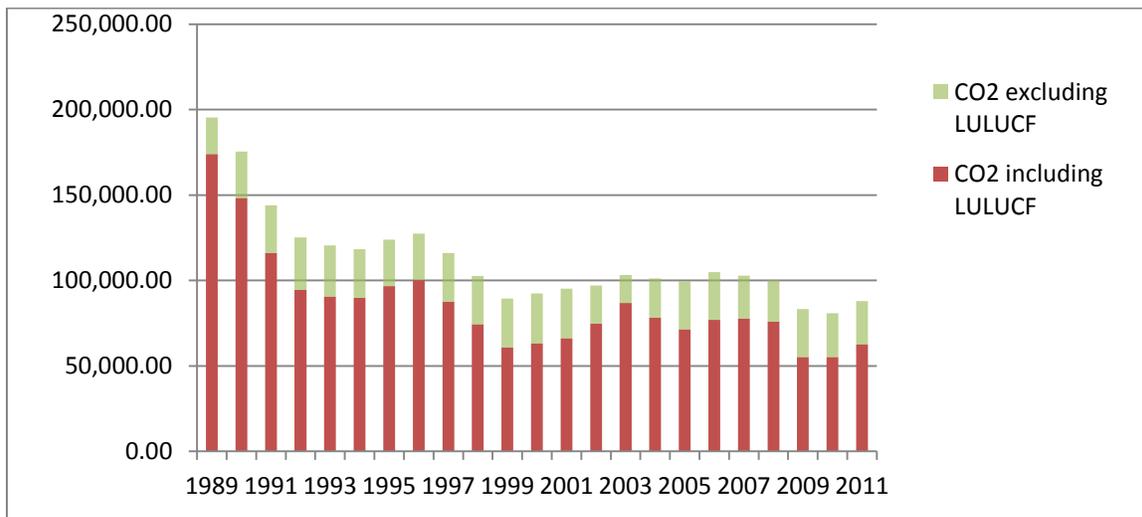
Following the implementation of land restitution legislation, by 2009 66.0% of the wooded land areas were in the public domain while 34.0% were privately owned. There are an estimated 850,000 forest owners in Romania. Private forest ownership in Romania spans both small and large areas, as well as individuals, indivisible communes, and churches. Restitution also has implications for Natura 2000. The total surface of forests within the Natura 2000 sites is 2,099,702 ha. In terms of forest ownership, this surface is split as follows: 64% are state owned forest; 15% are forest owned by municipalities; 3% are forest owned by the church; 10% are owned by indivisible communes; and 9% are owned by private individuals.

Private forest owners, regardless of the size of their forest landholding, are expected to comply with legal requirements for sustainable forest management. Where forests with protection status (or Natura 2000 status) have been restituted to private owners, the owners need to comply with protection requirements. Due to the restrictions on use resulting from having to manage forests for protection, compensation payments exist for protection of private forests. Compensation mechanisms for private landowners, however, only compensate individuals. The compensation mechanism is relatively new and has been active only for a short period, between 2008-2010.

Forests are important for sequestering greenhouse gases (GHGs) and reducing emissions, thus mitigating climate change. Romania's GHG Inventory (National Inventory Report) from 1989 to 2011 stated that “[i]n 2011, the GHG emissions without [land use, land use change, and forests (LULUCF)] have decreased [by] 54.86% comparing with the base year level.” When factoring in LULUCF, “the net GHG emissions/removals (taking into account the CO<sub>2</sub> removals) decreased [by] 61.05 %.” (MECC, 2013). To maintain forests' contribution to GHG emission removal, it is necessary to maintain the health of forests.

The total GHG emissions in 2011, excluding removals by sinks, amounted to 123,345.54 Gg CO<sub>2</sub> equivalents (MECC, 2013). CO<sub>2</sub> emissions from LULUCF (as shown in figure 11 below) are largely from land conversion. Since 1999, there is a reduction in total CO<sub>2</sub> emissions by approximately 30% on average every year when LULUCF is taken into account (see figure 11 below). When examining the change in emissions compared to the base year, LULUCF constitutes approximately 10% of the total reduction in emissions.

**Figure 11: Difference between CO2 emissions including and excluding LULUCF (Gg Tons)**



In Romania, approximately 1 million cum of timber are lost annually to wind and snow, and approximately 130,000 ha of the designated forest areas in the lowland are annually affected by drying due to soil water deficit. Compounding these losses are the damages caused by insect attacks. During the period of 1990-2006, forest health monitoring in Romania indicates that the forest health was poor in 1991, 2005, and 2006. The country had moderately disturbed forests in 1990, 1992, 1995-1999, 2000-2004.

Forests, like other natural systems, are affected by climate change. Romania’s projected changes in precipitation and temperature are anticipated to reduce the health of forest systems, and increase their vulnerability to pests and other biotic factors. This in turn could degrade forests, reducing their ability to sequester carbon, and increasing the likelihood that these forests become a source CO2 emissions. Climate change and the biotic pressures are also expected to decrease tree growth, further reducing their ability to sequester carbon. National forest research institute (ICAS) models predict a decline in growth by 30%.

The preliminary results of the degraded lands inventory (for 16 out of the 41 counties), done by the Ministry of Agriculture and Rural Development (MARD) to design the national program for restoring degraded lands, found 836,475 ha of degraded lands, out of which approximately 115,129 ha are suitable for improvement through afforestation (MARD, 2012). The majority of the degraded areas, or areas that are disadvantaged, are scattered throughout the country. The opportunities for afforestation that are being largely considered are abandoned agricultural areas in the southern belt of Romania.

Climate change might be a threat for Romanian biodiversity in the following ways<sup>16</sup>:

<sup>16</sup> (Source: <http://www.climateadaptation.eu/romania/biodiversity/> (viewed, 2013))

- modifications of the species behavior, as a result of the stress induced on their adaptation capacity;
- modification of the habitats distribution and composition as a result of the change in the species structure;
- increase of the exotic species at the level of the actual natural habitats and the increase of their potential to become invasive;
- modification of the distribution of the ecosystems specific to wet areas, with the possible limitation up to their extinction;
- changes in the freshwater and marine aquatic ecosystems generated by water warming and sea level rise;
- extinction of certain flora and fauna species.

### 3.7 Next Steps

It is certain that controlling global warming poses a two-fold challenge for most countries: an obligation to mitigate GHG emissions as a contribution to global welfare; and the need to adapt to a changing climate. The European Union has committed to tackle climate change and has set ambitious climate and energy targets for 2020. The EU's climate and energy package (which set out the "20-20-20 targets") is binding legislation approved in December 2008 to ensure that the EU achieves a 20 percent reduction in greenhouse gas emissions from 1990 levels; raises the share of EU energy consumption produced from renewable resources to 20 percent; and improves energy efficiency by 20 percent.

Another initiative that wants to limit the impact of climate change is the Kyoto Protocol, under which the EU-15 committed to reducing their collective emissions to 8% below 1990 levels by the years 2008-2012<sup>17</sup>. National programs to respond to the effects of climate change exist in many European countries. For example, Germany has instituted the National Climate Initiative which supports effective climate protection measures such as emissions reduction, energy efficiency and promotion of renewable energy. In Spain, the National Climate Change Adaptation Plan's (PNACC) objective is to "mainstream adaptation to climate change in the planning processes of all relevant sectors or systems."<sup>18</sup>

As a member state of the European Union, Romania has committed to combating global warming. All energy-intensive large installations in Romania must participate in the EU cap-and-trade mechanism, or Emissions Trading Scheme (ETS). Smaller installations and those in less energy-intensive sectors face country-specific targets (in Romania, this means that emissions from non-ETS sectors can't be more than 19 percent higher in 2020 than in 2005). Furthermore,

<sup>17</sup> EU-15 countries are the 15 countries that were EU members before 2004

<sup>18</sup> [http://www.magrama.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/folleto\\_pnacc\\_ing\\_tcm7-197095.pdf](http://www.magrama.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/folleto_pnacc_ing_tcm7-197095.pdf), Centro de Publicaciones, Ministerio de Medio Ambiente y Medio Rural y Marino

Romania has committed to achieving, by 2020, a share of 24 percent of energy from renewable sources in gross final energy consumption (up from 18% in 2005).

The preparation of a new EU budget cycle transforms the 2013-2014 period into a key momentum for EU member states to move to low-carbon green growth planning and actions. The programming of the next cycle of sectoral Operational Programs (OPs) will need to reflect and integrate climate action on mitigation and adaptation. The European Council (February 2013) has determined that the Multiannual Financial Framework will mainstream climate objectives, stating that “Climate action objectives will represent at least 20 percent of EU spending in the period 2014-2020 and therefore be reflected in the appropriate instruments to ensure that they contribute to strengthen energy security, building a low-carbon, resource efficient and climate resilient economy that will enhance Europe's competitiveness and create more and greener jobs.”<sup>19</sup>

Romania will need to thoroughly prepare for the next EU funding cycle and progressively develop a competitive, low-carbon green economy. The Government of Romania (GoR) will thus need to put forward a comprehensive climate change strategy and an action plan with enough details to implement it, develop a strong knowledge base and analytic capacity to assess the cost-effectiveness for both the policy and investment options, put mitigation and adaptation activities into action, and build institutional capacity to implement and support it.

