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Climate Change and Low Carbon Green Growth Program

Component B Synthesis Report

Summary of Sector Rapid Assessments and Recommendations for Incorporating Climate Actions in the 2014-2020 Sectoral Operational Programs in Romania

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ABBREVIATIONS AND ACRONYMS

ARD	Agriculture and Rural Development
BCM	Billion Cubic Meters
BRT	Bus Rapid Transit
CAP	Common Agricultural Policy
CC	Climate Change
CCS	Carbon Capture and Storage
CIAP	Inter-Institutional Committee for the Partnership Agreement
CO2	Carbon Dioxide
CO2eq	Carbon Dioxide equivalent
DH	District Heating
EAFRD	European Agricultural Fund for Rural Development
EEA	European Environment Agency
ERU	Emission Reduction Unit
EUR	Euro currency
ESCO	Energy Service Company
ETS	Emission Trading Scheme
EU	European Union
EUA	European Union emission Allowances
ESIF	European Structural and Investment Funds
FMP	Forest Management Plan
FWG	Functional Working Groups
GD	Government Decision
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GIS	Geographic Information Systems
GoR	Government of Romania
GTMP	General Transport Master Plan
HOA	Home Owners Association
IB	International Body
ICAS	National Forest Research Institute
IPCC	Intergovernmental Panel on Climate Change
IWT	Inland Waterway Transport
JI	Joint Implementation
KM	Kilometer
KP	Kyoto Protocol

LULUCF	Land use, Land use change and Forestry
MA	Managing Authority
MARD	Ministry of Agriculture and Rural Development
MECC	Ministry of Environment and Climate Change
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
NEEAP	National Energy Efficiency Action Plan
NRDP	National Rural Development Programme
NSP	National Strategic Plan
nZE	Nearly Zero Energy
OP	Operational Program
PA	Partnership Agreement
PV	Photovoltaic
PASC	Partnership Agreement Steering Committee
PNACC	National Climate Change Adaptation Plan (PNACC)
RAS	Reimbursable Advisory Services
RBMP	River Basin Management Plan
SFM	Sustainable Forest Management
SOP E	Sectorial Operational Program on Environment
SUMP	Sustainable Urban Mobility Plan
TA	Technical Assistance
TO	Thematic Objective
TEN-T	Trans-European Transport Network
T&D	Transmission and Distribution
UNFCC	United Nations Framework Convention on Climate Change
WSS	Water Supply and Sanitation

EXECUTIVE SUMMARY

Background and Introduction

Tackling the destructive effects of global warming is a global priority. Despite ongoing global efforts to combat global warming, it is widely accepted that the average temperature will continue to rise globally at an accelerated speed in the coming decades. This increased warming, largely attributed to the rise in greenhouse gas (GHG) emissions caused by human activity, will have a far-reaching impact on the earth's climate patterns and will pose a serious threat to human lives, economic development, and the planet earth itself, on which human survival depends.

Managing global warming is a two-fold challenge for most countries: an obligation to mitigate GHG emissions as a contribution to global welfare; and the need to continually adapt to a changing climate. Controlling global warming will require a globally-coordinated effort among all nations. Global mitigation polices and targeted adaptation action plans must be put in place both nationally and internationally to effectively limit the impact of climate change upon the environment, society, and local economies.

As a leading force in international efforts to tackle climate change, the European Union (EU) is committed to becoming a highly energy-efficient, low-carbon economy. It has installed some of the world's most ambitious climate and energy targets to date, which are due to be implemented by 2020, and the EU is the first region to have passed binding legislation to ensure that they are achieved.

The 2013-14 timeframe is an important one for EU member states and the move to low-carbon green growth because preparations are underway for a new EU budget cycle from 2014-2020. The programming in the next cycle of sectoral Operational Programs (OPs) needs to reflect and integrate climate action on mitigation and adaptation. The European Council determined in February 2013 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 strengthening energy security, building a low-carbon, resource efficient and climate resilient economy that will enhance Europe's competitiveness, and create more and greener jobs."

As an EU member state, Romania has made a commitment to combating global warming. It is obligated, under EU membership, to continue to implement climate change measures. 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 which state that emissions from non-ETS sectors cannot be more than 19 percent higher in 2020 than they were in 2005. Furthermore, Romania has committed to achieving, by 2020, a 24 percent share of energy from renewable sources in its gross final energy consumption (up from 18% in 2005).

To better address climate change issues, the Government of Romania (GoR) will need to put forward a comprehensive climate change strategy and a detailed action plan capable of being implemented, develop a strong knowledge base and analytic capacity to assess the cost-effectiveness of both the policy and investment options, put mitigation and adaptation activities into action and build the institutional capacity to implement and support them. It has requested that the World Bank provide technical assistance through its Reimbursable Advisory Service (RAS) Program.

The RAS program focuses on operationalizing its national climate change strategy and action plan (component A), identifying and integrating climate-related actions in new operational programs (component B), building a solid analytical base for impact assessment and climate-related decision-making (component C), and enhancing climate-friendly practices and monitoring systems (component D).

Component B is an urgent request for assistance in preparing the operational programming for EU funds in 2014-2020, particularly in providing recommendations for integrating climate actions into relevant sectoral operational programs in order to meet the EU requirement that 20% of spending tackle climate change. In response to the request, the Bank quickly carried out rapid assessments on climate risks and mitigation and adaptation opportunities in six sectors: energy, transport, urban, water, agriculture, and forestry. This report is a synthesis of component B outputs. It is based on the rapid assessments of climate risks and actions across the six sectors. The purpose of this report is to summarize the findings and present the final recommendations for integrating climate actions into sectoral OPs for EU funds in 2014-2020 for consideration of the GoR.

EU-funded Operational Programming in Romania

Romania needs to prepare for the next EU funding cycle, taking the CC challenges and opportunities to advance its economy towards a competitive, climate-resilient, and low-carbon green economy. In the new EU budgetary cycle for 2014-2020, Romania is expected to invest about €29 billion allocated from European Structural and Investment Funds (ESIF), which include the European Regional Development Fund (ERDF), the European Social Fund

(ESF), the Cohesion Fund (CF), European Agricultural Fund for Rural Development (EAFRD), and the European Maritime and Fisheries Fund (EMFF), plus national co-financing to support the eleven Thematic Objectives of the EU 2020 and Romania's national priorities. Of these Thematic Objectives, two directly target climate change, referring 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).

The EU funds will be allocated through several large sector operational programs (OPs). Each OP is eligible for one or more EU funds under the ESIF umbrella:

- Large infrastructure OP (ERDF and CF) which covers water, transport, energy, waste, etc.
- Regional OP (ERDF) with priority investments in urban and regional development including: local transport infrastructure; urban /local development; energy efficiency, etc.
- Rural Development OP, with priority investments in agriculture and rural development and public infrastructure in rural areas.
- European Territorial Cooperation OPs aiming to fund Territorial Cooperation Programs between Romania, Hungary, and Bulgaria, respectively.
- Human Capital OP (ESF).
- Administrative Capacity OP (ESF).
- Competitiveness OP (ERDF).
- Technical Assistance OP (ERDF).

Concerning Climate Change interventions, attention should be given to OPs on large infrastructure, regional development, and rural development.

It is too early to know the exact allocation of the EU budget by type of fund and thematic objective. From the indicative percentage presented in the draft Partnership Agreements for Romania, the transport sector will take over 20% of the total ESI funds (and over 13% of the Cohesion Fund) under the thematic objective "Promoting sustainable transport and removing bottlenecks in key network infrastructures." The TO of low carbon economy may use up to 10% of the total funds with the majority from ERDF. The budget for CC adaptation is mainly from CF and EAFRD. Although the percentages are indicative and subject to revision during the preparation of OPs, funding availability is one of the determining factors when proposing and integrating climate actions in OPs.

Climate Change Impacts and Sectoral Contributions

Like all countries, Romania is not immune to climate change. 2007 was Romania's warmest year in two decades (average temperature 11.5° C), while the coldest average temperature (8.4°C) 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. The effects of these extreme weather events adversely affected the country through significant economic loss in agriculture transport, energy supply, and water management. In a scenario of increased global warming by 4°C, the situation and impacts of climate change would certainly deteriorate in Romania. Consequently, adaptation to climate change and the mitigation of greenhouse gas emissions are important priorities for Romania.

Romania is also a contributor to climate change through its GHG emissions, despite a significant decrease in GHG emissions due to economic slowdown since 1989. The total emissions of CO2 equivalent without LULUCF for Romania were 123 million tons in 2011, accounting for 2.7 percent of the total EU emissions. The table below shows the sectoral contributions to GHG emissions.

GHG Source and Sink Categories	**Total GHG Emissions in 2011 (CO_2 equiv.)**	**% in Total GHG emissions (without LULUCF)**	**% Changes since 1989 (reference year)**
Energy (including Transport)	86,320.46	69.98%	-54.99%
where Transport	14,577.72	11.82%	-
Industrial Processes (including Solvent use)	12,591.53	10.21%	-59.67%
Agriculture	18,941.46	15.36%	-53.50%
Forestry	-23,353.01	-	-
Other Land Use (without Forest)	-1,951.93	-	-
Waste	5,366.48	4.35%	+14.91%
Total CO_2 equivalent with LULUCF	98,040.60	-	-
Total CO_2 equivalent without LULUCF	123,345.54	100%	-54.86%

Across sectors, energy contributes to about 70% of GHG emissions and is doubtlessly the priority sector for mitigation. The transport sector, although attributing only 12% in total

GHG emissions so far, has been increasing rapidly—up 36% since 1990. This upswing trend remains likely in the future, and the sector, especially road transport, deserves full attention in terms of containing GHG emission growth. The urban sector is where 56% of the population and the majority of economic activities are located. It is a diverse and complex area for a wide range of both mitigation and adaptation opportunities, from building energy efficiency and urban transport, to solid waste management, water, and sanitation.

The agricultural sector remains traditional and dominant in the Romanian economy in terms of land occupation and population. Over 15% of total GHG emission is attributable to agriculture, and the sector is also very vulnerable to CC. It is an important sector to factor into the potential for adaptation actions. Like the ARD sector, the water sector is vulnerable to global warming which is likely to result in changes in precipitation, river flows, water supply, and patterns of floods and droughts. Thus water is another key sector for introducing adaptation measures to climate change. As a major sink of GHGs, the forest sector offers a range of forest-based mitigation measures such as conserving existing CO2 sinks, enhancing carbon sinks, and reducing the trade-off between the sinks and the tangible and intangible benefits from other land uses. Romania's rich forest sector represents major carbon sink with an increasing role to play in CC.

Sectoral Recommendations

The following sections highlight key recommendations for climate actions by sector.

Energy

As a sector accountable for 70% of the total GHG emissions in Romania, energy is the most important sector for GHG mitigation. While the sector has contributed about 70% of the overall GHG emissions reduction achieved during 1989-2011, continued de-carbonization of the energy sector, through low-carbon power and heat supply options and improved efficiency in energy conversion, transmission, distribution and consumption, is essential to Romania's climate change mitigation agenda. This will require a substantial increase of energy efficiency investments and clean energy solutions, implementation of energy sector reforms which enable financing and sustainability, and putting an institutional framework in place for delivering sustained energy efficiency improvements. For the 2014-2020 period, the following priorities have been identified:

Investing in energy efficiency and clean energy solutions by both public and private sectors: (1) scale up thermal retrofit of "blocks of flats," in particular apartment buildings constructed during the 1950s and 1990s; (2) modernize and commercialize economically viable district heating systems; (3) reduce energy intensities in chemical and steel manufacturing; (4)

address highly disaggregate energy efficiency investments, such as high-efficiency appliances, through energy efficiency obligations; (5) expand the balancing infrastructure for integrating increased wind and solar generation capacity; (6) increase high-efficiency gas-fired generation capacity; and (7) modernize the electricity distribution network.

Implementing energy sector reforms and improving sector governance: (1) Resume the implementation of the 2003 Road Map for the Energy Field: a balanced strategy of attracting private sector investment and developing viable public sector energy companies; (2) Improve governance of energy SOEs in accordance with OECD best practice for transparency and accountability; (3) Rebuild the energy regulator ANRE's capacity, autonomy and accountability; (4) Improve inter-ministerial coordination of energy functions across the Government; and (5) Improve institutional set-up and governance arrangements for business environment functions in accordance with good international practices for regulatory management systems.

Creating an institutional framework for delivering sustained energy efficiency improvements: (1) plug gaps in policies and regulations, in particular, addressing price subsidies and the enforcement of codes and standards; (2) strengthen institutions, especially the authority and accountability of the national entity with an energy efficiency mandate; (3) establish long-term financing and delivery platforms for thermal retrofit of residential buildings; (4) improve access to finance, especially mechanisms which support access to EU co-financing; (5) develop technical the capacity of key energy efficiency market participants, such as end users, energy managers/auditors, banks, and energy service providers; and (6) increase information, data gathering and outreach to all stakeholders.

Transport

The transport sector, although attributing only about 12% in total GHG emissions so far, has been increasing rapidly—up 36% since 1990. While this is smaller than the EU's average of 20.2 percent, it is rising more quickly than the EU average. This upswing trend remains likely in the future, which makes the sector a key priority to containing GHG emission growth. Among the different transport modes, road transport is the source of the largest majority of GHG emissions in the transport sector, being responsible for 93 percent of domestic transport emissions.

Transport is the priority sector in OPs since it will utilize the largest share of ESIF in the 2014-2020 budgeting cycle. It is also where many large and climate friendly investment options, such as railways, inland waterway transport (IWT), ports, multimodal transport, and urban public transport, exist.

With regard to mitigation, the most pressing action is to develop a methodology for measuring emission intensity per passenger-km and ton-km for different transport modes, different technologies and under different operational conditions, in order to be able to prioritize investments, monitor GHG emissions by mode, and assess the impact of measures that will be undertaken to reduce the growth of GHG emissions. At present such an information base is absent. A second urgent priority is implementing policies that ensure improved performance of the rail infrastructure managers and public rail operators—including allocating funding to maintain infrastructure investments—so that investments in rail infrastructure financed under the Operational Programs translate into higher ridership and higher ton-km of freight transported in the rail network, contributing to a modal shift. A third priority is to launch a series of studies aimed at (a) reviewing fiscal measures to influence private car purchase and use; (b) assessing options in using alternative fuels; and (c) measures to encourage freight haulers to accelerate the adoption of lower-emission vehicle technology; and (d) the potential role of 'harder' demand management measures to address congestion and emissions in Romanian cities. Reducing the growth rate of emissions from the road sector is critical for decelerating the transport sector's emission growth. This will require changes in pricing and other policies—but the critical step is launching studies that will guide policy choices to be implemented over the 2014-2020 period and beyond.

Adaptation to climate change is a key requirement for Romania's transport sector in the future. It needs to become an integral part of all transport sector activities, and become embedded in the day-to-day thinking of people working in the sector. The starting point for adaptation work in the transport sector is to conduct sectoral or agency level Vulnerability Assessments in order to identify the relative vulnerability of assets and services to the impacts of climate change—through the development of vulnerability maps, among other things—in order to define short-term, medium-term, and long-term adaptation actions for implementation.

Urban

In Romania, roughly 56% of the country lives in urban areas, meaning this is where the majority of the country's GHG emissions are likely concentrated. Romanian cities are also where the impacts of climate change are likely to be felt more strongly, although gaps in knowledge make it difficult to predict with great certainty what the exact impacts will look like or how circumstances may vary in different parts of the country. In the 2014-2020 EU budgeting period, the Romanian government would benefit from investments aimed at deepening local understanding about what can be done to reduce GHG emissions in cities, and how to better prepare cities for the likely impacts of climate change. There is already a

base of work in both cases that can be built on from planning activities based on participation in the EU's Covenant of Mayors program, and local disaster planning efforts. In expanding this work, the Government of Romania and local authorities are advised to ensure that this work links to efforts to craft integrated urban development strategies, which have strong influence over infrastructure investment and land use development decisions.

Obviously, the majority of urban GHG emissions come from the transport and energy sectors, with a much smaller fraction of emissions associated with water supply and treatment facilities and the solid waste sector. In all cases, investments can be made that would enhance local system climate resilience and reduce local GHG emissions. Recommended priorities for the 2014-2020 OPs include:

Urban Transport Sector: The government is currently supporting the development of sustainable urban mobility plans which will inform future investment priorities in public transportation and pedestrian and bicycling infrastructure. In most cases, however, these investments will be aimed at reducing local traffic congestion, with GHG emission reductions a co-benefit rather than a primary goal. Technical and engineering studies should be undertaken to better assess how the existing road and public transport networks in cities will be affected by climate change.

Urban Energy Sector: The most important urban energy system changes must occur in the district heating sector, which has witnessed a dramatic decline in use over the past 15 years. Investments going forward should include strategic reviews of how to reduce costs and improve district heating system service quality; support for investment in cogeneration facilities, and investment in building energy efficiency upgrades.

Urban Solid Waste Sector: Collectively, solid waste disposal facilities around Romania generate roughly 2% of national GHG emissions. The majority results from the country's overwhelming reliance on landfilling as its primary waste management strategy, as organic waste buried in landfills converts to methane, a potent greenhouse gas. EU accession rules thus require the diversion of most organic waste away from landfills, requiring that Romania invests in composting, anaerobic digestion and recycling facilities. New collection network investments can ensure a high quality feedstock for these facilities.

Urban Water Sector: Urban water supply and treatment systems contribute little to Romania's overall GHG emissions picture. There is nonetheless room for improvement by accelerating the energy efficiency of utility operations, reducing current high water loss levels and reducing methane emissions from wastewater treatment facilities. Some system upgrades were funded during the 2007-2013 Operating Program period as part of efforts to

help Romania address its historically poor surface and ground water quality. These should continue to be prioritized during the new Operating Program period.