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<sup>19</sup> European Council, “7/8 February 2013 Conclusions on Multiannual Financial Framework”, European Council, Brussels, 8 February 2013 (EUCO 37/13).

## 4. Climate Dimensions of Europe 2020 and EU 20-20-20 and Implications for Romania

There are a range of climate change obligations for Romania resulting from EU membership. At the broadest level Romania must create policies plans and programmes to support the shift towards a low-carbon economy as well as promote climate change adaptation, risk prevention and management. The targets and policies related to these climate change obligations are articulated in three major EU policy documents: (1) The Energy Package, (2) Europe 2020 and (3) The Roadmap for 2050. These three major policy documents are briefly explained below:

1. Energy package. The EU's climate and energy package (which set out the "20-20-20 targets") is binding legislation approved in December 2008 to ensure that the EU achieves a 20 percent reduction in greenhouse gas emissions from 1990 levels; raises the share of EU energy consumption produced from renewable resources to 20 percent; and improves energy efficiency by 20 percent. The EU has offered to increase its emissions reduction to 30% by 2020 if other major emitting countries in the developed and developing world commit to undertake their fair share of a global emissions reduction effort. Energy-intensive large installations must participate in the EU cap-and-trade mechanism, the Emissions Trading Scheme (ETS). Smaller installations and those in less energy-intensive sectors face country-specific targets (which for Romania is that emissions from non-ETS sectors be no more than 19 percent higher in 2020 than in 2005). Furthermore, Romania has committed to achieving by 2020 a share of 24 percent of energy from renewable sources in gross final energy consumption (up from 18% in 2005).

2. Europe 2020 will frame EU policy for 2014-2020. It provides targets and a framework to promote smart, sustainable and inclusive growth. It establishes measurable EU targets in five key areas (1) employment; (2) research and innovation; (3) climate change and energy; (4) education; and (5) combating poverty. It also outlines seven flagship initiatives to be supported by the European Commission to catalyze progress in these areas. The strategy addresses two key aspects of climate change and environmental sustainability: 1) building a competitive low carbon economy that makes efficient use of resources and is resilient to climate risk, and 2) protecting the environment and preventing biodiversity loss. The most important and politically visible European targets at this point is at least 20% reduction in GHG emissions from 1990 levels by 2020 (or 30% reductions if the conditions are right), as well as increasing energy efficiency by 20% and increasing renewable energy by 20% during the same time period, together with other horizontal measures. This target is supported in particular by a flagship initiative on "Resource efficient Europe" which aims to help decouple economic growth from the use of resources, support the shift towards a low carbon economy, increase the use of renewable energy sources, modernize the transport sector and promote energy efficiency. In addition, the EU has set itself a

“green growth roadmap” for building a competitive green/low-carbon Europe by 2050 involving reduction of emissions of greenhouse gases to 80-95% below 1990 levels by 2050.

For **2050**, EU leaders have endorsed the objective of reducing Europe's greenhouse gas emissions by 80-95% compared to 1990 levels as part of efforts by developed countries as a group to reduce their emissions by a similar degree. The European Commission has published a roadmap for building the low-carbon European economy that this will require.

3. Roadmap 2050. The European Commission’s “Roadmap for Moving to a Competitive Low-Carbon Economy in 2050” (issued October 2011) is a long-term policy plan that suggests that the EU should cut its emissions to 80 percent below 1990 levels by 2050, with interim milestones of 40 percent cuts by 2030 and 60 by 2040. It proposes how the main sectors responsible for Europe's emissions--power generation, industry, transport, buildings and construction, as well as agriculture--can make the transition to a low-carbon economy most cost-effectively. The Roadmap argues that the transition to a low-carbon society can boost Europe's economy thanks to increased innovation and investment in clean technologies and low- or zero-carbon energy. Energy efficiency will be a key driver of the transition and allow significant savings in fuel costs (reducing imports and supporting energy security). The Roadmap aims to give direction to member states’ sectoral policies, low-carbon strategies, and long-term investment plans.

In terms of adaptation the Commission is providing guidelines for formulating adaptation strategies that are designed to help EU countries to develop, implement and review their adaptation policies. In addition by 2014 the Commission will develop an adaptation preparedness scoreboard, identifying key indicators for measuring Member States' level of readiness. EU LIFE funding is provided to support capacity building and step up adaptation action in Europe. (2013-2020).

## **Other EU Regulations and Policies Related to Climate Change**

Beyond the policies listed above there are a range of EU related policies and recommendations that are of relevant to climate change. For example, improved diversion of materials from landfills may assist urban centers in Romania with GHG reductions. Diversion rates are currently quite low. There is however an EU regulation mandating 65% organics and 50% recyclables diversion requirements by 2020.

Broadly speaking EU policies and regulations can be divided into 7 main categories:

1. Greenhouse Gas Monitoring and Reporting
2. EU Emissions Trading Systems

3. Effort Sharing Decisions
4. Carbon Capture and Storage
5. Transport/Fuels
6. Ozone Layer Protection
7. Fluorinated Gases

A full inventory of related and complimentary EU climate change legislation is presented in **Annex 1**.

A summary of the most relevant EU Climate Change legislation can be found in the table<sup>20</sup> below:

Key EU Legislation on Climate Change	Description of the legislation	Treaty Base Article in TFEU
Council Decision 2002/358/EC 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 fulfillment of commitments thereunder	Authorises the EU ratification of the Kyoto Protocol, and describes the joint fulfillment of commitments made under the Kyoto Protocol.	192, 218
Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community	Establishes a scheme for the trading of greenhouse gas emission allowance to enable the EU and the Member States to meet the commitments to reduce greenhouse gas emissions made in the context of the Kyoto Protocol	192
Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity	Imposes minimum levels of taxation for energy products and electricity and provides exemptions, including, for example, electricity from some renewable sources	113
Directive 2004/101/EC of the European Parliament and of the Council amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms	Establishes additional clarity on previous Directive points focused on access to information, support of capacity-building activities and implementation.	192, Directive 2003/87/EC
Decision 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for	Establishes a mechanism for monitoring and reporting greenhouse gas emissions in order to monitor progress made in reducing emissions with a view to	192

<sup>20</sup> Part of the information based on the *Call for evidence - Environment and climate change Report* of the UK Department for Environment, Food and Rural Affairs, Department of Energy and Climate Change (May 2013);

implementing the Kyoto Protocol	complying with the EU's commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol	
Commission Regulation no 2216/2004 of 21 December 2004 for a standardised and secured system of registries pursuant to Directive 2003/87/EC of the European Parliament and of the Council and Decision No 280/2004/EC of the European Parliament and of the Council;	Provides general provisions, functional and technical specifications and operational and maintenance requirements concerning the standardised and secured registries system consisting of registries, in the form of standardized electronic databases containing common data elements, and the Community independent transaction log. It also provides for an efficient communication system between the Community independent transaction log and the UNFCCC independent transaction log.	Directive 2003/87/EC, Council Decision No 280/2004/EC
Regulation 842/2006 of the European Parliament and of the Council on certain fluorinated greenhouse gases	Regulates the containment, use and marketing of listed fluorinated greenhouse gases covered by the Kyoto Protocol and products which contain them, in order to reduce emissions	192, 114
Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services	Provides an energy savings target for member states to be reached by way of energy services and other energy efficiency improvement measures and provides for the promotion of end-use energy efficiency	192
Commission Decision 2006/780/EC on avoiding double counting of greenhouse gas emission reductions under the Community emissions trading scheme for project activities under the Kyoto Protocol pursuant to Directive 2003/87/EC of the European Parliament and of the Council; [Official Journal L 316 of 16 November 2006]	Prevents Member States which host Kyoto Protocol project activities from issuing credits for those projects if the installations participate in the EU Emissions Trading Scheme (ETS)	192, Directive 2003/87/EC
Commission Decision no 2006/803/EC amending Decision 2005/381/EC establishing a questionnaire for reporting on the application of Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive	Amends the previous Directive and the questionnaire for reporting on the application of Directive 2003/87/EC, providing further clarifications on a number of relevant sections of the questionnaire.	Council Decision 2005/381/EC, Directive 2003/87/EC, Council Directive 96/61/EC