Water

With 40 billion cubic meters (BCM) per year of total utilizable water resources and a total current water demand of 8 BCM/year for its population of 20 million, Romania has adequate water resources in terms of average per capita availability. However there are significant inter-annual variations in the availability of water resources, and also significant variations between the basins, with the Jiu, Arges-Vedea, Buzau-Ialomita, Siret, Prut-Barlad, and Dobrogea-Littoral basins facing the most serious water scarcities. Current water demands come from industry (67%), agriculture (18%), and municipal needs (15%). Compared to the European annual average of 4500 cubic meters per capita, Romania's water availability stands at 2000 cubic meters per capita per year.

Climate change is likely to result in decreases in annual mean precipitation and in annual mean river flows, and seasonal changes in water supply. 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. These floods, and storm-water infiltration, may impair wastewater treatment in sewer systems. Energy supply may also be compromised by both intense floods and adversely dry summers, which would hamper energy generation from hydropower plants. Both are common climate-change related risks.

Priority actions are recommended for addressing the identified risks and opportunities related to climate change from an integrated, multi-sectoral water resources perspective, despite limitations in the quantitative estimates of climate change impacts on Romanian river basins and a thorough economic analysis to prioritize the recommended actions. Nonetheless, some obvious "no-regret" actions have been identified, with the recommendation that they be initiated as soon as possible, given the strong need and their significant benefits. The recommendations as highlighted below also include some investments (such as those in rural water supply and flood management) which do not directly seem to be related to climate change, but which can be validly considered to be a part of the adaptation response and thus may be eligible for climate change-related funding from the EU programs.

Quantitative assessments of water availability and management options. These recommendations include studies of climate change impacts on hydrology; assessments of the specific levels and types of irrigated agriculture that can be sustained in each of the river basins; analyses of the technical options and economic returns of converting pumped-

irrigation to gravity-based schemes; assessments of water demands and supply reliability for all of the main WSS utilities; assessment of the feasibility of desalinization for provision of drinking water supplies in water-scarce coastal basins; and assessment of the feasibility of using aquifers coupled with artificial recharge for inter-annual water storage in water-scarce basins.

Regulations and policies to increase water use efficiency and protect water supplies. Specific actions include establishing requirements that River Basin Management Plans (RBMPs) are updated with the results of quantitative climate change assessments; large industrial water users are supplied through utility lines instead of private groundwater wells; flood risk assessments are introduced into the regional development and general city planning processes; encouraging wastewater reuse in irrigation, especially in water-scarce basins; and protecting critical water supply sources (reservoirs or aquifers) through land use zoning measures in water-scarce locations.

Pilot projects for enhanced irrigation and water resource management, including pilots that test different models of efficient irrigation systems coupled with climate-smart agriculture practices; and pilots on suitable co-benefit models of natural resource management in forest catchments and wetland fisheries.

Investments in infrastructure to reduce disaster risk and safeguard supply. The investments include infrastructure for flood management on the basis of updated flood hazard/risk mapping and infrastructure to ensure water supplies and wastewater provisions for 263 municipalities that have more than 10,000 inhabitants by 2015 (and for 2,346 smaller townships with 2,000 - 10,000 inhabitants by 2018).

Agriculture and Rural Development

As a diverse and complex system with much variability in socio-economic context and institutional capacity, the ARD sector in Romania is facing a significant uncertainty and a huge challenge in addressing climate change. But uncertainty does not mean that action should be postponed and there is an immediate opportunity to embed climate action in the programming of the NRDP 2014-2020 which must be acted upon fully and effectively. Two immediate priorities for support under the NRDP 2014-2020 are: 1) education and training to improve awareness of climate change among farmers and rural communities, and; 2) the targeting of advisory / extension support on climate change mitigation and adaptation across the whole of the sector.

Although Romania has seen a significant reduction in GHG emissions from agriculture in recent years, there remains the very real possibility that emissions will increase again as the agricultural economy improves. The NRDP 2014-2020 can offer a mix of investment support and other policy incentives that can help to balance the need to limit / cap GHG emissions with the inevitable longer-term demands upon agriculture for increased food production. This includes promoting: a) technologies and farm management practices which directly contribute to reducing emissions through improvements in efficient use of energy, and the better management of carbon and nitrogen flows in the agricultural ecosystem; b) increased carbon sequestration (plus the reduction of soil carbon losses) through the afforestation of low quality and unproductive land and the increased adoption of organic farming and zero / conservation tillage techniques, and; c) the production of renewable energy including energy crops; rural biogas production from livestock manure, and; investment in the small- and large-scale technologies available for solar and wind power generation.

At the same time, adaptation is a very high priority as progressive climate change is occurring and significant impacts upon the ARD sector are developing with the expectation that the livelihoods of many rural people will be increasingly vulnerable to the accompanying risks: severe flooding; drought; soil erosion by wind and water; and the extreme land degradation associated with desertification. The sector needs to start responding more rapidly to prepare for future impacts and there is a need to build both the resilience and adaptive capacity of the two ARD sub-sectors that exist – namely, the large commercial farms and communities of small-scale subsistence farms.

An immediate priority that can be supported under the NRDP 2014-2020 is on-farm investment in economically viable and environmentally-sustainable irrigation systems in the most vulnerable regions where the occurrence of drought is predicted to be most frequent and intense. Related to this, the NRDP 2014-2020 also supports the introduction of risk management tools – notably the setting-up of farmers' mutual funds for stabilizing incomes - that can underpin the confidence of farmers to continue managing and investing in their farms in the face of the uncertainty associated with extreme weather events.

A less tangible, but equally important priority is the need to utilize a range of policy tools to build the long-term resilience and adaptive capacity of farmers and rural communities to the risks and uncertainties of climate change. This is a complex proposition that includes encouraging the adoption of appropriate technologies and practices, as well as promote and foster innovation, co-operation and other bottom-up initiatives amongst local communities, including farmers and other businesses.

These climate-related actions present a major challenge to the ARD sector in terms of science, policy and practice. Further work is needed to develop greater understanding of the economic feasibility and cost-effectiveness of the various mitigation and adaptation actions that are appropriate to the Romanian ARD sector. And ultimately a more strategic approach is needed that reconciles and integrates the climate challenges faced by the ARD sector with the need to also significantly reform the sector towards a more export-driven, high-value and climate-resilient agriculture, with rural living conditions more closely aligned to urban.

Forestry

Rich in forests, Romania's forest sector is a major sink of GHGs. The sector is responsible for nearly 10% of reduction in total GHG emissions of the country.

The forest sector offers opportunities for actions that contribute to mitigating climate change. Investments and technical assistance support sustainable management of production and the protection of forests, and can enhance the forest system's resilience to climate change. These actions also offer climate relevant co-benefits including enhancing the resilience of other sectors (e.g., agriculture) to climate related disasters, restoring degraded lands, and providing a source of low carbon renewable energy for rural areas, creating employment opportunities, and contributing to economic growth. Sustainable forest management (SFM) and afforestation are instrumental for complying with Romania's EU directives.

Measures for enabling SFM and afforestation reflect important areas of intervention in the short and medium term. They include, for example, adopting new technologies, targeted rehabilitation of forest roads, revising the regulations on forest management and harvesting, providing technical assistance to small forest owners, improving information on forest resources and forest land ownership, providing appropriate incentives for afforestation and the protection of forests. Several of the measures (with the exception of the measure on Natura 2000), however, require additional funding to bridge the gap between the current situation and optimal potential of the measures.

The proposed measures and funding requested for the forest sector will help Romania comply with the EU requirement that 20% of the EU funds be spent on measures that have positive climate relevance. They also help meet the requirement that 30% of NRDP resources be used for climate positive actions. The use of funds from the NRDP and other relevant OPs (e.g., the environment portion of the large infrastructure OP) for investments and technical assistance in the forest sector are "no regret" actions. The forest sector offers numerous opportunities for adaptation-based mitigation and synergies with other sectors. Key sectors for coordination include agriculture, energy, water and infrastructure.

Limitations and Moving Forward

Due to limited time, rapid assessments have drawn on available documents, data sets, and discussions as well as consultations with key stakeholders in Government ministries, institutes, and companies. They have also drawn on the information and experiences of other countries, both within the EU and around the world. However, because there remains a lack of cost-benefit analysis in many cases to help prioritize interventions, and virtually no quantitative sectoral and macro-economic models for impact assessment, many recommendations for climate actions are still qualitative and indicative and more attention should be given to cross-sectoral issues.

The Romanian government's process of preparing OPs has been running behind the original schedule. At the time that the six sector rapid assessments were conducted, none of the draft OPs were prepared and made available, neither was the National Rural Development Plan. In the transport sector, the General Transport Master Plan (GTMP), an ex-ante conditionality of the European Commission for transport interventions to be financed from the Operational Programs, was not yet finalized. As a result, the World Bank team could not directly help review the specific interventions proposed for operational programs or plans, or provide comments and suggestions on how to integrate climate actions into them as requested. This report remains a work in progress. The set of sectoral recommendations therefore are generic.

Nevertheless, the report, together with the six sector reports on which it is based, presents rich information on the links between sector interventions and climate change and provides Romania with many practical recommendations. It will be a good starting point for the government to use as they begin to consider integrating actions that address climate change into the operational programing for EU funds in 2014-2020.

Moving forward, the World Bank will continue to advise the government units and their consultants on how to integrate climate-related recommendations into the OPs when the draft OPs become available for review. As outlined in the climate change program, the World Bank will continue the analysis through in-depth sectoral analysis and modeling across the six sectors, further identifying and prioritizing a wide range of interventions addressing climate change, and will further assist the Romanian government in developing an action plan for addressing climate change and operationalizing its national climate change strategy.

The program's next step is to carry out in-depth sectoral analysis and modeling to further help Romania validate and prioritize these recommendations and propose strategic measures and actions for fighting climate change.

1. INTRODUCTION

1. Tackling the destructive effects of global warming is now a global priority. Despite ongoing global efforts to combat global warming, it is widely accepted that the average global temperature will continue to rise at an accelerated speed in coming decades. This increased warming, largely attributed to the rise in greenhouse gas (GHG) emissions caused by human activity, will have far-reaching impact on the earth's climate patterns and will pose a serious threat to human lives, economic development, and to the earth itself, on which human survival depends.

2. 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. It requires a global and well-coordinated effort among all nations. Global mitigation polices and targeted adaptation action plans must be put in place nationally and internationally to effectively limit climate impacts on the environment, society, and economies.

3. As a leading force in international efforts to tackle climate change, the European Union is committed to becoming a highly energy-efficient, low-carbon economy. It has installed some of the world's most ambitious climate and energy targets for 2020 and is the first region to have passed binding legislation to ensure that they are achieved.

4. As a member state of the European Union, Romania has also made a commitment to combating global warming. It is obligated to continue to implement climate change obligations due to EU membership. 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 that emissions from non-ETS sectors cannot be 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).

5. The period of 2013-14 is an important one for EU member states and the move to low-carbon green growth because of the preparation of a new EU budget cycle in 2014-2020. 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 determined in February 2013 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 strengthening energy security, building a low-carbon, resource efficient and climate resilient economy that they will enhance Europe's competitiveness and create more and greener jobs."[1]

6. Romania needs to prepare for the next EU funding cycle, taking the CC challenges and opportunities to advance its economy towards a competitive, climate resilient, and low-carbon green economy. To do this, the Government of Romania (GoR) will 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 of both policy and investment options, put mitigation and adaptation activities into action, and build institutional capacity to implement and support it.

7. To complement the efforts of the EU and other multilateral agencies, and in response to a 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.

8. This report is a synthesis of component B outputs. It is based on the rapid assessments of climate risks and actions in six sectors—energy, transport, urban, water, agriculture and forestry—conducted under component B. The purpose of this report is to summarize the findings and present the final recommendations for integrating climate actions into sectoral OPs for EU funds in 2014-2020 for consideration of GoR.

[1] European Council, "7/8 February 2013 Conclusions on Multiannual Financial Framework," European Council, Brussels, 8 February 2013 (EUCO 37/13).

9. The report is structured as follows. After the introductory section, Section 2 provides an overview of climate change and its implications on the EU and Romania. Relevant EU strategies, policies and operational requirements for climate actions are reviewed in Section 3, and Romanian national CC strategies, policies, and targets in Section 4. Section 5 looks at the structure of sectoral operational programs for EU funds in 2014-2020. Section 6 presents the rapid assessment findings and recommendations in the energy, transport, urban, water, agriculture and forestry sectors. Concluding remarks are in Section 7.

2. CLIMATE CHANGE AND ITS IMPLICATIONS ON ROMANIA

Global Trend

10. Despite some arguments to the contrary, the preponderance of evidence says humans are the main cause of global warming. According to a recent assessment of the Intergovernmental Panel on Climate Change (IPCC, 2013), "each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850."[2] 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.[3] Tackling the destructive effects of global warming has become a global priority.

11. This increased warming, largely attributed to the rise in Green House Gas (GHG) emissions caused by human activity, will have a far-reaching impact on the earth's climate patterns and pose a serious threat to human lives, economic development and to the earth itself, on which human survival depends. Although it is imagined that "most aspects of climate change will persist for many centuries even if emissions of CO2 are stopped,"[4] global mitigation polices and targeted adaptation action plans must be put in place to effectively limit the impact of climate on the environment, society and economies.

12. 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[5].

[2] Working Group I Contribution to the IPCC Fifth Assessment Report, Climate Change 2013: The Physical Science Basis, Summary for Policymakers
[3] World Bank, (2012), "Turn down the heat. Why a 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
[4] Ibid
[5] http://www.edf.org/climate/climate-change-impacts

13. This situation poses a two-fold global challenge: an obligation to mitigate GHG emissions as a contribution to global welfare, and the need to adapt to a changing climate.

14. The impact of climate change varies from one region to another, a fact that is driven, among other things, by the geological characteristics of the regions, the uneven distribution of solar heating, and the interactions between the atmosphere, oceans, and land surface. Some regions will warm much more than others and some will receive more rainfall, while other regions will be exposed to more frequent droughts. Due to these regional variations, it is necessary to implement a targeted approach to addressing climate impact.

15. Like other regions of the world, Europe is experiencing the effects of climate change. Over the last decade, the average temperature over land in Europe was 1.3°C above pre-industrial levels, making it the warmest decade on record[6]. Observed effects across Europe include: an 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.

Implications on Romania

16. Like all other countries, Romania is not immune to change. 2007 was Romania's warmest year in two decades (average temperature 11.5° C), while the coldest average temperature (8.4°C)[7] 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[8]. The effects of these extreme weather events adversely affected the country through significant economic loss in agriculture, transport, energy supply, and water management. In a scenario of increased global warming by 4°C, the challenges and impacts of climate change would be certainly deteriorated in Romania. Consequently, adaptation to climate change and the mitigation of greenhouse gas emissions is an important priority for Romania.

17. Romania is also a contributor to climate change through its GHG emissions, despite a significant decrease in GHG emissions due to economic slowdown since 1989. Total

[6] 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
[7] 5th National Communication of Romania, (2010), Ministry of Environment and Forests, Bucharest
[8] Ibid

emissions of CO_2 equivalent without LULUCF for Romania were 94 million tons in 2011, accounting for 2.7 percent of the total EU emissions. The table below shows sectoral contributions to GHG emissions across the country in 2011.

GHG Source and Sink Categories	Total GHG Emissions in 2011 (CO_2 equiv.)	% in Total GHG emissions (without LULUCF)	% Changes since 1989 (reference year)
Energy (including Transport)	86,320.46	69.98%	-54.99%
where Transport	14,577.72	11.82%	-
Industrial Processes (including Solvent use)	12,591.53	10.21%	-59.67%
Agriculture	18,941.46	15.36%	-53.50%
Forestry	-23,353.01	-	-
Other Land Use (without Forest)	-1,951.93	-	-
Waste	5,366.48	4.35%	+14.91%
Total CO_2 equivalent with LULUCF	98,040.60	-	-
Total CO_2 equivalent without LULUCF	123,345.54	100%	-54.86%

18. It is evident that the energy sector contributes about 70% of GHG emissions and should be the priority sector for mitigation. The transport sector, although attributing only 12% in total GHG emissions so far, has been increasing rapidly—up 36% since 1990. This trend towards upswing remains likely in the future and the sector should have our full attention for containing GHG emission growth moving forward. The urban sector is where 56% of the population and the majority of economic activities are located. It is a diverse and complex area for both mitigation and adaptation. The agricultural sector remains traditional and dominant in the Romanian economy in terms of land occupation and population. Over 15% of total GHG emission is attributable to agriculture, and the sector is also very vulnerable to CC. It is an important sector to factor into the potential for climate actions. Romania's forest sector, rich in forestry resources, represents major carbon sink with an increasing role to play in CC.

19. Romania has the lowest energy consumption per capita in the EU, but one of the highest energy intensities.[9] 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

[9] International Energy Agency (IEA Statistics © OECD/IEA, http://www.iea.org/stats/index.asp), Energy Statistics and Balances of Non-OECD Countries.

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.

20. The Government of Romania, together with the European Union and other multilateral agencies, is working collaboratively to help develop and integrate mitigation and adaptation measures into Romania's national policies, plans, programs, and strategies which would thereby shift its development path towards a climate resilient, low-carbon green economy.

3. EU REQUIREMENTS FOR CLIMATE CHANGE

21. The EU has taken a leading role in terms of adaptation, and the Commission is providing guidelines for formulating adaptation strategies designed to help EU countries develop, implement and review their adaptation policies.[10] 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 to step up adaptation action in Europe. (2013-2020). It is actively engaged internationally in climate change negotiations and in supporting partner countries in implementing adaptation and mitigation strategies through active programs such as the EU's Global Climate Change Alliance.[11] [12]

EU Climate-related Targets

22. The targets and policies related to these climate change obligations are primarily articulated in three major EU policy documents: (i) The Energy Package, (ii) Europe 2020 and (iii) The Roadmap for 2050. A range of EU policy and regulations further supports the implementation of both adaptation and mitigation measures.