96/61/EC;		
Commission Decision 2006/944/EC determining the respective emission levels allocated to the Community and each of its Member States under the Kyoto Protocol pursuant to Council Decision 2002/358/EC	Sets out the emission levels allocated to the EU and each Member State for the first commitment period of the Kyoto Protocol	Council Decision 2002/358/EC 192
Commission Decision 2007/589/EC establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council	Establishes new clearer and more accurate guidelines for monitoring and reporting of greenhouse gas emissions under the EU ETS	192
Commission Regulation no 916/2007 of 31 July 2007 amending Regulation (EC) No 2216/2004 for a standardised and secured system of registries pursuant to Directive 2003/87/EC of the European Parliament and of the Council and Decision No 280/2004/EC of the European Parliament and of the Council;	Provides clarifications and additions to general provisions, functional and technical specifications and operational and maintenance requirements concerning the standardised and secured registries.	Regulation (EC) No 2216/200, Directive 2003/87/EC, Council Decision No 280/2004/EC
Decision 406/2009/EC of the European Parliament and of the Council on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020	Sets out minimum contributions for Member States in terms of greenhouse gas emissions, following commitments made by the EU for the period from 2013 to 2020. Also defines the means for checking whether they have been met and provides for the contributions to be increased in line with international agreements	192
Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources	Establishes a common framework for the use of energy from renewable sources in order to limit greenhouse gas emissions and to promote cleaner transport. To this end, national action plans are defined, as are procedures for the use of biofuels	192,114
Regulation 911/2010 of the European Parliament and of the Council on the European Earth monitoring programme (GMES) and its initial operations (2011-2013).	Sets out the GMES operational programme. This builds on the research activities carried out under the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013) and the GMES Space Component Programme of the European Space Agency (ESA)	189
Commission Regulation 920/2010 for the	Establishes a system of standardised	2003/87/EC

establishment of a system of standardised registries in the form of electronic databases for monitoring the issue, holding, transfer and cancellation of allowances	registries in the form of electronic databases for monitoring the issue, holding, transfer and cancellation of allowances within the EU ETS. These registries also guarantee public access to information, confidentiality and conformity with the provisions of the Kyoto Protocol	280/2004/EC 192
Commission Regulation 1031/2010 on the timing, administration and other aspects of auctioning of greenhouse gas emission allowances pursuant to Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowances trading within the Community	Establishes a system, including the use of electronic auction platforms, for the auctioning of allowances in the EU ETS which are not allocated free of charge	2003/87/EC 192
<b>Non-binding EU documents</b>	<b>Description</b>	<b>Comms</b>
White Paper - Adapting to climate change: Towards a European framework for action (2009)	A European Commission white paper that presents the framework for adaptation measures and policies to reduce the European Union's vulnerability to the impacts of climate change.	COM 147 (2009)
EU Adaptation Strategy – April 2013	The European Commission adopted an EU adaptation strategy in April 2013 which has been welcomed by the Member States. Complementing the activities of Member States, the strategy supports action by promoting greater coordination and information-sharing between Member States, and by ensuring that adaptation considerations are addressed in all relevant EU policies.	COM 216 (2013)
Guidelines on developing adaptation strategies – Commission Staff Working Document, accompanying the document <i>An EU Strategy on adaptation to climate change</i>	It covers a wide spectrum of issues to be addressed when developing adaptation policy-making, from local adaptation strategies to sectoral aspects, but they also show a gap, as no resources currently target adaptation policy-making for EU Member States. It complements and aims to make more operational the <i>Adaptation Support Tool</i> .	SWD 134 (2013)
Fiche 2: Implementing Act on the nomenclature of categories of intervention and the methodology for tracking of climate	A provisional draft document that aims to establish a nomenclature for categorisation of financial data, in order to ensure	

change related expenditure under cohesion policy – Version 2 – 27/05/2013	reliable and comparable monitoring data on the use of the Funds, which is also used as input for studies, evaluation and communication activities. The document also aims to provide for a uniform methodology for the calculation of expenditure contributing towards climate change objectives.	
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## **5. Overview of National Strategies, Regulatory Framework, and Institutional Arrangements for Addressing Climate Change in Romania**

Romania is one of nations actively participating in international treaties and cooperation on GHG emission reductions. The nation signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 at the Earth Summit in Rio de Janeiro, and ratified it in 1994, being inscribed in Annex I as a country with Economy in Transition (EIT). It signed the Kyoto Protocol in 1999 and was the first Annex I Party to ratify it in 2001. Romania accepted an 8% reduction target below 1989 levels in the first commitment period from 2008-2012, and negotiates as part of the European Union negotiating block for the post-2012 period.

The process of European integration has represented the political objective of all Romanian governments and political parties since 22 June 1995, when it formally submitted the application for accession to the European Union. Romania signed the EU Treaty of Accession on 25 April 2005 and became a member state in 2007. It has implemented a series of climate change policies since joining EU, including the development of the National Strategy and Action Plan on Climate Change and the implementation of the EU Emissions Trading Scheme.

### **5.1 Implications of the 20-20-20 Targets on Romania**

The 20-20-20 targets to reduce GHG emissions to 20% below 1990 levels by 2020 and also to ensure that, by then, at least 20% of the EU's energy comes from renewable sources like wind and solar and to improve its energy efficiency by 20% by the same deadline translate in Romania into a power generation mix target of achieving 38% renewable energy generation share by 2020 and targeted energy intensity improvements of 1.5 % p.a. In terms of Green House Emissions reductions individual sectoral targets will need to be defined in agriculture, energy, forestry, transport and urban sectors. These targets are still being defined. To do this Romania will need to build a strong knowledge and analytical capacity to assess the cost effectiveness of policy and investment options. Draft OPs are to be submitted to EU in October 2013, with the final versions of OPs scheduled for January 2014. Romania has the capacity to set its greenhouse gas reductions, energy efficiency and renewable energy goals higher in order to narrow the gap with the EU15 countries. It follows that Romania must raise its efforts both in terms of investments and policy support.

	<b>Greenhouse Gas Emissions</b>	<b>Renewable Energy</b>	<b>Energy Efficiency</b>
<b>EU 2020 target</b>	Reduce emissions by 20% by 2020, compared to 1990	RE sources contribute to 20% of final energy consumption	Reduce primary energy consumption from the baseline by 20%
<b>Romania 2020 target</b>	Reduce emissions by 20% by 2020, compared to 1990	RE sources contribute to 24% of final energy consumption	Reduce primary energy consumption from the baseline by 19% (10 MToe)
<b>Romania actual status in 2012</b>	Actual emissions are down by 52% in 2011, compared to 1990	RE accounts for 20.8% of final energy consumption	Actual primary energy consumption is down by 16.6% from the baseline

## 5.2 National Strategies

The National Development Plan 2007-2013 provides strategic planning and multi-annual financial programming designed to give a sense of direction to national economic and social development, in agreement with the principles of the EU Cohesion Policy. The Plan sets as a general objective the fastest possible reduction of socio-economic disparities between Romania and the other EU Member States and details objectives of this process along different priority lines of action that integrate, directly or indirectly, the demands of sustainable development for the short and medium term. The Plan underlines as an objective the increase in competitiveness and development of a knowledge-based economy, including among the main subsidiary priorities the improvement of energy efficiency and expanded use of renewable energy resources in order to mitigate the effects of climate change.

The National Sustainable Development Strategy for Romania 2013-2020-2030 issued in 2008 defines the Horizon 2020 national objectives: to ensure the efficient and safe operation of the national energy system; to attain the current average levels of energy intensity and energy efficiency of the EU; to fulfill Romania's obligations in accordance with the EU legislative package on climate change and renewable energy and with international targets following the adoption of a new global agreement on that subject; to promote and implement measures for adaptation to the effects of climate change and to observe the principles of sustainable development. The same document provides the Horizon 2030 - National Objectives: to align Romania's performance with the EU average in terms of energy and climate change indicators; to meet Romania's commitments on reducing greenhouse gases emissions in accordance with existing international and EU agreements; to implement further measures for adjustment to the

effects of climate change.

In 2005, Romania adopted the National Strategy and Action Plan on Climate Change for the period 2005 – 2008, which had the following objectives were focused on:

- establishing the legal framework and improving the national system for the estimation of anthropogenic emissions by sources and removals by sinks of all greenhouse gases (GHGs) not controlled by the Montreal Protocol, and establishing the National GHG Inventory;
- creating the legal, institutional and procedural framework and implementing the EU Emission Trading Scheme (EU ETS); developing the National Allocation Plan for 2007 and 2008 -2012 periods;
- setting up the legal and procedural framework for the National GHG Registry; operationalizing the Registry and connecting it to the Community International Transaction Log and the International Transaction Log;
- setting up the national procedures for promoting JI projects under Track I and Track II, allowing for a greater flexibility for project developers in preparing project documentation and providing for a shorter approval process;
- establishing the national Guidelines on Adaptation to Climate Change, designed to address the challenges of adapting to the impact of climate change.