23. Europe 2020. Europe 2020 is the major policy framework for EU policy from 2014-2020. It promotes smart, sustainable, and inclusive growth, and establishes measurable EU targets in five key areas including specific targets related to climate change and energy (target area 3). The strategy and associated targets address two dimensions of climate change 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. It also outlines seven flagship initiatives the European Commission supports to catalyze progress in these areas. The flagship initiative on "Resource efficient Europe" 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 which involves reduction of emissions of greenhouse gases to 80-95% below 1990 levels.[13]

[10] http://ec.europa.eu/clima/policies/eccp/

[11] http://www.gcca.eu/sites/default/files/GCCA/gcca_brochure_2012_eng_pdf_lo_0.pdf

[12] European Commission (2013a) Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee and The Committee of the Regions: An EU Strategy on Adaptation to Climate Change

[13] European Commission (2010). Europe 2020: A strategy for smart, sustainable and inclusive growth.

24. The 20-20-20 Target. The EU's climate and energy package outlines the "20-20-20 targets." It 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 also offered to increase its emissions' reduction to 30% by 2020 if other major emitting countries in the developed and developing world commit to tackle their fair share of a global emissions reduction effort.[14] In Romania, these targets translate into a power generation mix aiming to achieve a 38% renewable energy generation share by 2020, with gross final energy consumption containing 24 percent of energy from renewable resources (up from 18% in 2005), and targeted energy intensity improvements of 1.5 % p.a.[15]

25. The 2050 Roadmap. In a longer term perspective, the European Commission's "Roadmap for Moving to a Competitive Low-Carbon Economy in 2050" is a long-term policy plan suggesting that the EU cut its emissions to 80 percent below 1990 levels by 2050, with interim milestones of 40 percent cuts by 2030 and 60 percent cuts by 2040. It proposes how the main sectors responsible for Europe's emissions--power generation, industry, transport, buildings and construction, and also agriculture--can cost-effectively make the transition to a low-carbon economy. 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.

26. The European Commission also recently proposed scenarios for 2030 targets as an intermediate step between the 20-20-20 goal of 2020 targets and the ambitious 80 to 95% reduction objectives of the 2050 Roadmap. These targets were first proposed in a green paper of the Commission published for consultation in March 2013. This proposal includes specific targets of 40% reduction in GHG emissions, and higher shares of renewable energy (around 30%), energy efficiency improvements and better and smarter energy infrastructure in

COM(2010) Communication from the Commission: Brussels, European Commission. http://ec.europa.eu/europe2020/index_en.htm

[14] European Commission (2013b) Europe 2020 Targets: Climate and Energy.http://ec.europa.eu/europe2020/pdf/themes/16_energy_and_ghg.pdf

[15] European Commission (2013c) Recommendation for a Council Recommendation on Romani's 2013 national reform programme and delivering a Council opinion on Romania's governance programme. COM (2013) 273. Final. Brussels, European Commission.

investments by 2030. While there are no country specific targets proposed so far, some EU countries, e.g., the EU "Green Growth" group, have called for an ambitious EU emissions reduction offer to be put on the table. Under the United Nations Framework Convention on Climate Change (UNFCCC), many Parties have put forth both emissions reductions targets and actions for negotiation in the year 2020. The 2030 targets proposed by the EU could be viewed as ambitious.

Other Related Regulations and Policies

27. Beyond the above-listed policies there are a range of EU related policies and recommendations 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 diversion of 65% of organics and 50% of recyclables by 2020.

28. Broadly speaking, EU policies and regulations related to climate change 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; and (7) fluorinated gases.

Climate Related Financing

29. In the forthcoming 2014-2020 financial perspective, Romania is expected to receive an allocation of about €29 billion 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. Improved access to funding will be a critical factor in building a climate-resilient economy. The 2014-2020 Multi-annual Financial Framework (MFF) adopted by the European Council in February 2013 requires increasing climate-related expenditures to at least 20% of the EU spending as a political objective.

30. The EC Implementing Regulations with the methodology for tracking climate related expenditure (and other implementing regulations) for the five ESI funds are under preparation and will be published in the spring of 2014. A target of 20% climate related expenditures will be integrated into detailed annual budgets. Romania and other less-developed Member States have the legal target of a minimum of 12% of ERDF for low-carbon thematic objective (TO), i.e., TO 4, but are expected to reach 20% on climate related expenditures for the five ESI funds either by spending more on TO4 or by including TO5 (adaptation) and through the mainstreaming of climate action across the remaining eleven thematic objectives. The mainstreaming of climate action is being emphasized by the

Commission in the dialogue with Member States on the Partnership Agreements and fund-specific programs.

31. While there is no internationally agreed definition of climate-related financing to date, two approaches coexist and efforts are made towards greater harmonization. **The Rio Markers for Climate Change** were established by the OECD Development Assistance Committee (DAC) to track aid flows targeted at climate action, There is one marker for mitigation (data available from 1998 onwards) and one for adaptation (data available from 2010 onwards). The Rio Markers for Climate Change allow an approximate quantification of climate-related aid flows based on aid activity objectives. Activities (and related funding) are tagged following a three-tiered scoring system:
    - "Principal objective": promoting mitigation or adaptation is one of the principal reasons for undertaking the activity;
    - "Significant objective: activity has other prime objectives, but has been formulated or adjusted to help meet climate concerns;
    - "Not targeted": activity found not targeted to the policy objective (adaptation or mitigation).

    Data on funding for principal and significant objectives should be shown separately and the sum referred to as the "estimate" or "upper bound" of climate-change-related aid.

32. **The Multilateral Development Banks' (MDBs) Joint Approach on Climate Finance Reporting** builds on Rio Markers for Climate Change, using similar definitions and eligibility criteria for adaptation and mitigation. Yet the approaches diverge as the Rio Markers are based on the objectives of a project while the MDB approach is based on the activities the project promotes. It thus adds granularity to the Rio Markers, as it goes beyond the project objective and examines activities the project supports, at the most detailed level of financing information available.

33. To assist Member States to calculate the 2014-2020 budgetary spending on climate actions, the EC has prepared a draft methodology for tracking climate change-related expenditures in its Guidance Fiche No. 2 "Implementing Act on the Nomenclature of Categories of Intervention and the Methodology for Tracking of Climate Related Expenditure Under Cohesion Policy." The document is currently in a provisional phase with on-going consultation with Member States and should be finalized in 2014. It provides information on the support for climate change objectives using methodologies based on the categories of intervention or measures adopted by the EC. More information on the categories of interventions by sector and their coefficients for the calculation of support to the climate change objectives can be found in this report's Annex.

34. Despite the methodology and co-efficiencies the EC is proposing its' member states use to calculate the percentage of climate-related expenditures, it is essential for a country to fully understand the climate risks it is facing and the links between its proposed EU-funded investments and GHG mitigation and/or in-country adaptation to climate change. Also, the contributing share of a particular intervention category on mitigation and adaptation varies from region to region and country to country. Therefore, the rapid assessments carried out under Component B are necessary to help the Romanian government understand the climate change impacts of its proposed investments for EU-funds in 2014-2020 and to better prioritize them in the OPs.

4. NATIONAL STRATEGIES, LEGISLATIVE AND POLICY FRAMEWORK, AND ORGANIZATIONAL SETUP FOR ADDRESSING CLIMATE CHANGE IN ROMANIA

35. Romania has been actively participating in global efforts to address climate change. In February 2001, the country ratified the Kyoto Protocol (KP) (Law 3/2001) becoming the first country listed in Annex 1 of the United Nations Framework Convention on Climate Change (UNFCC) to do so. Through early ratification of the KP, Romania committed to reducing GHG emissions and also showed global leadership in responding to climate change. Since then, the Government has been working to develop and implement coherent policies on climate change with yearly reporting of GHG emissions and also to translate EU-specific legislation into a national context.

36. European integration has been an important political objective of all Romanian governments and political parties since the country formally submitted the application for accession to the European Union on June 22, 1995. In the year 2000, a significant effort was made to draft the country's accession strategy into the EU. Romania signed the EU Treaty of Accession on April 25, 2005 and became a member state in 2007. Since joining the EU, it has implemented a series of climate change policies including the development of the National Strategy and Action Plan on Climate Change, the implementation of the EU Emissions Trading Scheme, and the successive energy and climate change packages.

National Targets and Strategies

37. As an EU member state, Romania has committed to taking climate action. The following table summarizes the EU-20-20 targets and Romania's 2020 agreed targets as well as its current status.

	Greenhouse Gas Emissions	**Renewable Energy**	**Energy Efficiency**
EU 2020 target	Reduce emissions 20% by 2020, compared to 1990	RE sources contribute to 20% of final energy consumption	Reduce primary energy consumption from the baseline by 20%
Romania 2020 target	Reduce emissions 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)
Romania actual status in 2012	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

38. The first national strategy and action plan for climate change was completed in 2005, covering the period 2005-2008. The strategy focused on several KP and UNFCCC requirements as well as EU legislation. The strategy had five main objectives: (i) establishing the legal framework and improving the national system for the estimation of anthropogenic emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol, and establishing the National GHG Inventory; (ii) 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; (iii) 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; (iv) setting up national procedures for promoting JI projects under Track I and Track II, allowing project developers greater flexibility in preparing project documentation and providing a shorter approval process; and (v) establishing the national Guidelines on Adaptation to Climate Change, designed to address the challenges of adapting to the impacts of climate change.

39. EU directives associated with the implementation of the EU-ETS mechanism (2003/87/CE and 2004/104/CE) have been transposed and implemented in the national Romanian context. A national allocation plan was completed for 2007 as well as for the second period of the EU-ETS (2008-2012). Furthermore, the EUA (EU emission allowances) market was created on a platform of energy market trading (OPCOM) This market remains operational. A number of Joint Implementation (JI) Projects were undertaken in parallel (about 24) leading to a sizeable quantity of Emission Reduction Units (ERU's). Romania is currently implementing the 3rd energy and climate change package of the EU and is in the process of enhancing its capabilities for emission evaluation and prediction as well as the associated institutional framework.

40. In July 2013, the Romanian Government approved a 2013-2020 National Climate Change Strategy with both adaptation and mitigation components. Mitigation actions are elaborated for 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 Strategy's adaptation component 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 also identifies adaptation measures to guide the development of policies for the above-noted sectors. They include (i) integration of measures for adjustment to the effects of climate change at the time of implementation, and the amendment of current and future legislation and policies; (ii)

revision of all national strategies and programs to include a requirement for the adjustment of sector policies; (iii) public awareness and development of communication that will help implement adaptation measures at a local level.

Legislative and Policy Framework

41. As a signatory country of UN treaties and an EU Member State, the regulatory and policy framework for environment and climate change in Romania has been developed to be in compliance with UNFCCC and Kyoto Protocol requirements as well as with EU legislation. National legislation can be divided into the following categories:

    a) legislation on emissions inventory: aimed at covering the types of emissions and evaluation methods as well as the institutional entities involved, the information (data, terms, etc.) to be reported, and the assembly of the reporting documents.
    b) legislative framework to coordinate and support activities related to participation in the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol: including the JI project cycle and founding of the National Commission on Climate Change as well as the conditions needed to trade assigned amount units and associated institutional responsibilities.
    c) EU-ETS related legislation: covering the transposed specific EU directives and the setup of the Register of Emissions as well as the norms for trading commercial operators for the power market in Romania and other market platforms.
    d) monitoring and verification: including primary and secondary legislation that ensures compliance with the requirements of UNFCCC and EU.

Organizational Setup

42. The Government of Romania's organizational setup for tackling climate change has been constantly evolving. At present, the Ministry of Environment and Climate Change (MECC) is the authority responsible for coordinating climate change policies and programs at the national level. MECC was reorganized by GD No.48/2013, an act that restructured the organization and operation of the Ministry of Environment and Climate Change, and modified some legal acts related to environment protection and climate change. MECC is also the coordinator of the National Commission on Climate Change (NCCC). Established under GD No. 658/2006, the NCCC was given a role in coordinating across various government ministries and agencies. Established in 2006 NCCC has been operating only on an ad-hoc basis, mainly for the approval of Joint Implementation Projects. Beyond that, NCCC has been inactive. MECC is now proposing to restructure NCCC and improve its functionality. A new draft GD foresees two levels of operation, technical and political. It

clarifies and enlarges the responsibilities of the NCCC, and targets broader participation (35 institutions) in issues related to climate change. However, strengthening the inter-institutional cooperation and enforcing the coordination role of MECC in the area of climate change remains a real challenge that demands a longer dynamic and iterative process.

43. There are also other line ministries and agencies dealing with CC tasks including, but not limited to, the Ministry of Economy (MoE) responsible for industry, energy and economic policy; the National Authority for Energy Regulation (NAER) which plays an important role in the energy market, energy efficiency, and renewable energy policy; the Ministry of Transport responsible for all transportation 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; the Ministry of Regional Development and Public Administration (MRDPA) responsible for climate-change-related issues in the areas of infrastructure, construction and urban planning; the Ministry of Agriculture and Rural Development (MARD) responsible for the climate-change-related issues in the areas of agriculture and rural development.

Area for Improvement

44. While Romania is making progress in addressing climate change institutionally, there is much room for improvement. As mentioned above, coordination among government agencies over climate change is weak and urgently needs to be strengthened. One solution as already proposed is to restructure and strengthen the NCCC. The awareness of climate impacts and action by line ministries and the general public is low. Basically, there is lack of adequate sector strategies and policies requiring integration of climate change into sectoral programs and investment. The capacity for implementing climate action at the national and local level barely exists, neither does research capacity, monitoring systems, and public education programs on climate change. The following sections will try to assess the need for climate action within and across sectors and propose interventions to address some of the areas in the OPs.

5. INTRODUCTION TO ROMANIA'S PROGRAMMING FOR EU FUNDS IN 2014-2020

45. In the new EU budgetary cycle for 2014-2020, Romania is expected to invest about €29 billion allocated from European Structural and Investment Funds (ESIF), which include the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), European Agricultural Fund for Rural Development (EAFRD), and the European Maritime and Fisheries Fund (EMFF), plus national co-financing to support the eleven Thematic Objectives of the EU 2020 and Romania's national priorities. Of these Thematic Objectives, two directly target climate change, referring 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).

46. The urgent need for CC-related actions is clearly reflected in the Europe 2020 Strategy and the EU's ambitious 20/20/20 targets for climate change mitigation— i.e., to cut greenhouse gas emissions by 20%; reduce energy consumption by 20% through increased energy efficiency; and meet 20% of energy needs from renewable sources.

47. In light of the new EU budget cycle, the period from 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.

48. The Government is preparing the Romanian Partnership Agreement (PA) for the 2014-2020 Programming Period (draft version, October 2013) and the Operational Programmes (OPs) (currently under preparation), which will be the main documents providing the framework for Romania's management of the 2014-20 ESIF.

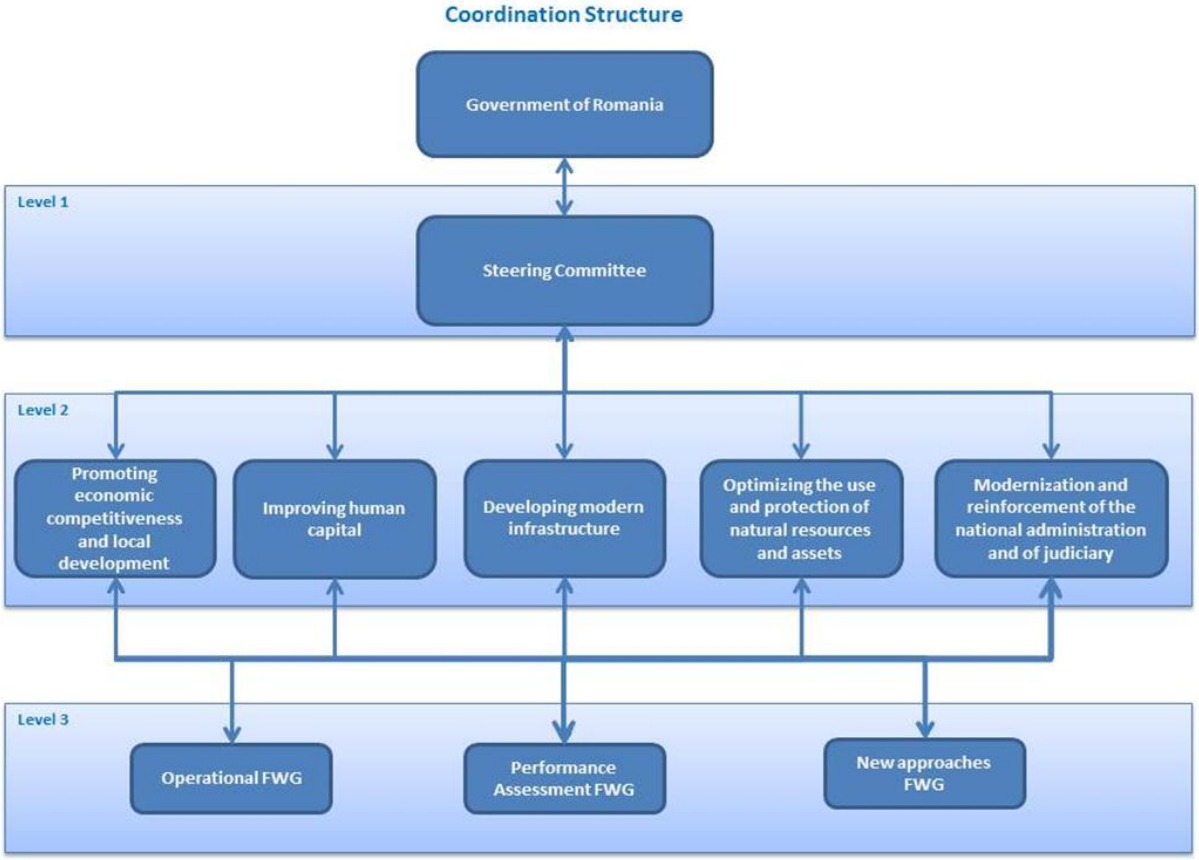
The Structure of 2014-2020 Operational Programs

49. In preparation for 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 that works under direct coordination of the Ministry of European Funds (MEF) and has prepared sectoral operational programs for the next budgetary exercise of EU funds in 2014–2020. It is made up of 12 sections/consultative committees, out of which 10 are technical and 2 are representative of regional development and territorial dimensions. Each includes

representatives from public authorities (national, regional, local), socio-economic sectors, academia, and civil society.

50. According to the draft PA, the 2014-2020 programs comprise thematic OPs, covering the following areas: large infrastructure, human capital, competitiveness, administrative capacity, rural development, fisheries, regional development, European Territorial Cooperation with Hungary and Bulgaria respectively, TA and direct payments for agriculture. The first four OPs are administrated by MEF and implemented by a number of intermediary bodies. Figure 1 below shows the proposed institutional structure for preparing and managing OPs.

Figure 1 - proposed institutional structure for preparing and managing OPs



51. To achieve the EU goal that at least 20% of the Union budget must go to climate-change-related interventions in the 2014-2020 ESIF programs, ESIF-proposed programs should be distinguished according to their climate relevance. The following can be identified as directly related to climate change mitigation and/or adaptation.

52. Large Infrastructure OP. The OP will be administrated by the MEF 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). Proposed priority investments mostly from energy, transport, and urban sectors include:

    a) road infrastructure Trans-European Transport Network (TEN-T).
    b) railway TEN -T; harbors TEN –T.
    c) public utilities services (water and used water, waste management).
    d) risk prevention & management and adaptation to CC (increase the resilience of infrastructure and services; combat drought through non-structural measures to mitigate the effects of climate change ; strengthen national disaster management systems to all risks).
    e) energy efficiency in industry (production, transport and distribution for renewable energy, cogeneration thermo, and systems).

53. Regional Operation Programs. Administrated by the Ministry of Regional Development and Public Administration, its proposed priority investments are from urban and regional development, including:
    - 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 as needed)
    - education and social infrastructure
    - health infrastructure
    - competitiveness and business environment for SMEs, including financial instruments.

54. European Territorial Cooperation OPs, again administrated and implemented by the MRDPA, aims to fund Territorial Cooperation Programs between Romania, Hungary, and Bulgaria, respectively.

55. Rural Development OP, administrated by the Ministry of Agriculture and Rural Development (MARD) and implemented by 2 IBs (MARD and MRDPA), with priority investments in agriculture and rural development, forestry, and public infrastructure in rural areas (roads, water, used waste-water community center).

56. The Competitiveness OP and Technical Assistance OP should also provide interventions related to climate change.

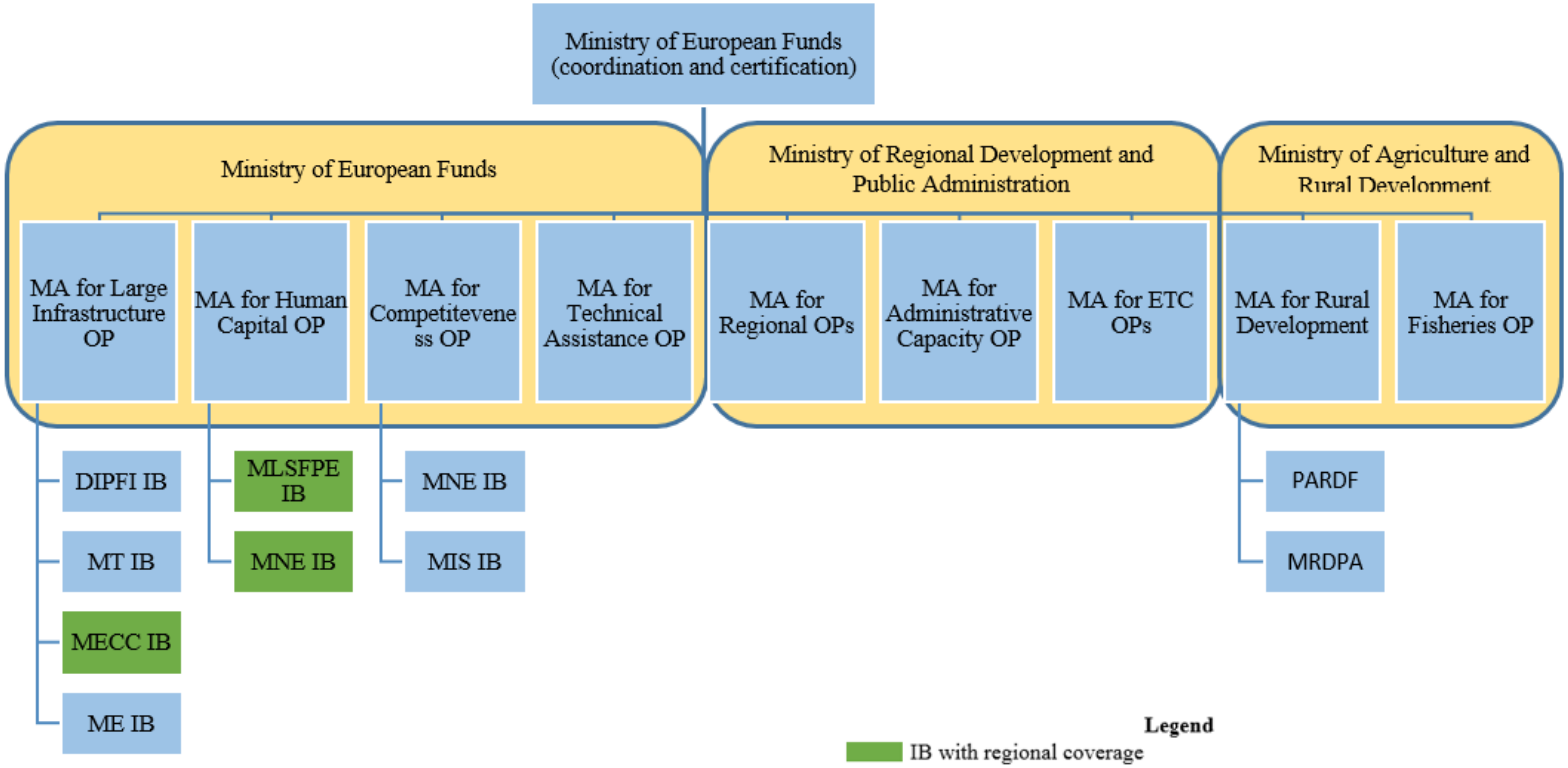
Coordination, Implementation Arrangements and Budget Allocation

57. The institutional framework for the 2014-2020 ESIF programming period currently continues to be revised. The main players are 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.

58. The institutional structure for managing 2014-2020 ESIF *(according to draft PA, version October 2013)* is shown in Figure 2 on the next page.

59. It is too early to know the exact allocation of the EU budget by type of fund and thematic objective. From the indicative percentage presented in the draft PA, the transport sector will take over 20% of the total ESI funds (and over 13% of the Cohesion Fund) under the thematic objective "Promoting sustainable transport and removing bottlenecks in key network infrastructures. The TO of low carbon economy may use up to 10% of the total funds with the majority from ERDF. The budget for CC adaptation is mainly from CF and EAFRD. Although the percentages are indicative and subject to revision during the preparation of OPs, funding availability is one of determining factors when proposing and integrating climate actions in OPs.

Figure 2: 2014-2020 Institutional Structures for Managing ESIF



6. SUMMARY OF RAPID ASSESSMENTS AND THEIR RECOMMENDATIONS BY SECTOR

60. For Romania to become a climate resilient society that has mainstreamed climate policies and actions into its sustainable economic growth strategy, all sectors need to reorient their policies towards achieving these goals. An immediate task is to identify and integrate climate actions into upcoming sectoral Operational Programs (OPs) for EU funds in 2014-2020. Rapid assessments of sectoral risks and actions were conducted in each of six study sectors: energy, transport, urban (planning, solid waste and water systems), water, agriculture, and forestry. They identified and assessed key climate risks in each sector, discussed the challenges and opportunities, and recommended actions to be considered in the OPs or NRDP for better incorporating climate change mitigation and/or adaptation concerns.

61. While in-depth analysis and economic modeling work couldn't be done during the short period of rapid assessments, the selection of and recommendation for climate interventions was based on use of the following standard criteria:
    - Potential for cost-effective GHG reduction or adaptation to a changed climate – this was based on reported experiences and studies from other countries.
    - Appropriateness to the Romanian environment – proposed measures needed to be able to fit within the developing cultural, administrative, and social framework of Romania.
    - Appropriate measures for OPs – in general, the focus was on investment projects, or on technical assistance (TA) actions that could guide further investment from both EU and national funds.
    - Implementation barriers / risks to benefit delivery – Priority should be given to interventions such as TA that would address barriers and risks prior to significant investment.

62. The summary of findings and recommendations by sector is presented below.

6.1. Energy Sector

Sector Characteristics and Trends

63. *The energy sector is the largest emitter of GHG, accounting for 70% of total greenhouse gas (GHG) emissions (excluding LULUCF) in Romania*. It has also contributed 70% of the overall GHG emissions reduction since 1989. The sector naturally has the full attention for mitigation. Three quarters of the energy sector's GHG emissions are from power and heat generation and non-transport fuel consumption. Continued 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 Romania's climate change mitigation agenda.

64. *Economic growth and energy consumption in Romania has been decoupled since 1998, and the energy intensity of the economy, measured by primary energy consumption per unit of gross domestic product, has been decreasing*. After the large contractions of the economy and energy consumption in the early to late 1990s, Romania's GDP rose by 53 percent from 2000 to 2011 while energy demand remained flat. In large part this is due to the structural adjustments of the economy toward higher-value-added manufacturing and services and significant improvements of industrial energy efficiency.

65. *Romania has substantially lower per-capita energy consumption compared to high-income EU countries. A significant increase in energy demand is expected if the economy continues to grow*. 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 high-income countries.

66. *Primary energy consumption in Romania is characterized by a relatively high and increasing share of low-carbon energy sources but a worrisome trend of declining natural gas consumption*. From 2000 to 2011, the share of primary energy sourced from nuclear, hydro and wind power, and biomass increased from 15 to 22 percent, while that of natural gas declined from 37 to 30 percent. The share of coal crept up from 20 to 22 percent. Overall, the carbon footprint of the energy sector shrank by 7 percent, from 92.89 to 86.32 million tons of CO_2 equivalent.

67. *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. 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, while residential and industrial energy demand, the largest and second largest among all sectors, declined by 6 and 21 percent, respectively.

68. *Energy for selected industrial customers and all residential customers is subsidized.* Energy-intensive state-owned enterprises (SOEs) benefit from low, preferential electricity and gas prices. State and local subsidies for residential district heating cover about 50 percent of residential customer costs. Under legislation passed in 2012 and 2013, 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.

69. *The broad energy sector reforms advocated by the 2003 Road Map for the Energy Field remain largely unimplemented, hindering private sector investments and the development of viable public sector energy companies, both are crucial to Romania's energy security and cleaner energy future*. While some progress in sector reforms has been made, the key findings and recommendations on sector governance in the 2011 Functional Review of the Ministry of Economy by the World Bank remain relevant and valid.

Potentials for Improvement and Climate Actions

70. *Continued reduction of the carbon footprint of power and heat generation in Romania requires a significant increase of investments in wind and solar power and supporting infrastructure, and in high-efficiency gas-fired generation in the medium term (up to 2020).* In the long term (beyond 2020), while these supply options will remain important, Romania's mitigation efforts will also benefit from increased nuclear power generation and potential opportunities offered by carbon capture and storage (CCS).

71. *The power and heat supply sectors have a large amount of obsolete physical assets which will need to be scrapped or selectively modernized*. For example, about 80 percent of the fossil fuel-fired generation capacity is deemed inefficient and obsolete and about 60 percent of the power distribution networks need to be modernized. Investments in retrofitting fossil fuel-fired power plants in the last 20 years have yielded little return, since many of these plants remain too expensive to operate.

72. *The continued deterioration and decline of the district heating systems is particularly distressing and undermines the quality of life in Romanian cities.* The number of operating district heating systems stood at about 100 in 2011, compared with over 300 in 1995. Many of the remaining operations are no longer economically viable because a substantial number of dissatisfied customers have disconnected themselves from the systems and chosen alternative heating options. The inefficiencies and high losses in the district heating systems also make them among the most costly to operate in the EU. A multi-year comprehensive program is needed to both modernize the economically viable district heating systems and improve their efficiency and service quality, and also implement sector reforms to restore financial sustainability to district heating companies.

73. *Despite good progress, Romania still lags significantly behind most EU countries in the broadest measure of energy efficiency and in key end-user sectors*. Its energy intensity denominated by GDP in purchasing power parity was about 18 percent higher than the EU average in 2011. The efficiency gap is most pronounced in residential space heating: specific heat consumption (kgoe/m^2) is 32 percent higher than comparable best EU practices; and in two dominating manufacturing energy users, chemicals manufacturing, where value-added energy intensity is over 4 times higher than the EU average (indicating structural issues), and steel making where energy intensity per ton of steel is 70 percent higher than the EU average. These three end-use areas combined account for roughly 40 percent of Romania's final energy consumption.

74. *Thermal retrofit of residential buildings is a huge challenge both financially, and implementation-wise.* Only about 1 percent of the 150 million m^2 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 €80/m^2, the total investments for retrofitting the entire stock amounts to €12 billion. Turning this big cost into a big economic opportunity is perhaps the most challenging energy efficiency agenda in Romania.

75. *Many of the legal and regulatory requirements to enable improved energy efficiency are dealt with on paper with uneven implementation*. The major exception is energy price reform, with an unfinished agenda in removing the large subsidies for natural gas and district heat. These general subsidies are major disincentives for energy consumers to engage in energy efficiency actions and divert public funds from more productive uses.

76. *Over €2 billion financing were available for energy efficiency investments during 2007-2013, including about €800 million in EU funds*. While this is 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. Implementation and delivery challenges will continue to grow in the next seven years.

Estimated Investment Needs

77. *The overall investment costs of the government's power sector development plan during 2014-2020 is estimated to be about €14 billion with an estimated public funding of €3.6 billion.* About half of the total investment cost will be devoted to the construction of two new nuclear reactors and retrofitting existing coal-fired power plants which will be primarily used as back-up units for the nuclear capacity. Since the financing of the nuclear units remains in limbo due to a lack of investor interest, it is unlikely that they will be completed by 2020, leading to a substantial increase in the use of inefficient fossil fuel-fired units in the outer years of the 2014-2020 period assuming a robust growth in power demand .

78. *About €2 billion capital savings could be achieved with reduced overall cost of electricity in an alternative power generation scenario from 2014 to 2020, if the Government chooses to source additional generation capacity primarily from high-efficiency gas-fired units, wind and solar PV. The reduced need for public funding amounts to EUR 636 million*. The rapid assessment compared an alternative power generation scenario with the existing government plan drafted in 2011 and concluded that the alternative is cheaper and more likely attainable by postponing the construction of the nuclear units and scrapping the old coal fired units instead of retrofitting them.

79. *The estimated subsidies for wind, solar PV and biomass (steam) through the existing green certificate scheme is expected to reach €220 million by 2020 to support the alternative scenario's significantly higher installed capacity of wind and solar PV*. The current green certificate scheme (already scaled back since July 2013) is evaluated and deemed sufficient to support the additional expansion of wind and solar PV power with a very small impact on end-user electricity bills (about €3/MWh additional cost).

80. *The estimated investment in end-use energy efficiency improvements—implementable during 2014-2020, and based on a few selected large-scale interventions such as building thermal retrofits, refrigerator upgrades and industrial energy efficiency—amounts to over €6 billion,*

of which about 28 percent, or about 1.7 billion is expected to be financed by public funds, including EU and government funds.

Recommended Actions

81. *Combined efforts in investments, sector reforms and implementation and delivery are required to secure reliable energy supply for economic growth and improving the quality of life on the one hand while increasing the share of clean energy sources, including energy efficiency, on the other*. These efforts should be guided by an overarching national energy and climate strategy jointly prepared by the concerned ministries. For the 2014-2020 period this rapid assessment has identified three thematic priorities for climate change mitigation in the energy sector: expanding cleaner power generation, restructuring the district heating sector and scaling up energy efficiency in manufacturing and buildings.

	Investment	Sector Reform	Implementation and Delivery
Expanding cleaner power supplies	• Wind and solar PV generation capacity • Balancing infrastructure for increased wind and solar generation capacity • High-efficiency gas-fired generation capacity • Modernization of distribution network	• Resume the implementation of the 2003 Road Map for the Energy Field; • Improve governance of energy SOEs for transparency and accountability; • Rebuild energy regulator ANRE's capacity, autonomy and accountability; • Improve inter-ministerial coordination of energy functions across the Government; and • Improve institutional set-up and governance arrangements for business environment functions	• Private sector participation • Public and private partnerships • Public sector energy companies
Restructuring district heating sector	• Modernization of economically viable district heating systems	• Unify sector regulation under ANRE • Improve district heating company governance through commercialization • Introduce two-part heat tariffs and consumption-based	• Initiate strategic sector review of local district heating systems to prioritize investment • Prepare long-term urban heating strategy led by MRDPA • Private sector participation,

		billing • Replace general heat subsidy for suppliers with targeted subsidies for the poor • Review and adjust the bonus scheme for high-efficiency co-generation	• Public and private partnerships
Scaling up energy efficiency	• Thermal retrofit of apartment buildings constructed during 1950-90 • Energy intensity reduction of chemicals and steel manufacturing • Energy efficiency obligations for energy utilities to address highly disaggregated energy efficiency investments in residential, commercial and public services and industrial sectors	• Strengthen government oversight for energy efficiency on the basis of the national energy efficiency action plan and programs either within ANRE or by re-establishing a separate agency • Implement pricing reforms for subsidized industrial users and the residential sector	• Strengthen enforcement of codes and standards; • Establish a long-term financing and delivery platform for residential thermal retrofits • Improve access to finance, especially mechanisms that support access to EU co-financing and expand the use of energy performance contracts • Develop technical capacity of key energy efficiency market participants, such as enterprises, energy managers/auditors, banks, and ESCOs and energy service providers • Increase information and data gathering and outreach to all stakeholders.