In July 2013, the Romanian Government approved a 2013-2020 National Climate Change Strategy with both adaptation and mitigation components. The mitigation side focuses on actions to be adopted in the following economic sectors: energy; transport; industrial processes; solvents and the use of other products; agriculture; the use of lands, the change of land use, forestry and waste management.

The adaptation component of the Strategy lists 13 priority sectors for monitoring the impacts of climate change: industry; agriculture and fisheries; tourism; public health; infrastructure, construction and urban planning; transport; water resources; forests; energy; biodiversity; insurance; recreational activities; and education. It identifies measures for adaptation to guide the development of policies for the above-noted sectors, such as:

- Integration of measures for adjustment to the effects of climate change at the time of implementation, and amendment of current and future legislation and policies;
- Revision of all national strategies and programmes so as to include the requirements for the adjustment of sector policies;
- Development of communication for the implementation of adaptation measures at a local level;
- Enhancing awareness of adaptation to climate change.

### 5.3 Regulatory and policy framework

As a signatory country of UN treaties and an EU Member State, the regulatory and policy framework for environment and CC in Romania has been developed in such a way to be in compliance with both UNFCCC and Kyoto Protocol requirements and with the EU legislation. The national legislation can be divided in the following categories:

#### a) **legislation on emissions inventory**

- GD no. 668/2012 for modifying and completing the GD no. 1570/2007 for establishing the National System for the estimation of anthropogenic greenhouse gas emissions levels from sources and removals of CO<sub>2</sub> by sinks, regulated through the KP;
- Ministry of Environment Order (MoEO) no. 1376/2008 for approving the Procedure on NGHGI reporting and the modality for answering to the observations and questions raised following the NGHGI review;
- MoEO no. 1474/2008 for approving the Procedure on processing, archiving and storage of data specific to the NGHGI;
- NEPA's President Decision no. 23/2009 for approving the Procedure on selection of the estimation methods and of the emission factors needed for the estimation of the GHG levels;
- NEPA's President Decision no. 417/2012 on abrogating the NEPA's President Decision no. 119/2012 (on abrogating the QA/QC Procedure approved through the Decision no. 24/2009 and on approving a updated QA/QC Procedure related to the NGHGI) and on approving a updated QA/QC Procedure related to the NGHGI;
- Protocol of collaboration no. 3029/MMP-RP/3.07.2012 between Ministry of Environment and Forests, NEPA and ICAS, on administrating the NGHGI LULUCF Sector both under the UNFCCC and KP;
- Protocol of collaboration no. 3136/MMP/9.07.2012 between Ministry of Environment and Forests, NEPA, Romanian Automobile Register and Directorate on Driving Licenses and Vehicles Registration in the Ministry of Administration and Interior, on the preparation of Road transport category estimates based on COPERT 4 model.

#### b) **Legislative framework to coordinate and support activities related to participation in the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol**

- Minister's Order no.1122 of 17.10.2006 for the approval of the Guidelines on the use of the "joint implementation (JI) mechanism" based on modality II (art.6 of the Kyoto Protocol) (published in the O.GM. no.957/28.11.2006)

- Minister's Order no.297 of 21.03.2008 for the approval of the national procedure on the utilization of the JI mechanism based on track I (published in the O.M. no.308/21.04.2008)
- Minister's Order no.957 of 2006 for the approval of the national procedure on the utilization of the JI mechanism based on track II (published in the O.M. no. 957/2006)
- Decision no.432 of Apr.28, 2010 on the inception and development of green investment schemes
- Emergency Ordinance no.29 of March 31, 2010 on the use of amount units surplus assigned to Romania under the Kyoto Protocol.

c) **Transposition of EU-ETS legislation**

- Government Decision no.780/2006, amended and completed by Decision no.133/2010 and Decision no. 204/2013 on the establishment of **certificate trading schemes for greenhouse gas emissions**, transposes the Directive of the Council no.2003/87/CE of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC,.
- Governmental Decision no. 60/2008 approving the National Allocation Plan for 2007 and 2008-2012 periods;
- M.O. 85/2007, amended by Ministerial Order no. 296/2008 for approving the Methodology regarding the development of the National Allowance Plan.
- Ministerial Order no. 1897/2007, amended by Ministerial Order no. 2069/2010 for approving the Procedure for permit issuance, regarding greenhouse gas emissions..
- Minister's Order no.254/2009 on the approval of the Methodology for the allowance of **certificates** for **greenhouse** gas emissions from the Reserve of newly entered installations for the period 2008-2012 (published in the O.G. no.186/25.03.2009)

d) **Transposition of SEA Regulations**

The Strategic Environmental Assessment (SEA), is a mandatory requirement for EU member states and has the primary objective to evaluate the environmental impacts of strategic documents such as national laws and regulations and development strategies, policies, plans and programs (PPP). In the Member States of the European Union the SEA requirement is based on the European Council Directive No. 2001/42/CE.

As in many other countries, typical phases of a SEA in Romania proves can be summarized as follows.

<i>SEA Phases</i>	<i>SEA activities</i>
<i>Phase 1 - Screening</i>	1.1- The PPP first version is submitted as a notification to the

(Investigation of whether the PPP falls or not under the SEA legislation).	competent authority for environment (MECC or the territorial agency under the jurisdiction on which the PPP is proposed to be developed); the public is informed with regard to the intention of developing the respective PPP (it is a standard format announcement).
	1.2 – The competent environmental authority organizes a Committee for developing an appropriate SEA process.
	1.3 – There are two categories of PPP: (i) mandatory submitted for a SEA process, and (ii) mandatory submitted for the screening in order to establish the need of undertaken a SEA process or not.
	1.4 – The screening decision is based on criteria to determinate the significant or potential impacts on environment.
	1.5- The competent environmental authority makes public the screening decision and the arguments supporting this decision.
	1.6 – The public can comment on the screening decision and then the Committee is invited to decide if it is the case or not for a reconsideration of the screening decision.
<b>Phase 2 - Scoping</b>  (defining the boundaries of investigation, assessment and assumptions required by a PPP)	2.1: Developing baseline scenario (option zero, without a PPP).
<b>Baseline Scenario</b>  (on which to base judgments)	2.2: Developing strategic alternatives.
	2.3: Predicting and evaluating the social and environmental impacts of the PPP, including alternatives.
	2.4 Mitigating adverse impacts and proposing mitigation plan.
	2.5: Proposing measures to monitor the environmental and social impacts during the implementing stage of the PPP.
	<b>Social and Environmental Strategic Impacts</b>  (determinate strategic social and environmental impacts, usually in terms of direction of change caused by a PPP)
<b>Phase 3 – Prepare SEA Report</b>	3.1: Establishment of a Working Group for preparing SEA Report and in parallel defining the PPP.

	3.2: Preparation of the SEA Report before the submission of the PPP to the approval.
<b>Phase 4 - SEA Report Review and decision making.</b>	4.1: Quality analysis of the SEA Report, including in the transboundary context if this apply.
	4.2: Decision making and public consultation.
<b>Phase 5 – Disclosure and public participation in the SEA process.</b>  (started in the early stage of the screening process).	5.1: Disclosure on the competent environmental authority, on the PPP Internet page (and on the WB’ Infoshop if this is a cooperation with WB).
	5. 2: Interested parties and public, including NGOs and professional organizations are consulted in each phase of the SEA process.
<b>Phase 6 - Follow-up</b>  (implementing, monitoring, periodical reporting, assessment of the performances of the PPP).	6.1: Developing monitoring and survey programs.
	6.2: Proactive approaches or responding to adverse impact.

In Romania, as required by the European Union for its Member States the Directive 2001/42/EC on the assessment of the effects of certain PPP on the environment is totally transposed through the following regulations:

- GD No 1076/2004 (OJ 707, 05.08.2004) for setting up the environmental assessment procedure of certain PPP;
- MO No 117/2006 (OJ 186, 27.02.2006) on approval of the Manual concerning the implementation of environmental impact assessment for plans and programs;
- MO No 995/2006 (OJ 812, 03.10.2006) on approval of the list consisting of plans and programs falling under GD No 1076/2004 on establishing the procedure for plans and programs environmental assessment ;
- MO No 1026/2009 (OJ 562, 12.08.2009) regarding the approval of the requirements of elaborating the environmental report, the environmental impact assessment report, the environmental audit, the site checking report, the safe functioning report and the appropriate assessment study.