82. Supporting the expansion of cleaner power generation:

a) *Review and adjust the long-term power sector development plan with a view to reducing the implementation risks and costs of the proposed investments for the period of 2014-2020*. The initial analysis of this rapid assessment suggests that a shift of investment priority over the next seven years towards additional wind and solar PV power and associated T&D infrastructure and major additions of high-efficiency gas-fired capacity could reduce the overall costs of electricity, increase private sector participation, and cut GHG emissions.

b) *Prioritize EU funds for investments in expanding and reinforcing the infrastructure for supporting intermittent renewables, transmission and cross-border interconnection, demonstration of smart grids and smart meters, high efficiency co-generation, and critical research and development activities for low-carbon energy options.* The estimated need for EU funds for the power sector amounts to about €1.5 billion. This amounts to about half of the estimated public financing for the power sector in the alternative scenario to the government's current plan for 2014-2020.

c) *Accelerate sector reforms to create a stable and predictable business environment for expanding private sector investments in cleaner power generation*. A recent World Bank functional review of the Ministry of Economy provided suggestions for key actions to improve the energy sector business environment. Among the most important are the following:

- Cancel the plan to create the two national champions and the restart of the implementation of the 2003 Road Map: a balanced strategy of attracting private sector investment and developing viable public sector energy companies;
- Enforce and implement sound commercial practices by the Government, energy regulator ANRE and public sector energy companies;
- Continue energy market liberalization and remove regulated prices for electric and gas supply for non-residential consumers;
- Strengthen energy regulator ANRE's capacity, autonomy and accountability;
- Prepare an energy and climate change strategy
- Provide policy and legislative stability to increase investor confidence and lower the perception of investment risks.

83. Supporting the restructuring of the district heating sector:

a) *Develop and begin to implement a comprehensive investment and sector reform program to address the multitude of issues and constraints of the district heating sector, and to a greater extent, the long-term urban heating strategy*. Some of the reforms that must be implemented to stem further deterioration of district heating (DH) in Romania include:

- Strategic reviews of local DH systems to establish the most efficient and cost-effective heat supply options strategy, taking into account economic levels of fuel prices and the environmental costs of burning fuels, as well as modern heat and cogeneration technologies, and efficient and cost-effective distributed systems;
- Acceleration of electricity and natural gas price liberalization, maximizing the

role of the market in resources allocation;
- Abolishing all price subsidies; only low-income families would receive targeted subsidies in the form of cash payments within the social protection system;
- Investment support for truly high-efficiency cogeneration;
- Unification of DH regulation under one regulator;
- Introduction of a two-part heat tariff system;
- Consumption-based billing at the dwelling level for heat and hot water;
- Consideration of additional policies to "protect" district heating in areas where it is already supplied and cost-effective.

b) *Focus initial investment efforts on a few select cities where district heating is deemed economically viable and competitive compared with distributed alternatives, and where local governments are committed to sector reforms*. Thorough analyses need to be carried out to determine whether a district heating system can be modernized to the point of efficiency and be competitive compared to distributed alternatives based on economic costs and benefits before a funding decision is made. Under certain conditions, modernization of district heating systems should be eligible for EU funding in the 2014-2020 period.

84. Scaling-up energy efficiency investments:

a) *Prioritize policy support towards scalable energy efficiency interventions where market barriers and a weak implementation capacity have held back investments*. There does not appear to be a general lack of financing for energy efficiency investment in Romania, although large financing gaps do exist in select market segments, such as residential thermal retrofits. Public support is particularly important for scalable energy efficiency interventions which have a relatively high cost of saved energy due to low market uptake as illustrated in the table below.

Scalability and cost of selected energy efficiency interventions

		Cost of saved energy		
		Low	Medium	High
Aggregate potential energy savings	High	• Energy efficiency measures in steel and chemicals manufacturing	• Energy efficiency of major consumer appliances • Industrial motors energy efficiency	• Thermal retrofit of residential buildings

	Medium	• Energy efficiency measures in SMEs • Residential lighting (CFL) • Commercial lighting (CFL and high performanceT8)	• Modernization of district heating systems • Thermal retrofit of public buildings, such as schools • Retrofit or new commercial HVAC systems	• New nearly zero energy (nZE) buildings • Residential lighting (LED) • Commercial lighting (LED)
	Low		• Public lighting (sodium lamp) • Energy efficiency in water supply and wastewater treatment	• Public lighting (LED) • High efficiency residential air conditioners

b) *Match financing and delivery mechanism with specific sector needs and constraints*. Of particular interest over the long term is the use of financial instruments to increase the leverage of public funds in energy efficiency investments in public and residential sectors, for thermal retrofit of buildings in particular. Increasing the role of energy service companies (ESCOs) in the delivery of energy efficiency projects has the added benefit of bringing in third-party commercial financing, especially in public -sector energy efficiency investments. More specifically:

i. Manufacturing sector energy efficiency investments should in general be financed through commercial means. Nevertheless, public funding in supporting information dissemination, awareness raising, and capacity building among key stakeholders (enterprises, ESCOs and banks) have proven to be of catalytic value.

ii. A dedicated energy efficiency revolving fund for the public sector could be an effective way of addressing some of the critical financing and implementation constraints faced by municipal public entities, while also helping nurture and develop Romania's nascent ESCO market. Such a fund may be seeded by a combination of EU funds and government grants and could potentially attract private financing if proven successful.

iii. A financing mechanism/platform that matches the needs for long-term (up to 20 years) and low-interest-rate loans in residential thermal retrofits while also providing streamlined processing and necessary assistance to home owners associations will help mitigate the challenges facing thermal retrofit programs in Romania. There have been some successful operations of housing renovation loan

funds in other EU countries, which could be a blueprint for designing a similar program in Romania.

c) *Match government support with critical needs*. The characteristics of key government support are summarized in the table below.

Key areas of intervention	Critical constraints to scaling-up EE investment	Means of government support
Basic policies	Subsidized energy prices	Cost reflective prices (remove general price subsidies) with targeted support for low-income families
	Metering and consumption-based billing	Requiring consumption-based billing as part of district heating modernization investments
	Lack of clear legal regulation of ESCO contracts, lack of deliberate policy support for ESCOs, and insufficient market recognition and credibility	Market development support efforts to improve the credibility of ESCOs (such as accreditation and certification) and access to project financing; changes in public sector budgeting, accounting and procurement regulations
	Reliance on grant financing	Expanded menu of support for energy efficiency: monetary and non-monetary incentives, financial instruments that leverage private financing
Institutional support	Lack of EE planning, policy implementation and supervision capacity	Improved governance and strengthening of the EE agency - either within ANRE or as re-establishment of a separate EE agency
Selected energy-intensive manufacturing	Competing demands on funds, sector restructuring, SOE privatization in some industries	Long-term agreements Information dissemination, awareness raising and capacity building
Small and medium enterprises	Information, creditworthiness, credit terms	Support for audits and dedicated energy efficiency credit line Information dissemination, awareness raising and capacity building
Residential thermal retrofit	HOA credit-worthiness/ decision-making process, poverty/ affordability; lack of information on building stock and energy performance	City-level market assessment, program design and implementation support Dedicated financing mechanism with appropriate blending of long-term and low-interest loans and grants TA/grants for engaging and informing HOAs, preparing, supervising and monitoring projects
Public buildings thermal retrofit	Lack of information and capacity, budgeting/accounting/ procurement restrictions; lack of information on building stock and energy performance	Market assessment, program design and implementation support for municipal public buildings Changes in budgeting, accounting and procurement regulations Dedicated financing mechanism with consideration of introducing a revolving fund
nZE buildings	Untested, new technologies	Grants for demonstrations

Large appliances upgrade	Up-front incremental cost	EEOs, on-bill financing, rebates
Residential and commercial lighting upgrade	Poverty, up-front capital costs	Ideal for EEOs, on-bill financing, rebates; regulation to phase out incandescent lamps
Other municipal services, such as public lighting and water supply	Access to financing	PPPs, for example, ESCO arrangements Energy assessment support to water utilities

6.2. Transport Sector

85. The GoR aims to support the development of a safe integrated transport system that serves the Romanian people and economy efficiently and equitably while protecting the environment, for a sustainable development of Romania within the EU. One of its strategic pillars is to support the development of an integrated and environmentally friendly transport system through the encouragement of a transport system that protects the environment and supports integrated social and economic development without harm to human health or to environment for the benefit of today's and future generations.

86. These goals are in line with the nation's Climate Change Strategy and sector strategies such as the draft Transport Strategy of Romania's Ministry of Transport, which are expected to be adopted soon. Climate friendly policies and investments are needed to achieve the strategic goals and generate both global and local benefits.

87. Local co-benefits of climate-friendly policies include, but are not limited to reduced traffic congestion and road accidents, improved air quality—a recent study found that poor quality in Bucharest reduces life expectancy by two years and is a leading cause of respiratory diseases among city inhabitants, with road congestion being one of the main drivers of air quality—and these can become important drivers of transport policies and investments.

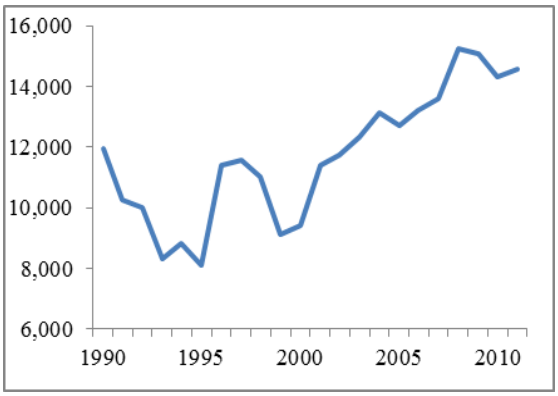
Sector Characteristics

88. The transport sector is a significant emitter of greenhouse gas (GHG) emissions, while at the same time transport infrastructure is expected to be heavily impacted by changes in climate, particularly extreme weather events. In EU countries, transport is responsible for around a quarter of greenhouse gas emissions making this the second largest greenhouse gas emitting sector after energy. While emissions from other sectors are generally falling, those from transport have increased 36 percent since 1990. Most transport-related greenhouse gas emissions result 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.

89. 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

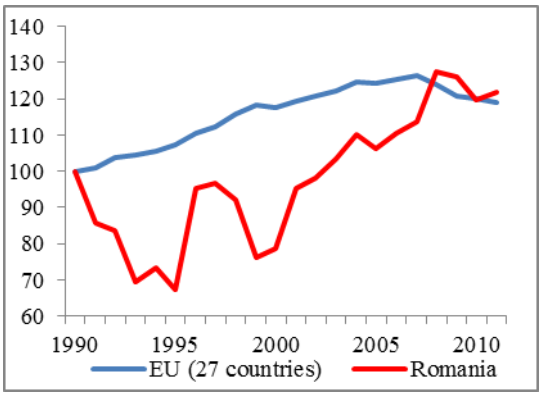
percent, it is rising more quickly than the EU average. The steady upward trend since the turn of the century is particularly noteworthy. The figures below show the increases over time as well as how these compare to the EU-27. Among the different transport modes, road transport is the source of the great majority of GHG emissions in the transport sector, 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 CO2)



Source: EEA.

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



Source: EEA.

90. Transport statistics show a marked rise in mode share of private cars and a significant decline in rail mode share of passenger transport (with 2011 rail mode share being approximately one third of the 2000 figure). Bus and coach travel mode shares have grown slightly between 2000 and 2011. Private car mode share now approaches 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 close to the EU average level, the motorization (or car ownership) rate in Romania was the lowest in the EU at 201 cars per 1000 inhabitants in 2010,[16] but has grown significantly in recent years, up from 150 cars per 1000 inhabitants in 2004.[17] Experience across world data suggests that as the Romanian economy grows, this rate will continue to grow in the future. Without intervention to provide better transport alternatives and encourage their use, as car ownership grows, car use is also likely to grow. 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 level is relatively low compared to other EU countries (the EU-27 average is 18 percent), although it has increased in recent years

[16] Energy, transport and environment indicators. Eurostat Pocket Books 2012 Edition. European Commission.
[17] 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 Regioo, 2006.

91. 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 outlined 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 recent growth.

92. 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[18]. Transport within urban areas forms a vital part of their functioning 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, does not form a coherent network, and is often poorly maintained.

Climate Change and Transport

93. 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".[19]

[18] http://www.recensamantromania.ro/rezultate-2/
[19] 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

94. Extreme weather events, which may be linked to climate change, have been experienced in some parts of Romania in recent years. These include severe floods in 2005, 2006 and 2007, and an expansion of drought-affected areas in the south and south-east of Romania. According to the draft Romanian Climate Change Adaptation Strategy, the expectation is that in the future, Romania can expect to have: a rise in average temperature overall; more frequent summer droughts, especially in the south and south-east; more frequent heat waves; and more intense rainfall across short periods of time, leading to more frequent flash floods.

95. Some major Climate Change risks in the transport sector have been identified by the Assessment. 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 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 roads company, with use of adjusted material standards and design norms in vulnerable areas to cope with higher temperatures and minimize deformations. Similar issues may also arise with asphalt surfaces (e.g., runways) at Romanian airports. Railway lines also can buckle under high temperatures, which can again lead to speed and usage restrictions.

96. Rail, road and waterborne transport infrastructures are potentially vulnerable to the effects of more intense rainfall and the increased frequency of flash floods. Bridge abutments, piers, road and rail embankments, and riverbanks are all 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.

97. Reduced precipitation, droughts and the associated reduced runoff may affect river navigation on the major waterways such as the Danube. This is something already being seen, according to the Lower Danube River Administration, with reduced water depths, meaning that the number of days requiring implementation of navigation restrictions 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 the rise in sea level. The navigability of shipping channels is likely to change and needs to be properly reassessed (Romania's Danube-Black Sea Canal).

Recommended Actions

98. Recognition of climate implications in transport, unlike other sectors, has had a slow start. One reason is that the transition to a low-carbon context appears to be more costly than in other sectors representing a real challenge for authorities worldwide. But broadening the policy agenda to shift behaviors changes the cost picture completely, especially measures to reduce congestion, local air pollution, safety risks, and energy imports. Policies to guide demand towards low-emission modes and technologies must be part of investment programs and projects. Such policies can reduce transport demand in the long run by changing the economic geography of cities and countries. But that will take close coordination of transport, urban, environmental, and health policies.

99. The Transport Rapid Assessment has drawn on published documents and discussions with key stakeholders in Government ministries and transport infrastructure and operating companies. It has also drawn on information and experiences from other countries, both within the EU and around the world. Based on these activities, the overall conclusion is that there is significant potential for climate change mitigation through the reduction of transport sector GHG emissions growth in Romania. The World Bank has recommended mitigation actions for further consideration and investigation prior to their integration within Romania's 2014-2020 Operational Programs. Some of these involve Technical Assistance while others are Investment actions. The recommended actions complement and reinforce transport measures that may be proposed for the OPs for other reasons, such as economic development, connectivity, safety and security.

100. Within the recommended actions the World Bank has highlighted that, while certain infrastructure investment measures are potentially positive from a climate change mitigation perspective, the climate change benefits—and indeed economic and other benefits—will only be realized if all aspects of transport service provision are addressed holistically to ensure that the transport mode is able to attract new users. This is particularly relevant to the rail sector, where rail travel is in decline, but also applies to urban public transport services and to Inland Waterway Transport. In all of these areas, maintenance, vehicles or rolling stock, customer service, operational efficiency and service prices need to be considered as part of an attractive package 'offer' to customers. The impact of investments financed through the sectoral OPs for rail and public transport could be monitored through changes in occupancy rates — low occupancy, low emission rail transport or public transport is not only failed investment but can be more emission intensive per passenger-km or ton-km than the use of cars and trucks.

101. A summary of the specific recommended mitigation actions in each transport sub-sector is provided in the following summary table.

Sectoral Focus	Action	Type of action
All modes	Methodology for measuring emission intensity per passenger-km and ton-km for different transport modes using different technologies and under alternative operational conditions.	Technical Assistance
Rail transport	A comprehensive review of the rail network prior to further investment in any rail infrastructure outside the priority TEN-T network.	Technical Assistance
	Implementation of the recommendations of the energy audit study previously undertaken, particularly with respect to equipping the railway network with equipment to allow regenerative braking.	Investment
	Individual railway infrastructure projects in line with the results of the General Transport Master Plan (GTMP) appraisal and prioritization process, provided that they are implemented as part of a holistic package to improve the attractiveness of rail transport.	Investment
Road transport	Study on fiscal measures to influence private car/LDV purchase and use choices	Technical Assistance
	Study on which alternative fuels will best suit Romania and how best to encourage take-up of those alternative fuels and support roll-out of their associated fueling / charging infrastructure. Such a study should look at the feasibility of introducing alternative fuels and assess costs and likely uptake, while also reviewing vehicle efficiency standards for vehicles using conventional fuels (gasoline and diesel), and the scope for introducing minimum standards for used vehicles.	Technical Assistance
	Study on measures to encourage freight haulers to accelerate adopting lower emission vehicle technology and behavior.	Technical Assistance
	Consideration of high-occupancy vehicle (HOV) restrictions and/or lift-sharing schemes in the design stages of national road infrastructure projects given a high national priority by the General Transport Master Plan.	Investment
Inland waterway transport	Study on measures to improve GHG emission from inland navigation on Romania's waterways.	Technical Assistance
	Studies of river morphology and assessment of alternative river interventions to maximize river navigability while taking account of ecological considerations and sensitivities.	Technical Assistance
	General port infrastructure improvements to improve operational efficiency, in line with GTMP priorities.	Investment

Sectoral Focus	Action	Type of action
	New and improved freight interchange facilities at river ports, including improved road and rail access, in line with GTMP priorities.	Investment
	Improving navigability of waterways to link the Danube with Bucharest metro area, subject to the outputs of the GTMP prioritization process.	Investment
Urban transport	Improvement of integrated urban planning – as covered in the Urban sector rapid assessment report	Policy
	Development of sustainable urban mobility plans (SUMPs) for all cities with populations of over 100,000.	Technical Assistance
	Study on the potential role of 'harder' demand management measures to address congestion and emissions in Romanian cities.	Technical Assistance
	Bus Rapid Transit (BRT) feasibility studies in cities where the SUMP indicates that this is likely to provide a cost-effective solution to urban mass transit.	Technical Assistance
	Investment in urban public transport, in accordance with the framework provided by the SUMPs, provided that investment is part of a holistic package to improve the attractiveness of urban public transport.	Investment
	Investment in cycling and walking infrastructure, in accordance with the framework provided by the SUMPs, coupled with better enforcement and promotional campaigns.	Investment
	Pilot projects to demonstrate and test the feasibility, costs and benefits of urban freight consolidation centers.	Investment
	Pilot projects on alternative fuels for buses and other urban fleet vehicles – linked to the Technical Assistance study on alternative fuels.	Investment
	Extension of the metro system in Bucharest to provide a more complete network, with specific projects in line with the GTMP prioritization process.	Investment
	Implementation of urban intelligent transport systems, in line with any priorities established in these areas by the SUMPs.	Investment
Domestic air transport	Studies to develop sustainable mobility plans for ground transportation connections to Romanian airports.	Technical Assistance

102. Adaptation to climate change is a key requirement for the transport sector in Romania in the future. It needs to become an integral part of all transport sector activities, and become embedded in the day-to-day thinking of people working in the sector. In addition the use of new design norms (for example, increased drainage provision or heat-resilient materials) that

take account of climate change, consideration of climate change adaptation need to be built into tendering procedures across all parts of the transport sector, and into infrastructure asset management systems, emergency preparedness planning, and revised planning and project development cycles. The starting point for the adaptation work in the transport sector is to conduct sectoral or agency level Vulnerability Assessments in order to identify the relative vulnerability of assets and services to the impacts of climate change—through the development of vulnerability maps, among other things—in order to define short-term, medium-term, and long-term actions for implementation. Within this Report the World Bank has recommended adaptation actions for further consideration and investigation prior to their integration within Romania's 2014-2020 Operational Programs. Again, some of these involve Technical Assistance while others are Investment actions.

103. A summary of the specific recommended adaptation actions in each transport sub-sector is provided below—with illustrations on the kind of factors that need to be considered for each mode—with the top part of the table describing measures that apply to all modes and that are required in order to have the information basis to make investments that factor into climate consideration.

Sectoral Focus	Action	Type of action
All modes	National study of vulnerability by sector/model which would involve conducting a comprehensive and detailed risk assessment should be undertaken, using the best available climate change forecasts from the National Meteorological Administration. Outputs include a mapping of risks, as well as an action plan of short-term, medium-term, and long-term actions.	Technical Assistance
	Revised planning and project development documentation. Require climate adaptation to be addressed in the transportation planning and project development processes, by (a) making changes supporting longer planning timeframes; (b) providing guidance on the incorporation of quantitative and qualitative climate considerations and how to address uncertainty; (c) require climate change adaptation screening in Environmental Impact Assessments by reviewing and updating regulations and procedures where climate impacts and adaptation are relevant; and (d) require inclusion of adaptation considerations in project tender documentation. In addition, the planning process should require the maintenance of nationally standardized data sources and modelling techniques for transportation climate adaptation planning and for input	Technical Assistance

	on project development.	
	Review of design standards for transport mode to factor into expected climatic risks emerging from the Vulnerability Assessment and the mapping of risks.	Technical Assistance
	Development of Emergency Preparedness Planning for each agency/sector, in line with projected climatic impacts	Technical Assistance
	Inclusion of projected future climate impacts into infrastructure asset management systems. Given that transportation agencies have some form of an asset management system, it is a convenient and targeted approach to incorporate climate-induced change into transportation decision-making, including project selection and implementation.	Technical Assistance
Rail transport	National study of the vulnerability of existing rail infrastructure and rolling stock to changed climate conditions to form the basis of a network-wide adaptation action plan and which would include a mapping of risks.	Technical Assistance
	Review of design standards to factor into expected climatic risks, including flash floods, higher precipitation intensity, and extreme heat and cold weather.	Technical Assistance
	Feasibility study on an improved weather warning system to better prepare for extreme weather events in advance, reducing disruption and damage.	Technical Assistance
	Implementation of resilience infrastructure measures (to address, for instance, requirements necessitated by lower cold temperatures which may result in higher snow and ice accumulation, and higher warmer temperatures which may result in kinks), including improved design measures, improved track maintenance, wooden sleeper replacement and vegetation management.	Investment
	Improvement of resilience of rolling stock to higher and lower service temperatures, including more efficient ventilation / air conditioning	Investment
	Implementation of flood resilience measures, including increased drainage provisions and flood protection on new infrastructure and retrofits of flood protection measures in vulnerable locations.	Investment
Road transport	National study of the vulnerability of existing road infrastructure to changed climate conditions, to form the basis of a network-wide adaptation plan which would include a mapping of risks.	Technical Assistance
	Review of design standards to factor in expected climatic	Technical

	risks. As a result of higher precipitation intensity (a) reassess parameters used for designs of storm drainage systems and structures; (b) investigate the need for river training and increased channel maintenance and bridge scour protection; (c) review culvert designs to ensure that they cause limited damage to roads during flooding; (d) reassess methods for slope stabilization and protection; and (e) prepare new pavement specifications.	Assistance.
	Review of a road asset management system to incorporate adaptation considerations during the planning of investments, operations and maintenance of roads.	Technical Assistance
	Implementation of resilient infrastructure measures (design and/or material specifications to address instances of lower cold service temperatures and higher warm service temperatures) in the design and implementation of new road infrastructure and in any refurbishment or upgrading.	Investment
	Implementation of flood resilience and improved slope stabilization measures, including increased drainage provisions and flood protection on new infrastructure, retrofits of flood protection measures in vulnerable locations, revised designs and standards for improved slope stabilization. Higher precipitation intensity to be reflected in revised design standards for tunnels, bridges and culverts.	Investment
Inland waterway transport and ports	National study of vulnerability of existing IWT and port infrastructure to changed climate conditions, to form the basis of a national IWT adaptation plan, including a mapping of risks.	Technical Assistance
	Review design of ports lying in low coastal areas to reflect new water levels arising from expected sea level changes and update dredging requirements of rivers in light of expected hydrological and morphological changes.	Technical Assistance
	Implementation of improved river information systems adapted to, for instance, lower and more variable water levels.	Investment
	Implementation of carefully selected river-based measures, including ecosystem-based measures, and river engineering measures, but only after detailed consideration of their ecological and biodiversity impacts.	Investment
	Adapt designs of ports in low lying coastal areas to reflect new water levels due to sea level changes. Adapt	Investment

	IWT dredging practices to expected climatic changes.	
Urban transport	Studies of the vulnerability of urban transport infrastructure and systems to climate change for Romanian cities, and the development of city-wide adaptation plans as well as mapping of risks.	Technical Assistance
	Implementation of resilience infrastructure measures on local rail and tram tracks, including design measures and improved maintenance.	Investment
	Implementation of more efficient ventilation and/or air conditioning at metro or rail stations.	Investment
	Introduction of more efficient ventilation and/or air conditioning in public transport vehicles.	Investment
	Implementation of flood resilience measures, including provision of greater drainage capacity and flood protection.	Investment
Domestic air transport	Studies of vulnerability of airport transport infrastructure and systems to climate change, for all Romanian airports, and development of airport-specific adaptation plans.	Technical Assistance
	Implementation of heat and cold resilience infrastructure measures (design and/or material specifications) in design and implementation of all new airport infrastructures and in any refurbishment or upgrading.	Investment
	Implementation of flood resilience measures, including provision of greater drainage capacity and flood protection.	Investment

104. Given all the proposed measures an important question is their sequencing or prioritization in terms of implementing the proposed Action Plan. The measures proposed are aimed at being implemented in the 2014-2020 period, in line with the time line of the Operational Programs. With regard to adaptation the key immediate priority is to develop, mode by mode, national vulnerability studies which would form the basis of an adaptation plan and which would include a mapping of risks. This information base which identifies key risks and vulnerabilities of transport infrastructure and transport services must be carried out before implementing other proposed measures, such as modifying planning and project preparation documentation, reviewing design standards, or implementing resilient infrastructure and rolling stock measures.

105. With regards to mitigation, the most pressing action is to develop a methodology for measuring emission intensity per passenger-km and ton-km for different transport modes, different technologies, and under different operational conditions, in order to be able to monitor GHG emissions by mode, assessing the impact of measures that will be undertaken to reduce the growth of GHG emissions. Such an information base is at present absent. A

second urgent priority is implementing policies to ensure improvement in the performance of the rail infrastructure manager and public rail operators—including allocating funding to maintain infrastructure investments—so that investments in rail infrastructure financed under the Operational Program translate into higher ridership and higher ton-km of freight transported in the rail network, contributing to a modal shift. A third priority is to launch a series of studies aimed at (a) reviewing fiscal measures to influence private car purchase and use; (b) assessing options in using alternative fuels; and (c) measures to encourage freight haulers to accelerate take-up of lower emission vehicle technology; and (d) the potential role of 'harder' demand management measures to address congestion and emissions in Romanian cities. Reducing the growth rate of emissions from the road sector is critical for decelerating transport sector emission growth. This will require changes in pricing and other policies—but the critical step is launching the studies that will guide policy choices to be implemented over the 2014-2020 period and beyond.

106. In order to meet the target of spending 20 percent of ESIF funds on climate change—or whatever percentage decided by the Romanian government—it will be essential to make large investments in railways, IWT, ports, multimodal transport, and urban transport. At the moment the coefficients for the calculation of activities supporting climate change activities for the sub-sectors listed above are 40 percent. This means that the modal composition of the investment program will need to allocate significant resources to non-road infrastructure projects. Road investments could be counted as supporting climate change activities if they are made climate resilient—this is why undertaking a vulnerability study for the road sector early in the 2014-2020 period will be important, not only for helping to meet the spending target on climate actions, but also to make the infrastructure resilient to projected climate change impacts.

107. Going forward, the key next step is finalization of the General Transport Master Plan (GTMP), as this is an ex-ante conditionality of the European Commission for transport interventions financed from the OPs. It is also critical in terms of determining a list of prioritized projects and policies able to be financed by the Technical Assistance and Investment Action window available through the Operational Programs. It is understood by the World Bank that there is considerable work required in order to finalize the GTMP, and that this will be a critical measure for prioritizing investments to be financed out of EU funds. This provides a window of opportunity to incorporate the recommendations of this Report into the finalization of the GTMP, thus ensuring adequate consideration of climate change interventions.

108. A second critical step is for Romania to decide on how it will implement the requirement that 20 percent of European Structural and Investment Funds be used for climate action. This

is important, as it is currently not clear for the Large Infrastructure Operational Program—which includes transport, energy and environment—what percentage of climate expenditure the transport sector will need to meet. This could have an impact on the modal composition of the transport program. Likewise, the same applies for the Regional Operational Program, which includes county roads and urban transport (excluding the metro of Bucharest).

109. Lastly, it will be important to coordinate the preparation of transport related aspects in the Large Infrastructure Operational Program and the Regional Development Operational Program, particularly with regard to roads. Motorways and national road projects will be financed through the Large Infrastructure Operational Program while county roads will be financed through the Regional Development Operational Program, and these need to be coordinated to ensure that when a motorway section is built, access roads and roads in the surrounding area are also upgraded in order for the investments to maximize benefits. While this is not a climate related issue, it is nevertheless important in order to develop an integrated and optimized transport system. The General Transport Master Plan, which is based on a National Transport Model, could serve as the basis for the selection of road projects in both Operational Programs.

6.3. Urban Sector

Sector Background

110. Cities have long held a central place of importance in society as hubs of commerce, culture, and political power. Globally, cities are where 53 percent of the world's population live and they are estimated to be responsible for 70% of global GHG emissions (2011 figures). In Romania, the urbanization rate is roughly 55%, but little is known about the contribution of urban areas to Romania's current emissions picture.

111. Because of climate change, the clustering together of large numbers of people and high levels of economic activity also creates vulnerabilities. Some will be found directly within a city: people living and working in coastal areas or in river floodplains may be subject to the impacts of sea level rise or extreme rainfall events that put their lives or businesses at peril. Urban climate change can also take other forms, however, including situations where impacts occurring far outside of a city can affect essential systems (e.g. water or energy supply) essential to life within the city.

112. In some parts of the world, central governments are taking action, requiring cities to take measures to ensure that the economic engine of their country is not harmed. With international and national technical support, many local authorities are also taking action, concerned about long-term impacts facing their city or cognizant of the fact that some climate mitigation actions can actually result in cost savings, making the city more economically competitive. The urban sector assessment reviews the current state of urban climate planning in Romania (and opportunities for improvement); what is known about how cities in Romania contribute to climate change, and how cities in Romania will be affected by climate change.

113. Because the urban sector is a spatially (rather than topically) bounded sector, the complete examination of climate change mitigation and adaptation/resilience measures must necessarily cover a wide range of issues from urban planning to policies and financing mechanisms for four key urban infrastructure-focused sectors: energy, transport, water, and waste. This section focuses on urban planning, municipal solid waste management, and urban water systems only, since urban energy and transport topics have been covered in previous sections of the report. High priority action items are discussed in each sub-sector summary, but are spelled out with greater specificity at the end of the write-up, along with action items that can be implemented over a more extended time scale.

The Current State of Urban Climate Knowledge and Planning in Romania

114. National level climate studies project that Romania will get warmer and that both drought and extreme rainfall events will become increasingly commonplace in the coming century, although strong regional differences will remain. There is, however, a dearth of knowledge 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. Therefore, such information does little to help a local authority assess what specific actions they should take going forward.

115. Fortunately, some baseline analysis is available to support local climate planning work, on both the mitigation and adaptation/resilience sides of the equation.

116. For example, as of September 2013, there were 60 communities (representing roughly 5 million people) from around Romania that have signed on to the 'Covenant of Mayors,' a European Commission-supported initiative aimed at promoting sustainable energy use in cities. Each community is required to develop an action plan within a year of signing up for the Covenant program. The 30 Romanian communities submitting plans thus far have heavily emphasized actions focused on improving energy efficiency in buildings and addressing local transport problems. Other climate-related planning work is taking place in seven Romanian cities where the World Bank has supported local energy efficiency planning efforts. These analyses similarly place a large emphasis on addressing local building energy use and transport issues.

117. In terms of climate adaptation/resilience, planning activity has largely taken the form of disaster planning which is 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 around urban climate matters. Strategies the Government of Romania should prioritize include requiring local authorities to prepare emission inventories, climate risk/vulnerability assessments, and climate action plans as a pre-condition for the receipt of other climate-related investment monies. The Government should also provide a range of technical and financial assistance to help local authorities obtain the information necessary to prepare such plans.

Sectoral Focus	Action	Type of action
Integrated planning	Establish requirements that integrated climate plans achieving minimum quality standards be prepared by	Policy oversight

	cities applying for some or all Operating Program support.	
	Provide training for local authority staff on how to prepare comprehensive integrated local climate plans.	Training/ education
	Establish university curricula to train future environmental and urban planners on local climate planning.	Education/ training
	Provide financial/resource support to the "Covenant Club" and other technical assistance organizations focused on local climate, energy efficiency, or transport planning, etc.	Education/ training
	Provide planning grants to local authorities to support the preparation of comprehensive, integrated local climate action plans.	Planning support
	Provide greater access to data sources relevant to comprehensive integrated local climate planning efforts	Planning support/ research & analysis
Technical studies	Fund research downscaling global climate models to provide more localized assessments of climate impacts in different regions, enabling local authority planners to assess their city's vulnerability to future climate shocks	Research & analysis
	Fund LIDAR surveys and other analyses that support the development of highly granular, building-scale assessments of flooding and other types of climate risk in the 20 largest cities around Romania.	Research & Analysis
	Support/require the use of broader GHG emission inventories (such as the GPC -- Global Protocol on Community Scale GHG Emissions) at the local level, to ensure more comprehensive assessments than those employed by the Covenant of Mayors.	Policy/ oversight
Public education	Establish public education programs to expand general awareness of climate change and local climate planning issues	Education/ training

Urban Solid Waste Sector

118. Collectively, the GHG emissions associated with Municipal Solid Waste disposal in Romania total approximately 2% of the country's overall emissions. 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 into the atmosphere.

119. 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 Romanian Government can keep this situation from becoming even more problematic going forward, ramping up efforts to divert organic waste material discarded in cities into alternative waste processing methods such as composting or anaerobic digestors. Both techniques prevent the release of methane into the atmosphere, while simultaneously creating either a useful soil nutrient amendment and/or energy that can replace fossil fuels.

120. The EU accession agreement has already established a timetable for this to be achieved, requiring that 65% of all biodegradable waste generated in Romania 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.

121. 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.

122. Priority actions the governments should consider for the waste sector include continuing to promote the development of new composting facilities to provide an alternative to the disposal of organic waste in landfills. The government should also provide localized climate impact data and require local authorities and relevant waste system facility operators to prepare climate action plans reflecting local climate risks and vulnerabilities.