In Romania, the Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, amended by Directives 97/11/EC and 2003/35/EC is totally transposed through the following regulations:

- GD 17/2012 amending and supplementing GD 445/2009 on the assessment of the environmental impact of certain public and private projects

- GD No 445/2009 (OJ 481, 13.07.2009) regarding the environmental impact assessment of certain public and private projects;
- MO No 860/2002 (OJ 52, 30.01.2003) for the approval of the procedure for environmental impact assessment and the issuance of the environmental agreement, amended by MO No 210/2004 (OJ 309, 07.04.2004) and MO No 1037/2005 (OJ 985, 07.11.2005);
- MO No 863/2002 (OJ 52, 30.01.2003) regarding the approval of methodological guidelines to be applied to the framework procedure for environmental impact assessment;
- MO No 864/2002 (OJ 397, 09.06.2003) for the approval of the impact assessment procedure and public participation to the decision-making process for the projects with trans-boundary impact;
- Law No 22/2001 (OJ 105, 01.03.2001) on the ratification of the Espoo Convention regarding the trans-boundary environmental impact assessment, adopted at Espoo, 25.02.1991;
- MO No 1026/2009 (OJ 562, 12.08.2009) regarding the approval of the requirements of elaborating the environmental report, the environmental impact assessment report, the environmental audit, the site checking report, the safe functioning report and the appropriate assessment study.

e) **Monitoring and checking**

- Ministerial Order no. 1768/2007 approving the Procedure for the accreditation of verification bodies on the monitoring of GHG emissions, with subsequent amendments;
- Ministerial Order no. 2842/2010, approving the Procedure for the accreditation of verification bodies on the monitoring of GHG emissions for aviation activities;

## 5.4 Organizational Setup

The Government of Romania has made an institutional arrangement for addressing climate change. Its organizational setup for climate change is guided by the following legislations.

- GD no. 48/2013 on the organization and functioning of the Ministry of Environment and Climate Change and for modifying some environment protection and climate change domain related legal acts; it modified the GD no. 1570/2007;
- GD no. 658/2006 established the National Commission on Climate Change and its attributions;
- Emergency Government Decision (EGD) 115/2011, modified and completed by EGD 70/2013, regarding institutional framework and Governmental authorization, through

Ministry of Public Finance, to auction **greenhouse** gas emissions certificates attributed to Romania at the level of EU,.

The leading authorities with responsibility in the climate change policy implementation process are:

Ministry of Environment and Climate Change (MECC): It is the central body responsible for coordination of climate change policy at national level and reports to the European institutions. MECC is also the coordinator of the National Commission on Climate Change (NCCC). MECC was reorganized by G.D. 48/2013, an act that restructured the organization and operation of the Ministry of Environment and Climate Change, and modified some environment protection and climate change domain related legal acts.

National Commission on Climate Change (NCCC): The National Commission on Climate Change (NCCC) was established in 2006 but has been operating only on an ad-hoc basis, mainly for the approval of the Joint Implementation Projects. MECC has recently produced a new draft Government Decision (GD) aimed at enforcing the role and improving the operation of the National Commission for Climate Change. The new GD foresees two levels of operation (technical and political), clarifies and enlarges the responsibilities of the NCCC, and targets a larger participation (35 institutions) of various structures involved in climate change related matters. However, the Commission is inactive. Strengthening the inter-institutional cooperation and enforcing the coordination role of MECC in the area of climate change remain real challenges that demand a longer and dynamic process.

Other environment-related institutions include:

National and Local Environmental Protection Agencies (EPAs): The National Agency for Environmental Protection is subordinated to MECC and is responsible for the implementation of the environmental policy and legislation. These organizations serve primarily as data providers for the national GES inventory system through their territorial branches.

National Environmental Guard: The NEG is responsible for enforcement of penalties, site visits and inspections in order to check whether operators are complying with the provisions of their GHG permit.

Environment Fund Administration: The EFA is responsible for the administration of GHG emission levies of 100 euro/CO<sub>2</sub> ton for those entities that exceed their allowed emission quota.

Responsibility for the implementation of climate change policies is shared among each affected Ministry. A Memorandum between all ministries was signed in 2009 to specify the obligations of each ministry to have dedicated personnel on climate change, but was never implemented. As a

result, there is no dedicated staff to oversee the overall implementation of the Strategy across different Departments. This has led to certain difficulties for MECC in managing the inter-institutional dialogue.

Relevant line ministries and institutions.

There are a set of line ministries also having mandates or a role in climate change. They are:

Ministry of Economy: responsible for industry, energy and economic policy. The energy sector accounts for 70% of Romania's total GHG emissions. It is the sector with the most influence over whether the country will be able to reach the EU's GHG emission, energy efficiency improvement and renewable energy targets by 2020. The Ministry of Economy is also responsible for the biofuel legislation and industrial processes.

National Authority for Energy Regulation: NAER is a regulatory body under the Romanian Parliament. It plays an important role on energy market, and on energy efficiency and renewable energy policy.

Ministry of Transport: It is responsible for all transport sectors (air, sea, road, rail), as well as infrastructure (roads, railways, air infrastructure, shipping, etc.), except for urban transport which is covered by local authorities. It represents a main source of information for the inventory of annual estimated emissions of the atmospheric pollutants at the national level (Long-range Transboundary Air Pollution - LRTAP inventory) from fuel combustion.

Ministry of Regional Development and Public Administration: It is the central body responsible for climate change related issues in the areas of infrastructure, construction and urban planning.

National Authority for Regulation of the Communitarian Services for Public Utilities: The Authority falls under the coordination of MRDPA, and is responsible for regulation and monitoring at the central level of activities in the field of community Services for Public Utilities in conformity with Law 51/2006.

Ministry of Agriculture and Rural Development: It is the central body responsible for the climate change related issues in the areas of agriculture and rural development.

Ministry of Foreign Affairs is responsible for international climate change negotiations.

Ministry of Finance is one of the main actors in all climate change financial instruments (ex: trade of AAUs, EU ETS auctions revenues, savings from the New Entrance Reserve of Joint Implementation, etc.)

Ministry of European Funds – Plays a very important role for the next Multiannual Financial Framework 2014 – 2020 by managing funds allocated for environment.

Ministry of Research and Education – should play an important role on climate change research and education.

National Institute of Statistics (NIS): It represents a main source of information for the inventory of annual estimated emissions of the atmospheric pollutants at national level (Long-range Transboundary Air Pollution - LRTAP inventory) in various areas of activity (e.g. energy balance, industrial processes, etc).

National Administration “Romanian Waters”, National Meteorological Administration, National Institute for Hydrology and Water Management are also governmental institutions that contribute to climate change policy.

## **6. Romania 2014-2020 ESIF Programming**

### **6.1 Background information**

Romania will invest about €39.34 billion allocated from ESIF plus national co-financing in line with the eleven Thematic Objectives of the EU 2020 and Romania's national priorities. The Investment Priorities will be supported in the areas identified as most affected. There will also be significant thematic concentration of investments, according to the provisions of EU regulations and with the specificities of the Romanian regions.

For preparation of the forthcoming programming period, an Inter-Institutional Committee for the Partnership Agreement (CIAP) was set up. CIAP is a consultative forum at the national level working under direct coordination of the Ministry of European Funds and has the role to prepare the next budgetary exercise 2014–2020. It is made up of 12 sections/consultative committees, out of which 10 are technical committees and 2 are representative committees for regional development and territorial dimension. Each of them include representatives of public authorities (national, regional, local), socio-economic sectors, academia and civil society.

For the new programming period, the EC introduced a number of “Ex-ante conditionalities”, out of which MECC is in charge with those under the themes of climate change; waste; water; EIA and SEA). It also set a goal of at least 20% spending of the Union budget must be on climate change related interventions in the 2014-2020 ESIF programs.

### **6.2 The Structure of 2014-2020 Operational Programs**

Romania Partnership Agreement for the 2014-2020 Operational Programming Period (PA) (draft version, October 2013) and Operational Programmes (Ops) (currently under preparation) represent the main documents to provide the framework for Romania to manage the 2014-20 ESIF.

The proposed PA comprises thematic operational programs, covering the following areas: large infrastructure, human capital, competitiveness, administrative capacity, rural development, fisheries, regional development, European Territorial Cooperation with Hungary, respectively Bulgaria, TA and direct payments for agriculture.