Urban Water Sector

123. Compared to sectors like buildings and transport, urban water systems tend to receive comparatively little attention in most city or national level climate mitigation plans. 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.

124. 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.

125. More significant concerns 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 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 that the demand-supply gap in these regions is expected to be manageable for the next 15-20 years, but after that significant demand reduction measures or new supply capacity will be needed. Research detailing the climate impacts on other water basins should be prioritized, to provide a comprehensive picture of the challenges certain cities might face in decades to come.

Summary -- High Priority Action Items

Sectoral Focus	Action	Type of action
General planning activities	Establish requirements that integrated climate plans achieving minimum quality standards be prepared by cities applying for some or all Operating Program support. As part of this, support/require the use of broader GHG emission inventories (such as the GPC -- Global Protocol on Community Scale GHG Emissions) at the local level, to ensure more comprehensive assessments than those employed by the Covenant of Mayors.	Policy oversight
	Provide planning grants to local authorities to support the preparation of comprehensive, integrated local climate action plans.	Planning support

	Provide training for local authority and utility staff on how to prepare climate plans for their cities or systems.	Training/ education
	Provide financial/resource support to the "Covenant Club" and other technical assistance organizations focused on local climate, energy efficiency, or transport planning, etc.	Education/ training
	Provide greater access to data sources relevant to comprehensive integrated local climate planning efforts.	Planning support/ research & analysis
General climate related research	Fund research downscaling global climate models to provide more localized assessments of climate impacts in different regions, enabling local authority planners to assess their city's vulnerability to future climate shocks.	Research & analysis
	Fund LIDAR surveys and other analyses that support the development of highly granular, building and facility scale assessments of flooding and other types of climate risk in the 20 largest cities around Romania.	Research & Analysis
Climate change preparedness wareness	Require solid waste system operators to prepare climate action plans for their operation.	Policy oversight
	Require water utilities/ROCs to prepare climate action plans for their operation.	Policy oversight
System upgrade investments	Continue to finance solid waste management upgrades (including composting facilities, anaerobic digestion facilities, and recycling programs) in towns/cities/regions to ensure compliance with relevant EU directives.	Direct investment
	Continue to finance water supply, distribution, and treatment system upgrades in towns/cities/regions to ensure compliance with relevant EU water quality and service coverage requirements. System upgrades should focus on maximizing efficiency improvements and minimizing GHG releases through improved gas management and sludge treatment. Upgrades should also focus on maximizing climate resilience of these systems.	Policy oversight

Summary -- Medium and Long-term Priority Action Items

Sectoral Focus	Action	Type of action
Waste Sector System	Conduct studies on tariff levels to assess the extent to which they successfully support the 'polluter	Policy oversight

Studies	pays principle'.	
	Conduct and publish studies on organics management practices deployed to date to assess cost effectiveness of different approaches.	Policy analysis/ oversight
	Fund waste composition studies in cities and counties that have deployed backyard composting bins to assess the extent to which such programs are effective at diverting organic waste.	Policy oversight
	Study feasibility of use of wastewater treatment network and facilities to process organics waste	Policy analysis
	Analyze the effectiveness of recycling collection services at tower blocks, which are difficult to serve, seeking to identify the best program models across Romanian cities.	Policy analysis
Waste Sector Education Efforts	Support efforts to promote expanded County/Local Authority knowledge on the link between climate change and solid waste management operations.	Education/ training
	Provide training for waste facility operators on climate-sensitive design and operations.	Education/ training
	Establish university curricula to train future civil/solid waste engineers on climate sensitive waste system design and operations.	Education/ training
	Establish public education programs to promote waste prevention, reuse, composting, and recycling.	Education/ training
	Convene conferences/training programs for waste system operators and local authority officials on "best practice" solid waste management strategies around Romania.	Education/ training
Water Sector Education Initiatives	Convene/support efforts to promote expanded IDA/Local Authority knowledge on climate-sensitive water system design and operations.	Education/ training
	Provide training for water system operators on climate-sensitive design and operations.	Education/ training
	Establish university curricula to train future civil/water system engineers on climate sensitive water system design and operations.	Education/ training
Miscellaneous Demand Management Strategies	Provide subsidies to provide households with backyard composting bins.	Direct investment
	Develop/promote building code changes designed to reduce on-site water demand.	Policy oversight
	Establish public education programs to reduce on-site water use.	Education/ Training
	Provide subsidies to households to replace high	Direct

	water demand appliances with more efficient models.	investment
	Incentivize/require IDAs/water utilities/ROCs to establish subsidy programs to replace high water demand consumer appliances with more efficient models.	Policy oversight
	Require IDAs/ROCs/water utilities to eliminate 'combined sewer overflow' designs wherever system expansion is being pursued, reducing the overall amount of material that must be processed on a regular basis, cutting energy demand.	Policy oversight

6.4. Water Sector

126. The water section is presented from an integrated water resources perspective, thereby including all pertinent water-related sectors, viz. municipal water supply and sanitation, industrial water supply, agriculture, energy generation, environment, and disaster management. It is based on available information on the current status of the water resources sector in Romania, along with existing knowledge on the anticipated impacts of climate change in this sector.

Water Resources Availability and Demands

127. 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.

128. 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.

129. 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.

130. 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, the shut-down of economically unviable irrigation schemes, introduction of metering and tariffs in domestic water supply, and reducing system losses. The total demand, as measured by the volume of water made available to users, has decreased from approx. 20 BCM/year in the early 1990s to 8 BCM/year now. The actual consumption is still lower (approx. 6.5 BCM in 2012). As a result the system currently has a degree of over-capacity at the national level.

131. Irrigated area in Romania has decreased from 2 million ha in the late 1908s/early 1990s to approx. 0.8 million ha (considered irrigable with functional infrastructure), as economically unviable schemes were closed down. In fact, the land under irrigation has remained below 300,000 ha for the past 5 years. The corresponding water demand has been reduced from about 8 BCM to 1 BCM per year. While the overall situation appears good because of over-capacity, there are areas of water scarcity in many basins where summer droughts are a significant concern.

132. About 70% of the water supply for domestic use is sourced from surface waters, compared to 95% dependence on surface waters for industrial supply. From a quantitative perspective, a majority of the basins have no serious problems in ensuring sufficient volume for water for meeting the domestic and industrial demands. However, the basins with lower endowment of water (Jiu, Arges-Vedea, Buzau-Ialomita, Siret, Prut-Barlad, and Dobrogea-Litoral) face supply reliability challenges during the summer months, especially in dry years. The Dobrogea-Litoral basin is the most severely affected in this regard.

133. Romania's hydropower potential is estimated at 36 TWh/year, and currently the total installed hydropower capacity amounts to 6,400MW. Hydropower generation accounts for 32% of Romania's total electricity generation, and 16% of the total energy use. The Government intends to decommission/modernize some of the high-emission and obsolete thermal power plants, and therefore plans on a modest increase in hydropower generation capacity. While hydropower is not a consumptive user of water, operation rules for hydropower facilities constrain and are constrained by water uses in other sectors. Therefore the proposed new hydropower facilities would need to be planned taking into account the existing and anticipated future water uses in all sectors. In the basins where scarcity already arises in the summers of dry years, hydropower production will be adversely affected for a short duration, as it was in the dry year of 1990. These constraints can be alleviated to a large extent by careful systems planning and operations optimization, and by accounting for anticipated climate change impacts in the operations planning in both new and existing facilities.

134. Almost 60% 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, physic-chemical, and specific pollutants).

Projected Impacts of Climate Change

135. 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 is likely to decrease by 5-20% in southern Europe and the Mediterranean between the years 2071-2100, compared to numbers 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 range of climate change impacts across Romania includes a likely increase in cold spells, heat waves, heavy floods, landslides, the formation of ice-dams on watercourses, damaging frost, and avalanches.

136. 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 likely 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 occurrences 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 vulnerabilities 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 % for the period 2021-2050. 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.

137. 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 a decrease of seasonal snow volume and to the snow melting early and fast, 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 timeframe 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. Hydropower facilities will also face the increasing threat of intensive floods, and operations will need to provide sufficient flood cushion in storage reservoirs.

Actions Recommended

138. The rapid assessment identified and recommended actions for possible financing under Large Infrastructure OP and Rural Development Plan financed by the EU funds in the 2014-2020 budget cycle; they are identified in the following tables,. The estimated time-frame for these actions is also indicated.

Recommended "No-Regret" Actions

Action	Type of Action	Time frame
1. Conducting Quantitative Assessments of Climate Change Impacts on Hydrology, for estimating future water availability and demands under climate change scenarios. This exercise needs to be completed for all basins of Romania (4 are already covered).	Research & Analysis/ Technical Assistance	Short term
2. Establish requirements that River Basin Management Plans (RBMPs) in each basin must be updated with the results of quantitative climate change assessments described in #1 above.	Policy Training/ education	Short term
3. Ensure that RBMPs currently being prepared for 2015 are updated with quantitative climate change assessments.	Technical Assistance	Short term
4. Conduct analysis to assess the specific levels and types of irrigated agriculture that can be sustained in each of the river basins, accounting for climate change impacts. This should feed into RBMP process.	Research & Analysis/ Technical Assistance	Medium term

5. Conduct analysis of the technical options and economic returns of converting pumped-irrigation to gravity-based schemes, in areas with confirmed and steady demand for irrigation services.	Research & Analysis/ Technical Assistance	Medium term
6. Conduct quantitative assessments of water demands and supply reliability for all the main WSS utilities of Romania, taking into account the expected impacts of various climate change scenarios. This should feed into RBMP process.	Research & Analysis/ Technical Assistance	Medium term
7. Establish regulations to ensure that large industrial water users are provided through utility supplies instead of private groundwater wells (The issue is being considered by the Ministry of Environment and Climate Change).	Policy/Regulation	Short term
8. Conduct quantitative assessments for water needs of various ecosystems. These environmental uses should feed into the RBMP process.	Research & Analysis/ Technical Assistance	Medium term
9. Update flood hazard and risk analysis by using a higher resolution GIS-based approach; upgraded nationally to 1% (1 in 100 years flood) level for inhabited area; and take into account expected climate change impacts.	Technical Assistance	Medium term
10. Establish regulations to formally introduce flood risk assessments into the regional development and general city planning processes.	Policy/ Regulation	Medium term
11. Assess feasibility of regulation for monitoring and managing construction activities in the high flood-risk areas.	Policy/ Regulation	Medium term
12. Strengthen local-level planning capacity for episodic events such as heat waves.	Capacity-building	Medium term

Recommended Actions for Prioritization and Financing under ESIF (2014-2020)

Sectoral Focus	Action	Type of Action	Time frame	Applicable OP
Irrigation	1. Implement pilots to test different models of efficient irrigation systems coupled with climate-smart agriculture practices.	Pilot Investments	Medium term	Rural Development OP
	2. Establish regulations to limit the use of groundwater for domestic water supplies, in the areas where groundwater over-abstraction is leading to serious depletion of aquifers.	Policy/ Regulation	Medium term	Rural Development OP
	3. Wastewater reuse in irrigation should be encouraged, especially in water-scarce basins.	Policy/ Pilot Investments	Medium term	Rural Development OP
Water Supply and	4. Investments in infrastructure to ensure water supply and wastewater provisions for 263 municipalities having more than	Direct Investment	Long term	Large Infrastructure OP / Rural

Sanitation	10,000 inhabitants, by 2015 (and by 2018 for 2,346 smaller townships with 2,000 - 10,000 inhabitants).			Development OP
	5. Assess scope and scale of methane capture and flaring, as well as high efficiency pumps, to reduce the GHG emissions from the water and wastewater supply investments, and qualify these investments as climate actions.	Technical Assistance/ Direct Investments	Medium term	Large Infrastructure OP / Rural Development OP
	6. Support utility investments aimed at reducing system losses in water distribution networks (currently estimated at approx. 50%).	Direct Investment	Long term	Large Infrastructure OP
	7. Wastewater reuse in industrial sectors should be encouraged.	Policy/Pilot Investments	Medium term	Large Infrastructure OP
	8. Assess the feasibility of using aquifers coupled with artificial recharge for inter-annual water storage in water-scarce basins.	Technical Assistance/Pilot Investments	Medium term	Large Infrastructure OP
	9. Establish requirements for protection of critical water supply sources (reservoirs or aquifers) in water-scarce locations, through land use zoning measures.	Policy/ Regulation/ Pilot Investments	Medium term	Large Infrastructure OP/ Rural Development OP/ Regional OP
	10. Assess feasibility of desalinization for provision of drinking water supplies in water-scarce coastal basins.	Technical Assistance	Medium term	Large Infrastructure OP
	11. Afforestation and other catchment improvement activities should be encouraged in flood- and erosion-prone uplands.	Direct Investments	Medium term	Rural Development OP
	12. Implement pilots on suitable co-benefit models of natural resource management, in forest catchments and in wetland fisheries, whereby the ecosystems sustain local livelihoods while providing valuable environmental service.	Technical Assistance/ Pilot Investments	Medium term	Rural Development OP/ Regional OP
Disaster Risk Reduction and Manage-ment	13. Undertake construction of flood management infrastructure. Since the potential investments pipeline is huge (estimated at €17 billion), investments should be prioritized on the basis of updated flood hazard/risk mapping and accounting for the climate change impacts.	Direct Investments	Long term	Large Infrastructure OP
	14. Upgrade the existing radar network for	Direct	Medium	Large

	measuring precipitation intensity to digital, and install a new radar station in Galati.	Investment	term	Infrastructur e OP

6.5. Agriculture and Rural Development Sector

139. Climate change is a huge challenge for the ARD sector in Romania. On the one hand, agriculture is a source of greenhouse gas (GHG) emissions and must therefore be expected to contribute towards the climate change mitigation goals of the Europe 2020 Strategy. On the other hand, the ARD sector is highly vulnerable to the impacts of climate change since the capacity of the "rural space" to provide adequate food supply, deliver ecosystem services, support economic growth, and provide a safe living environment for rural communities is *directly dependent* upon favorable climatic conditions.

140. However, there are opportunities in the EU Common Agricultural Policy (CAP) for helping to address these challenges during the next programing period of 2014-2020 – in particular, the new rural development policy (Pillar II of the CAP) which has been significantly strengthened regarding actions for climate change mitigation and adaptation. This rapid sectoral assessment aims to contribute to the successful mainstreaming of climate action into Romania's post-2013 rural development policy – namely the *National Rural Development Program (NRDP) for Romania 2014-2020* that will be co-financed by the European Agricultural Fund for Rural Development (EAFRD).

Sector Characteristics

141. 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 area is 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 extensive, occupying 59.8% of total territory and providing a home to 44.9% of the total population. A relatively high proportion of national Gross Added Value (32.4%) and employment (41.5%) is also generated in rural areas.

142. The ARD sector in Romania is also diverse and complex with much variability in socio-economic context and human / institutional capacity. Rural areas in Romania are characterized by low quality infrastructure and relatively undeveloped basic services (health and education systems, finance and credit facilities etc.) compared to the urban areas. 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 producing goods largely for their own consumption.

143. 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. In the short-term context of 2014-2020 it is reasonable to assume that this small-scale farm sector will continue to persist, but in the longer-term there is a clear governmental commitment to structural reform of the highly polarized agricultural sector, and a decline in the number of small farms is likely.

144. 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. While the overall situation appears good because of over-capacity, there are areas of water scarcity in many basins where summer droughts are a significant concern. In particular the basins of Jiu, Arges-Vedea, Buzau-Ialomita, Siret, Prut-Barlad, and Dobrogea-Litoral face significant scarcity, with the last one being the most water-scarce basin in Romania. This situation will become more serious as the impacts of climate change become more pronounced. A large amount of water available annually in Romania is not utilized, either because much of it flows during flood periods or because there is insufficient storage capacity to allow for an efficient multi-annual management of water stock.

145. Pollution of groundwater with nitrates continues to be a serious problem and is largely associated with the poor management of livestock manure and human waste in rural areas, despite the rapid and continuous decline of livestock production (except for poultry) in Romania following the collapse of the socialist regime.

Vulnerabilities and Risks from Climate Change in the ARD Sector

146. 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. The projections have some variations depending on the 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).

147. 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 and between the mountains and lowland areas. 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.

148. Romania is already increasingly encountering the negative impacts of climate change (including extreme events) and the modeling of future climate trends suggests that these negative impacts will continue to become more severe. These impacts include: (i) the increased incidence of severe flooding with the associated social and economic disruption and costs; (ii) the increased frequency and intensity of drought; (iii) increased risk of soil erosion by wind and water; (iv) the risk of desertification and associated land degradation, notably in southern and eastern Romania; and (v) reduced agricultural productivity.

149. 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 increasingly 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.

150. Key vulnerabilities are:

- reduced agricultural productivity;
- water supply for rural consumers;
- other social (e.g. human health) and economic hazards for rural communities and households, and;
- environment and the 'health' of natural ecosystems.

151. 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.

152. Mitigation measures therefore need to be put in place in the ARD sector that limit / cap GHG emissions. The big question remains whether the necessary mitigation can be balanced with the inevitable longer-term demands upon agriculture for increased food production. An appropriate mix of actions is therefore needed to manage, offset and avoid emissions across the whole ARD sector.

153. Adaptation is clearly also a high priority – progressive climate change is occurring and significant impacts upon the ARD sector are developing. The ARD sector needs to start responding more rapidly to prepare for future impacts and there is a need to build both the resilience *and* adaptive capacity of the two ARD sub-sectors (the large commercial farms *and* the communities of small-scale subsistence farms).

Existing National Strategies, Policies and Initiatives of Relevance to the ARD Sector

154. The National Climate Change Strategy for Romania 2013-2020 (recently approved by Government Decision No. 529/2013 in July 2013) provides clear guidance on appropriate climate action in the ARD sector in both mitigation and adaptation components and identifies the EU budget (Multi-annual Financial Framework) for 2014-2020 as playing an important role in "catalysing the specific investments that will be needed to meet climate targets and to ensure climate resilience." There are also various other existing strategies of specific relevance to climate action in the ARD sector, including the National Strategy on Drought Effects Mitigation and on the Prevention and Combating the Land Degradation and Desertification (elaborated on in 2008, but not yet approved).