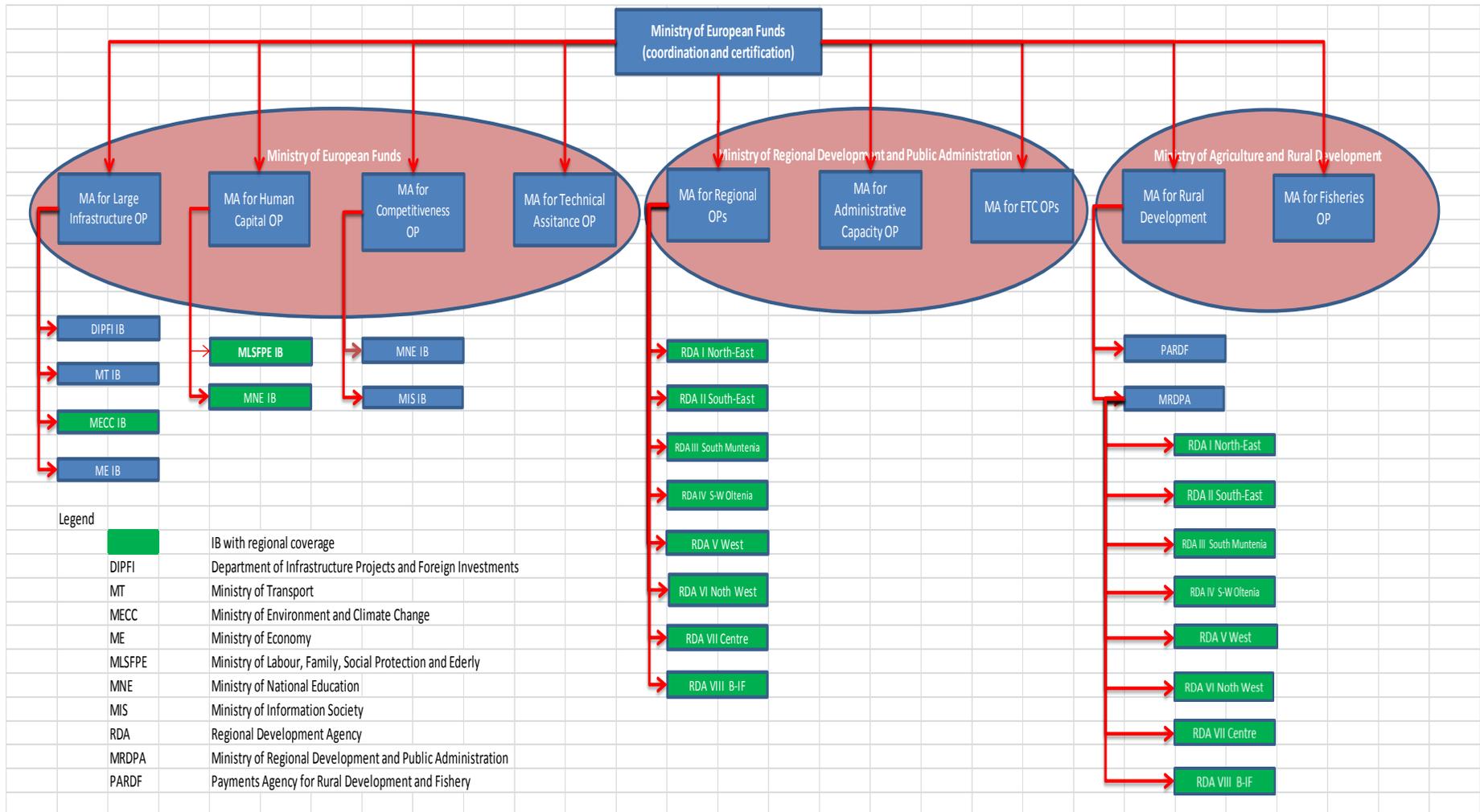
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GOVERNMENT OF ROMANIA



Structural Instruments  
2007 - 2013





EUROPEAN UNION



GOVERNMENT OF ROMANIA



Structural Instruments  
2007 - 2013

**Large Infrastructure OP** – administrated by the MEF, through the Management Authority and Implemented by 4 Intermediary Bodies (IBs) (Department of Infrastructure Projects and Foreign Investments, Ministry of Transport (MT), Ministry of Environment and Climate Change (MECC), Ministry of Economy (ME));

Priority investments:

- electrical road infrastructure TEN-T
- railway TEN -T; - harbors TEN –T
- public utilities services (water and used water, waste management)
- risk prevention and climate (structural measures: dams,?)
- coastal areas and non-structural measures of risks, including draught, Nature 2000, biodiversity, etc.
- energy efficiency in industry (production, transport and distribution for renewable energy, cogeneration thermo and systems)

**Human Capital OP**– administrated by the MEF, through the Managing Authority and implemented by 2 IBs (Ministry of Labor, Family, Social Protection and Elderly (MLFSPE) and the Ministry of Education (MNE))

Priority investments:

- employment, social inclusion, strengthening institutional capacity of the National Agency for Employment
- education and training

**Competitiveness OP** – administrated by MEF, through the Managing Authority and Implemented by 2 IBs (MNE and Ministry for Informational Society (MIS))

Priority investments:

- research, development and innovation (including for the large enterprises)
- digital agenda (broadband and different IT infrastructure and interoperability )

**Technical Assistance OP** – administrated and implemented by the MEF, through the Managing Authority

Priority area:

- Horizontal technical assistance for management of structural and investment funds

**Administrative Capacity OP**– administrated and implemented by the Ministry of Regional Development and Public Administration (MRDPA).

Priority investments:

- strengthening administrative capacity

- modernizing the judicial system
- e-government (e-health, e-justice, e-education etc.)
- management system
- cadastre

**Regional Operation Programs** – administrated by the Ministry of Regional Development and Public Administration, through the Management Authority and Implemented in territory by 8 Regional Development Agencies;

Priority investments:

- local road, railway and harbor infrastructure
- urban /local development (including public transportation and related infrastructure cultural heritage, sport facilities, multifunctional facilities)
- energy efficiency (including rehabilitation of networks if the case may be)
- education and social infrastructure
- health infrastructure
- competitiveness and business environment for SMEs, including financial instruments.

**European Territorial Cooperation OPs**– administrated and implemented by the MRDPA

Priority investments:

- Territorial Cooperation Program Romania - Hungary
- Territorial Cooperation Program Romania – Bulgaria

**Rural Development OP**– administrated by the Ministry of Agriculture and Rural Development (MARD) and implemented by 2 IBs (MARD and MRDPA)

Priority investments:

- investments in agriculture and rural development
- public infrastructure in rural areas (roads, water, used water waste community center)

**Fisheries OP**– administrated by the MARD

Priority investments:

- sustainable fisheries and aquaculture investments (both private and public)

### 6.3 Coordination and Implementation Arrangements

The institutional framework for the 2014-2020 ESIF programming period is currently still being revised. The main players are MA MEF, MARD and MRDPA. Beyond its coordination role, MEF will act in the new institutional set-up as MA for four OPs (Large Infrastructure, Human Capital, Competitiveness and TA OPs). MARD will act as Managing Authority for Rural

development and Fisheries OPs, whereas MRDPA will act as MA for Administrative Capacity, Regional and ETC OPs.

The institutional coordination mechanism, proposed for next programming period (Annex 3), implies three levels:

- **Level 1 – Partnership Agreement Steering Committee (PASC)** will be set up as an inter-ministerial committee under the responsibility of Ministry of European Funds (MEF)
- **Level 2 – five Thematic steering sub-committees** (promoting economic competitiveness and local development; improving human capital through higher employment and better social inclusion and education policies; Improving human capital through higher employment and better social inclusion and education policies; developing modern infrastructure for growth and jobs; optimizing the use and protection of natural resources and assets; modernization and reinforcement of the national administration and of judiciary);
- **Level 3 – three Functional Working Groups (operational, new approaches FWG, respectively performance assessment FWG )** under the coordination of MEF.

*The detailed description of each coordination level (role, composition, representation, meetings, etc) is presented in Annex 4.*

An inventory of the Agencies and Units involved in 2014-2020 Operational Programming with relevance for the Climate Change Area, as well as the main Romanian counterparts in each institution are presented in Annex 5.

## **6.4 Climate Change related Objective Targets (OT) for Romania's Operational Programming for EU Funds 2014-20**

In light of the new EU budget cycle, the period of 2014-2020 is an important one for EU member states and the move to low-carbon green growth. The programming of the next cycle of sector Operational Programs will need to reflect and integrate climate action on mitigation and adaptation. As a member state of the EU, the Government of Romania is committed to fighting climate change and pursuing low carbon development.

The draft 2014-2020 Multi-annual Financial Framework (MFF) includes a proposal for increasing climate-related expenditure to at least 20 % of the EU budget.

In the forthcoming 2014-2020 financial perspective, Romania will have access to **€39.34bn** allocated from the European Structure and Investment Funds (ESIF), plus national co-financing in line with the Thematic Objectives of the EU 2020 and Romania's national priorities. A first draft of the Partnership Agreement related to the 2014-2020 ESIF programming period was submitted to EC by Romania in June 2013. The PA has been updated and the sectoral OPs are

under preparation in the different responsible ministries. The structures for the CSF implementation in Romania are not fully designated yet, but the process is in progress.

Two out of the eleven thematic objectives directly target climate change, as they refer to “supporting the shift towards a low-carbon economy in all sectors” (TO no. 4), and “promoting climate change adaptation, risk prevention and management” (TO no. 5).

Interventions from ESI Funds under TO 4 will contribute to achieve the objective assumed by Romanian authorities through the National Reform Plan, which will ensure **that by 2020, greenhouse gas emissions will be reduced by at least 19% compare to 2005 levels for non EU – ETS sectors, increase the share of renewable energy in final energy consumption to 24%, and achieve a 19% (estimated 10Mtoe) increase in energy efficiency.**

Component B of the RAS program developed by the World Bank in conjunction with the Romanian Ministry of Environment and Climate Change deals with identifying and integrating climate actions into the 2014-2020 sectoral Operational programs. Its synthesis report focuses on the identification of operational programs, actions and sets sectoral actions and recommendations (across energy, transport, urban, water, ARD and forest sectors) for incorporating climate-related tasks in the 2014-2020 OPs. The synthesis report climate-related recommendations correlate with the framed thematic objectives no. 4 and no. 5, providing a starting point for consideration in the 2014-2020 EU operational programming period.

For OT 4, the ESIF investment priorities in the field will be focused on the following actions:

- upgrade and build new power and heating production capacities especially for the types of Renewable Energy Services (RES) which are underused comparing to the existing potential (according to National Renewable Energy Action Plan (NREAP) and for which there is low investors’ interest, in particular by encouraging investment in distributed generation (small and very small capacities) for all types of beneficiaries (public, private and residential).
- promote investment in solutions for compensating fluctuations due to RES energy production, especially by encouraging energy storage solutions
- support measures for expanding and upgrading electricity and thermal energy distribution grids, in order to support the integration of RES into the grids
- promote high efficiency cogeneration
- expand and upgrade electricity transmission (transport) grids, in order to take over then RES energy and limit the impact of uncontrollable production from RES
- provision of advice and, where justified, support for investment in green supply and energy efficiency measures and shift towards a low carbon and climate resilient economy, with particular emphasis in agriculture

- support the reduction in greenhouse gas emissions in business, fisheries, aquaculture and in agriculture, notably through the exploitation of land management and carbon sequestration potential actions to promote investment in climate change mitigation/ improving energy efficiency of the fishing vessels and processing units (with European Maritime Fisheries Fund (EMFF) support)
- improve the thermal insulation of residential and public buildings to be prioritised on the basis of systematic appraisal taking into account the cost-efficient reduction of GHG emissions and societal benefits including addressing energy poverty and employment creation.
- support rehabilitation and renewal of mass transit systems within the framework of sustainable urban mobility plans, where these will make significant contribution to air quality and energy efficiency in addition to place competitiveness.
- actions for replacement/improvement of lighting systems to ensure greater energy efficiency in the public realm, particularly in urban areas
- increase energy efficiency by reduction of the primary energy consumption in agriculture and food processing
- facilitate the supply and use of renewable sources in the agricultural sector (by-products, wastes, residues and other non-food raw material).

These priorities need to be synchronized with the financed intervention and with the measures for SME's under objective 3, the measures for environment protection under objective 6 and measures for promoting sustainable transport under thematic objective 7.

For OT 5, the ESIF investment priorities in the field will be focused on the following:

- Complete the national system of risk identification and management in the framework of the National Risk Assessment.
- Build a national culture of disaster risk reduction
- Set-up and improve the risk monitoring and prevention systems in relation to identified risks: earthquake, flood, landslide, drought, forest fire, erosion and coastal erosion, radiological chemical, domestic fires
- enhance professional emergency response services at the national level in order to respond to major national and international emergencies, including transnational cooperation in the framework of the Danube and Black Sea macro-regional strategies
- structural and non-structural measures in order to reduce risks and damage from flooding, drought and erosion
- strengthen institutional and technical capacity of ESMNS through collaborative solutions between different authorities

Specifically in agriculture, action will be support:

- sustainable irrigation and water management systems and practices to combat climate change.
- conservation of soil and its carbon stock through land management practices such as low tillage, winter crops and forest planting.
- maintaining genetic diversity by supporting local crop varieties and livestock breeds.

The proposed priorities for funding need to be synchronized with the financed intervention and with the measures for ICT services and infrastructure under objective 2, measures to promote good environmental practice in business under objective 3 and measures for agriculture, forestry and fisheries.

Expected results are (i) reduced losses and damages caused by various types of disasters, including recurrent floods, forest fires and drought, through risk prevention and management measures; (ii) reduced earthquake exposure of Romanian population and territory; reduced landslides exposure of Romanian population; (iii) reduced coastal erosions; (iv) a new system covering all risk management phases in place; (v) infrastructure and capacities of disaster management ready to assess and manage the increasing risks; (vi) reduced losses in agriculture because of CC related risks.

## 7. Summary of Climate Change Relevant Literature for Romania

The following literature review and bibliography is intended to inform the World Bank Reimbursable Advisory Services (RAS) to Romania on Climate Change and Low Carbon Green Growth. It includes academic books, journal articles and web resources as well as publications by key national and international organizations. The review covers both Romania specific studies and broader regional studies and is divided into 8 key topic areas: (1) Climate Change General References, (2) EU Policy, (3) Economics and Macro-economic Modeling, (4) Energy, (5) Agricultural Research and Development (R&D), (6) Forestry, (7) Transport and Urban, (8) Water.

- **Climate Change General References**

This section primarily provides the general information on the science of current and anticipated climate change impacts in Romania. This includes a wide range of national scientific studies as well as international references such as the IPCC reports. The reports emphasize that Romania is already experiencing extreme weather events and pinpoint current country background status. Coal, mostly lignite, provides about 20 percent of Romania's total primary energy supply and about 40 percent of the country's electricity. Gas provides about 30 percent of the total energy supply. Total CO<sub>2</sub> emissions for Romania stood at 78 million tons in 2009, accounting for a modest 2 percent of total European Union emissions. Per capita CO<sub>2</sub> emissions were also modest, at 3.7 tons in 2009 and about half of the EU average. As for all the transition countries, emissions have dropped significantly from their peak in the late 1980s as a co-benefit of structural transformation. However, despite the decline in total emissions, CO<sub>2</sub> emissions per unit of GDP remain high. The emissions intensity of output in Romania in 2009 was about 1.4 kg of CO<sub>2</sub> per USD of GDP (in 2000 prices). Although well below Romania's peak of 4.0 kg per USD in 1989, this ratio is significantly higher than the EU average of 0.4. Romania's CO<sub>2</sub> emissions per unit of energy supply and per kWh are all higher than the EU average. Romania has the lowest energy consumption per capita in EU but one of the highest energy intensities.<sup>21</sup>

- **EU Policy**

The section on EU policy sites literature relevant to climate change related requirements arising from EU members including the EU 20-20-20 energy package, Europe 2020, and the Roadmap 2050 as well as existing analysis of the implications for Romania of EU integration. The references listed here are essential reading for all aspects of this project.

- **Economics and Macro-economic Modeling**

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<sup>21</sup> See International Energy Agency (IEA Statistics © OECD/IEA, <http://www.iea.org/stats/index.asp>), Energy Statistics and Balances of Non-OECD Countries.

This section of the literature review focuses on economic forecasting models and reporting. In particular it focuses on OECD studies of Romania's economy as well as the two main macroeconomic, econometric, models - Dobrescu Macromodel and HERMIN type model (HEROM). Currently available in the National Commission for Forecasting, the models are used either for official forecasts (Dobrescu model), respectively for assessing the macroeconomic impact of the structural funds (HEROM). The latest HEROM simulations until 2016 show a slight recovery of the Romanian economy, boosted by foreign trade, amelioration of the main domestic and external macroeconomic equilibria, public budget deficits stays within the limits established by European Union for country-members. Consequently, the public debt changes in a very narrow range, regarding sectoral structure of the economy, manufacturing is likely to increase its share, services to contract slightly and construction to keep the same share, a certain improvement of the global energy intensity of Romanian economy, the shape of the CO2 emissions curve is replicating the economic output developments, Output gap has switched from positive to negative with the crisis (in 2009). This literature review also covers the ongoing project "New Member States: Climate Protection and Economic Growth", that includes Romania, aims to determine how emissions can be significantly and permanently reduced while simultaneously achieving pre Great Recession levels of economic growth while adding the necessary ingredient of "sustainability".

- **Energy**

The section is divided into economic models, green house gas emissions, and policies, plans and programmes. In terms of Economic models ENPEP, MARKAL, WASP, and EFOM are listed as models used for analysis to date. An annex further explores these models. Of particular relevance to those interested in Green House Gas Emissions is the study by Ionuț Purică, Carmen Uzlău, Sorin Dinu (Romanian Academy of Sciences): 'The assessment of the greenhouse gas emissions reduction impact on the Romanian economy by using the technological and Input-Output models relations', Editura Economică 2012. This study commissioned by National Commission for Forecasting (CNP) within their Technical Assistance Programme (2012-2013) is a collection of information related to energy sector in Romania available in official sources (UNFCCC, OPCOM, National Agency for Environment Protection) or studies (ISPE mainly). The literature review includes a simplified listing of these references.

- **Agricultural Research and Development (ARD)**

The literature review covers studies of the climate related vulnerabilities and risks associated with both large-scale commercial farming and very small-scale subsistence farmers. It includes Government reports and policies such as the National Rural Development Programme (NRDP) for Romania 2014-2020 as well as scientific studies as well as economic models such as AGMEMOD an econometric, dynamic, multi-product, partial equilibrium model that generates baseline projections up to the 2025 time horizon and simulates the impacts of policy changes for the EU27, its Member States, Croatia, Macedonia, Turkey, Russia and Ukraine related to

agricultural activity level (area harvested, livestock numbers), supply and use balances (production, domestic use, imports, exports and ending stocks) and prices. The ARD literature is divided into 6 key sections (1) Baseline Data Emissions, (2) Assessments of Vulnerabilities, Risks and Impacts (3) National and International Mitigation and Adaptation, (4) Priorities and Strategies for the ARD Sector in Romania and (5) Other Documents of Relevance to ARD in Romania re Mitigation and Adaptation Strategies and (6) Disaster Risk Reduction.

- **Forestry**

This section is divided into climate change impacts on forest, as well as issues related to land use, land use change and forests. The scientific literature recognizes that climate change is one of the biotic factors that can have a negative impact on forests. The section recognizes the importance of forests for climate change mitigation and includes references related to improving forest management practices, increasing access to forests by improving logging infrastructure, promoting afforestation and agroforestry systems, harmonizing protection, incentivizing implementation of Natura 2000, providing compensation payments to landowners to mitigate the consequences of management restrictions, investing in technology and short rotation trees, conducting research and monitoring as well as improving regulations.

- **Transport and Urban**

The literature available on climate change and transport in Romania is currently very limited with the most relevant document being the recent publication by Balan, Mariana and Valentina Vasile. 2013 on "Measures to Reduce Transportation Greenhouse Gas Emissions in Romania." Calitatea 14: 306. Additional relevant documents related to the economic of transportation as well as the Romanian National Transportation Plan. With regards to Urban the key literature here relates to the anticipated impacts of climate change on cities, water treatment and water supply. Significant literature recognized the vulnerability of urban areas to climate change including flood and drought risk as well as the need for urban planning to address climate change mitigation. Additional literature with specific concrete guidance for urban planners is needed.

- **Water**

This section of the literature review includes a range of hydrological studies on climate change impacts on water supply including risks of droughts and floods. The implications of these changes in water supply on key sectors such as agriculture or urban water supply are covered in the other sections of the literature review. Despite the abundant hydrological literature there were significant gaps on specific/procedural guidelines on national water planning process, specific strategies for water agencies or utilities to adapt to climate change impacts, limited information related to climate change implications on potential vulnerabilities and impacts on Groundwater and Water Quality. Much of the available literature presents general information, but there is relatively little which presents specific tools and guidelines on how to apply climate impacts to the water sector project prioritization and evaluation processes.

## **ANNEX 1: Inventory of the EU Climate Change Related Policies and Regulations**

### **Greenhouse Gas Monitoring and Reporting**

- Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol
- Commission Decision No 2005/166/EC of 10 February 2005 laying down rules implementing Decision No 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol
- 2010/778/EU: Commission Decision of 15 December 2010 amending Decision 2006/944/EC determining the respective emission levels allocated to the Community and each of its Member States under the Kyoto Protocol pursuant to Council Decision 2002/358/EC
- Commission Decision of 14 December 2006 determining the respective emission levels allocated to the Community and each of its Member States under the Kyoto Protocol pursuant to Council Decision 2002/358/EC
- 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

### **EU Emissions Trading System**

- Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC
- Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms
- Commission Regulation (EC) No 2216/2004 of 21 December 2004 for a standardised and secured system of registries AMENDED by: Commission Regulation (EC) No 916/2007 of 31 July 2007 L 200 5 1.8.2007 and Commission Regulation (EC) No 994/2008 of 8 October 2008 - version applicable until 31 December 2011
- Commission Decision 2006/780/EC of 13 November 2006 on avoiding double counting of greenhouse gas emission reductions under the Community emissions trading scheme for project activities under the Kyoto Protocol pursuant to Directive 2003/87/EC of the European Parliament and of the Council (notified under document number C(2006) 5362)
- Commission Decision 2007/589/EC of 18 July 2007 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC

of the European Parliament and of the Council amended by Commission Decision 2009/73/EC and Commission Decision 2009/339/EC

- Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community
- Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community
- Commission Decision 2009/450/EC of 8 June 2009 on the detailed interpretation of the aviation activities listed in the Annex I to Directive 2003/87/EC
- Commission Regulation (EC) No 748/2009 of 5 August 2009 on the list of aircraft operators which performed an aviation activity listed in Annex I to Directive 2003/87/EC on or after 1 January 2006 specifying the administering Member State for each aircraft operator
- Commission Decision of 24 December 2009 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage
- Commission Regulation No. 82/2010 of 28 January 2010 on the list of aircraft operators specifying the administering Member State
- Commission Regulation (EU) No 920/2010 of 7 October 2010 for a standardised and secured system of registries pursuant to Directive 2003/87/EC of the European Parliament and of the Council and Decision No 280/2004/EC of the European Parliament and of the Council
- Commission Regulation (EU) No 1031/2010 of 12 November 2010 on the timing, administration and other aspects of auctioning of greenhouse gas emission allowances pursuant to Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowances trading within the Community

### **Effort Sharing Decision**

- Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

### **Carbon Capture and Storage**

- Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006

### **Transport/Fuels**

- Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC
- Directive 1999/94/EC of the European Parliament and of the Council of 13 December 1999 relating to the availability of consumer information on fuel economy and CO2 emissions in respect of the marketing of new passenger cars
- Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC
- Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO2 emissions from light-duty vehicles
- Commission Regulation (EU) No 1014/2010 of 10 November 2010 on monitoring and reporting of data on the registration of new passenger cars pursuant to Regulation (EC) No 443/2009 of the European Parliament and of the Council
- Regulation No 510/2011 of the European Parliament and of the Council of 11 May 2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO2 emissions from light-duty vehicles

### **Ozone Layer Protection**

- Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer
- 2010/372/: Commission Decision of 18 June 2010 on the use of controlled substances as process agents under Article 8(4) of Regulation (EC) No 1005/2009 of the European Parliament and of the Council
- Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halons

### **Fluorinated Gases**

- Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006, establishing the format for the report to be submitted by producers, importers and exporters of certain fluorinated greenhouse gases
- Commission Regulation (EC) No 1493/2007 of 17 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, the format for the report to be submitted by producers, importers and exporters of certain fluorinated greenhouse gases
- Commission Regulation (EC) No 1494/2007 of 17 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, the form

of labels and additional labelling requirements as regards products and equipment containing certain fluorinated greenhouse gases

- Commission Regulation (EC) No 1497/2007 of 18 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard leakage checking requirements for stationary fire protection systems containing certain fluorinated greenhouse gases
- Commission Regulation (EC) No 1516/2007 of 19 December 2007 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, standard leakage checking requirements for stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases
- Commission Regulation (EC) No 303/2008 of 2 April 2008 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of companies and personnel as regards stationary refrigeration, air conditioning and heat pump equipment containing certain fluorinated greenhouse gases
- Commission Regulation (EC) No 304/2008 of 2 April 2008 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of companies and personnel as regards stationary fire protection systems and fire extinguishers containing certain fluorinated greenhouse gases
- Commission Regulation (EC) No 305/2008 of 2 April 2008 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of personnel recovering certain fluorinated greenhouse gases from high-voltage switchgear
- Commission Regulation (EC) No 306/2008 of 2 April 2008 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, minimum requirements and the conditions for mutual recognition for the certification of personnel recovering certain fluorinated greenhouse gas-based solvents from equipment
- Commission Regulation (EC) No 307/2008 of 2 April 2008 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, minimum requirements for training programmes and the conditions for mutual recognition of training attestations for personnel as regards air-conditioning systems in certain motor vehicles containing certain fluorinated greenhouse gases
- Commission Regulation (EC) No 308/2008 of 2 April 2008 establishing, pursuant to Regulation (EC) No 842/2006 of the European Parliament and of the Council, the format for notification of the training and certification programmes of the Member States

## ANNEX 2: Bibliography - Climate Change Relevant Literature for Romania

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