155. In June 2006, the Ministry of Agriculture and Rural Development drafted a National Strategic Plan (NSP) for Rural Development in preparation for EU accession in 2007 and the launch of the National Rural Development Program (NRDP) for Romania 2007-2013 that was co-financed by the European Agricultural Fund for Rural Development (EAFRD). The fight against climate change was mentioned in the NSP as an important priority for Romania and the mitigation of greenhouse gas emissions was set as a key priority for the NRDP 2007-2013. A total of 8 measures were programmed in the NRDP 2007-2013 that are targeted at, or directly relevant to, climate change mitigation and adaptation, as well as the transition to a low carbon economy.

156. The total financial allocation to these 8 measures was €6 399.1 million, of which 46.2% (€2 958.9 million) had been committed to beneficiaries (i.e. absorbed) by the end of 2012. While this only gives a very general indication of the success to-date of targeting NRDP measures / funding on climate action, good experience has been generated with the implementation of

individual measures that should be built upon and developed when programming the forthcoming NRDP 2014-2020.

Priority Actions for Climate Change Mitigation and Adaptation in the ARD Sector

157. The table below presents a set of interventions selected through the analysis for mitigation and adaptation in the ARD sector. All of the interventions have the potential to be initiated (to some extent) in the forthcoming programming period of 2014-2020 and are clustered in terms of: Short-Term Priority – immediate potential to support under the *NRDP 2014-2020*, and, Medium-Term Priority – accompanying action to *NRDP 2014-2020* with longer-term horizon.

Short-Term Priority – immediate potential to support under the *NRDP 2014-2020*

Sectoral Focus	Action	Type of action
General Actions for Supporting Mitigation and Adaptation	Improve awareness of climate change among farmers and rural communities, to articulate clear and simple messages for farmers and rural communities related to the trends, risks and uncertainties that associated with the changing climate.	Education / Training
	Target research and advisory support at climate change mitigation and adaptation in the ARD sector, to i) develop greater understanding of what climate actions are relevent and effective in the specific context of the Romanian ARD sector, and ii) communicate this knowledge via a functional farm advisory and extension system.	Research & Analysis / Education / Training
Priority Actions for Mitigation	Support farmers with the continued reduction of GHG emissions and the adoption of low carbon technologies, to encourage them to adopt technologies and farm management practices which directly contribute to reducing emissions – this includes improvements in the efficiency of energy use and the better management of carbon and nitrogen flows in the agricultural ecosystem.	Policy / Investments / Incentives
	Support for the reduction of soil carbon losses and increased carbon sequestration, to encourage farmers to adopt technologies and farm management practices which directly contribute to reduced soil carbon loss and increased carbon sequestration. Priority actions for support include: i) afforestation of low quality and unproductive land must also be encouraged, especially in those areas where soils are most vulnerable to degradation and loss; ii) organic farming, and; iii) zero /	Policy / Incentives

	conservation tillage techniques.	
	Support for the increased production of renewable energy in rural areas, to encourage i) farmers and other rural businesses and ii) communities to invest in the production of renewable energy including energy crops; rural biogas production from livestock manure, and; investment in the small- and large-scale technologies available for solar and wind power generation.	Policy / Investments
Priority Actions for Adaptation	Investment in irrigation infrastructure in the most vulnerable regions. Priority action is needed at the national level to improve / rehabilitate the economically viable irrigation infrastructure in Romania's south, south-east and east where drought occurrence is predicted to be most frequent and the most severe. The comprehensive conditions attached to EAFRD-financed investments in irrigation (Article 46 of EC Regulation No. 1305/2013) aim to avoid maladaptation to climate change, for example by expanding irrigation in catchments already suffering from water stress and where climate change projections indicate reduced precipitation.	Investments
	Better management of the climate-related risks in the ARD sector, to introduce relevant risk management tools that underpin the confidence of farmers to continue managing and investing in their farms in the face of the uncertainty associated with extreme weather events. Specific tools for consideration include: i) insurance schemes against natural disasters and against pest and disease of livestock and crops, and ii) the setting-up of farmers' mutual funds for stabilizing incomes in case of price volatility or losses from natural disasters or livestock/crop diseases.	Policy / Incentives

Medium-Term Priority – accompanying action to *NRDP 2014-2020* with longer-term horizon

General Actions for Supporting Mitigation and Adaptation	Assess the economic feasibility of investments and incentives for climate action in the ARD sector, to develop greater understanding of the economic feasibility and cost-effectiveness of the various mitigation and adaptation actions that are appropriate to the Romanian ARD sector.	Research & Analysis
Priority Actions for Adaptation	Support for accelerated adaptation by farmers and rural communities. This is a complex action that includes two complementary objectives: i) to encourage farmers and rural communities to adopt technologies and practices	Policy / Education / Training / Investments /

	which build their resilience / adaptive capacity to deal with the uncertainties of climate change, and; ii) to promote and foster innovation, co-operation and other bottom-up initiatives among local communities, including farmers and other businesses, which build their resilience / adaptive capacity to deal with the uncertainties of climate change	Incentives

158. These climate-related actions present a major challenge to the ARD sector in terms of science, policy and practice – a challenge that is complicated by the variability in socio-economic context of rural areas and the highly polarized structure of agriculture. For example, very different approaches are required to address contrasting vulnerabilities in the sector, such as large-scale crop production in the lowland areas of south and south-east Romania, compared to small farmers in geographically remote and economically disadvantaged communities in the mountains where access to relevant information and advice is currently very limited.

Opportunities for Mainstreaming Climate Actions in the NRDP 2014-2020

159. There is a comprehensive suite of mitigation and adaptation measures eligible for EAFRD co-financing under the *National Rural Development Program (NRDP) for Romania 2014-2020*. In broad terms the menu of actions supported by the EAFRD Regulation (EC Regulation No. 1305/2013) include "knowledge transfer and innovation" under Priority 1; "investments" in farm modernization and competitiveness under Priorities 2 and 3, and; the encouragement of sustainable land management via "area-based compensatory payments" under Priorities 4 and 5. Of course the measures selected for inclusion in the *NRDP 2014-2020* will not be able to address all climate-related challenges faced by farmers and other rural stakeholders. Prioritization and careful targeting of the *NRDP* measures will therefore be needed.

160. The main entry point for climate actions in the *NRDP 2014-2020* is under priority 5 of the new EC rural development proposals, namely: *"promoting resource efficiency and supporting the shift towards a low carbon and climate resilient economy in the agriculture, food and forestry sectors."* But since climate change mitigation and adaptation are also cross-cutting objectives for the EAFRD, climate actions should also be introduced under other priorities.

161. A basic intervention logic for the mainstreaming of climate actions in the *NRDP 2014-2020* is included in the report. Some examples of climate-related measures that can be financed in

the *NRDP 2014-2020* are listed below – note that the Article numbers are taken directly from EC Regulation No. 1305/2013 published in December 2013:

EAFRD Measures		**Actions eligible for EAFRD financing**
Article 14	Knowledge transfer and information actions	Actions related to improving knowledge transfer and information on climate-related issues, including general awareness-raising; practical training courses; new agro-meteorological services; internet-based decision tools and information exchange platforms etc.
Article 17	Investments in physical assets	Investments in technologies which reduce the exposure of individual farms to climate change impacts, such as on-farm water storage installations; more efficient irrigation systems; investments in livestock buildings to cope with heat stress etc.
Article 22	Afforestation and creation of woodland	Afforestation of degraded and unproductive agricultural and non-agricultural land
Article 20	Basic services and village renewal in rural areas	Various actions for the climate proofing of local development plans, measures to adapt small scale infrastructure such as local water supply, energy production etc.
Article 28	Agri-environment-climate	Area-based compensatory payments for a wide range of land management practices relating to mitigation and/or adaptation, including novel crop rotations; under-sowing and cover crops; hedges and buffer strips; extensification of livestock production etc.
Article 29	Organic Farming	Area-based compensatory payments for the conversion to, and maintenance of, organic farming methods
Article 36	Risk management	Development of risk analysis models and mutual funds to stabilize farm incomes and compensate for losses from climate-related hazards

162. It must be kept in mind that the ARD sector in Romania is a complex sector and the successful mainstreaming of climate action into the *NRDP 2014-2020* will require the careful tailoring of measures. A "one-size fits all" approach to mainstreaming climate action in the *NRDP 2014-2020* will not be appropriate – a flexible and localized approach should be encouraged as much as possible and the potential of bottom-up, community-based initiatives should not be under-estimated (for example, utilizing the LEADER-approach).

Broad-based Actions in the Face of Uncertainty

163. Significant uncertainty exists in the ARD sector regarding a) the direction and magnitude of climate change; b) its impacts upon agriculture and the wider rural community, and; c) the effectiveness and economics of different actions and strategies for mitigation and adaptation.

164. This uncertainty is inevitably reflected in this rapid sectoral assessment and some very broad-based actions have been recommended that reflect a generic understanding of the most appropriate actions for supporting farmers, including small-holder farmers, to maintain viable and productive systems in the face of climate change. But uncertainty does not mean that action should be postponed and the immediate opportunity to embed climate action in the programming of the NRDP 2014-2020 must be fully and effectively acted upon for the short- to medium-term benefit of the ARD sector.

165. But in parallel further work does need to be done sharpen the generic recommendations in this rapid sectoral analysis. In particular:

- A robust evidence base needs to be built-up, one that ensures all future policy decisions relating to mitigation and adaptation in the ARD sector are cost effective. For example, impact studies are needed that integrate climate, land use and macroeconomic policies, while financial and socioeconomic analyses are needed to evaluate the cost-effectiveness of deploying these various technologies. This will require the Romanian government and research institutions to work more closely together to develop evidence and inform policy;
- A more strategic approach is needed that reconciles and integrates the climate challenges faced by the ARD sector with the need to also significantly reform the sector towards "a more export-driven, high-value and climate-resilient agriculture, with rural living conditions more closely aligned to urban";
- A macro-economic model for the impacts of climate change upon the ARD sector would be useful, but there is an inevitable trade-off that needs to be resolved between a single complex model that allows exploration of multiple policy questions and a suite of simple models that seek to answer the same questions individually.

6.6. Forest Sector

166. The forest sector assessment reviews the measures the government has proposed for the forest sector to determine whether they are climate positive. Based on available information in published literature and limited data on costs and benefits of different forest management approaches, the assessment provides a basis for refining the proposed measures in order to respond to the climate change requirement. Due to limited data, prioritization was not feasible. The assessment also presents information that can assist in monitoring the impacts of the measures.

Sector Characteristics

167. Romania's forests are roughly 27 % of the country land surface (MECC, 2012). Most of Romania's forests are secondary forests and are distributed across the mountains, hills, and plains of the country. Romania is relatively rich in biodiversity and has the largest remaining tract of contiguous natural and naturally regenerated forest because of their current management practices. Romanian forests are used for protection and production purposes.

168. National regulations and technical requirements, and five major management principles structure forest management in Romania. Forest management plans (FMPs) are valid for 10 years and must include management prescriptions for each forest stand, be prepared by specialized forest management planning companies, be approved by the national forest authority and must be implemented in practice. The prescriptive regulatory and technical requirements and restrictions on uses limit flexibility and innovation (which are increasing elements of best forest practice worldwide) and result in costs that can reduce the profitability of sustainable forest management for some private forest owners, especially smallholders.

169. In 2010, the forest sector and wood industry contributed 3.5% of GDP (INS CON 105D). Furniture exports were 3.45% of national exports, and the forest sector was 7% of national exports. The forest sector is also an important employer in rural areas, formally employing approximately 143,000 people in 2011.

170. Implementation of the land restitution legislation resulted in 66% of the wooded land areas were in the public domain while 34% were privately owned in 2009. There are an estimated 850,000 forest owners in Romania, including individuals, indivisible communes, and churches, owning small and large tracts of forests. Approximately 40% of the area under private ownership is managed by smallholders. Restitution has had implications for forest

management including meeting objectives of Natura 2000, as 36% of Natura 2000 sites are on private lands. While the total area under smallholder is less than 20% of the total wooded land area, the parcels are scattered around the country. Motivating private landowners to comply with sustainable management requirements is important to maintain the health of forests. Furthermore, inclusion of small private landowners is also important for meeting the objectives of the SCF.

Forests and Climate Change

171. 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 carbon dioxide (CO2) removals) decreased [by] 61.05 %." (MECC, 2013). To maintain forests' contribution to GHG emission removal, it is necessary to maintain the health of forests.

172. Forests, like other natural systems, are affected by climate change. Projected decrease in precipitation and increases in temperature are anticipated to reduce the health of forest systems, and increase their vulnerability to pests and other biotic factors. This is turn could degrade forests reducing their ability to sequester carbon and increasing the likelihood that forests become a source of CO2 emissions. Less suitable climatic conditions and associated biotic pressures are also expected to decrease tree growth by approximately 30%. Decreased growth will reduce the ability of forests to sequester carbon and will have economic ramifications[20].

Using Forests to Adapt to and Mitigate Climate Change

173. Forests provide supporting, provisioning, regulating and cultural services. These ecosystem services support human wellbeing at the local, national, regional and global level, including through the sequestration of GHGs and mitigation of climate change. Forests structures, species, and species distribution, however, are being modified by climate change. Responding to this requires the adaptation of forests themselves in order to prevent the degradation of forest resources and to protect the ecosystem services that society relies on for its wellbeing.

[20] There is inadequate data to assess the potential economic impacts, and a 30% decrease in growth cannot assumed to be a decrease in contribution to GDP by a third (i.e., roughly 1.3% of GDP) as value addition is not accounted for.

Opportunities Identified

174. Sustainable management of production forests could contribute to mitigating climate change through naturally regenerated stands sequestering carbon and reducing the occurrence of pests or other biotic factors that degrade forests. To foster sustainable management of production forests under private ownership, the government should consider: (i) offering guidance for sustainable forest management rather than prescriptive legal and technical requirements, fostering innovation, (ii) simplifying rules for administering forests, (iii) providing technical support for innovating in forest management, harvesting and value addition, (iv) offering incentives and opportunities for smallholders to associate and benefit from economies of scale, and (v) improving and extending road access in production forest areas. Well planned and maintained road access can make a positive contribution to mitigating climate change as it enables forest management, continuous monitoring of forest health, and assists in preventing and putting out fires and pest infestations (both of which can release CO2).

175. Maintaining protection forests that promote sustainable use of resources can enhance the resilience of forest systems, help preserve biodiversity, and reduce carbon emissions. Romania has an obligation to meet the directives associated with Natura 2000. Facilitating management of existing protected areas and Natura 2000 sites with forests can help reduce carbon emissions from degradation of these sites. The extent of carbon sequestration, however, will be lower in those sites where the trees are of an older age class. Achieving the objective of protected forests requires providing the necessary human and financial resources to develop management plans and review, approve and implement management plans for protected natural areas. It will also require determining how to most effectively ensure compliance with Natura 2000 – with incentives, regulations, technical support, purchasing privately owned Natura 2000 sites or a combination of these.

176. Afforestation can increase carbon sequestration, especially during the early stage of tree growth (after the initial years). There are approximately 115,129 ha as suitable for improvement through afforestation and agricultural areas that are not suitable for cultivation are scattered throughout the country. The national forest authorities are considering afforestation in largely abandoned agricultural areas in the southern belt of Romania. Due to the cost of afforestation, financial resources to support such activities are important. This can be provided as compensation for lands being included within a national afforestation program that aims to plant contiguous parcels of land (referred to as forest belt in Romania). Financial support can also be provided to individual interested in afforestation through appropriate credit opportunities. In addition, the 'infrastructure' (i.e., capacity for seedling production,

technical support, accessible data and information on species suitability) for afforestation must be in place.

Proposed Measures for 2013-2020 Programming

177. The Government of Romania has initially identified the following measures from the forest sector for the upcoming operational programming cycle (2013-2020):

- Improving forest accessibility by maintaining and building forest roads and other accessibility facilities (article 18 in the EU Regulation for programming 2014-2020 CSF).
- Investments in new technology, processing and marketing forestry: products (article 22).
- Implementation of Natura 2000, afforestation, and establishment of forest belts (article 31, 35).
- First afforestation of agricultural lands (article 22).
- Training and consultancy (article 15 and 16).
- Support for organizing the supply chain in forestry.
- Insurance and mutual funds in forestry.
- Support for innovation and collaboration.

178. The contribution of forests to GHG emission reduction requires that the sector manage the resource in a sustainable manner (keeping the system healthy and trees growing). In Romania this requires addressing many of the policy and regulatory challenges and technical and access constraints in the sector. Many of the aforementioned measures are important to address constraints to sustainable forest management in the current context of Romania. Therefore, these measures, if properly implemented, would help contribute to GHG emission reduction, adapting forests, and using forests for adaptation to climate change during the programming period.

179. The Delegate Ministry on Forests has proposed funding amounts for each measure, with a total value of €3.93 billion. This amount is well in excess of the total funding anticipated for the overall NRDP. As a consequence several of the measures may not receive the desired amount. Using available qualitative and quantitative data, the rapid forest sector assessment makes recommendations for refining the measures and enhancing their positive impact on mitigating climate change.

Recommendations and Conclusions

180. The measure on improving road access will be fundamental for ensuring that forests help mitigate climate change because of the net benefits for SFM. To effectively deliver positive climate outcomes with this measure it will be important to:
    - Ensure that the roads that are rehabilitated, and that new roads constructed, improve the contribution of forests to carbon sequestration, by ensuring that the eligibility criteria are inclusive of all the entities managing forests and requiring a clear indication of the potential reduction in GHGs as a result of the project;
    - Base financing provided for forest roads on the economic rationale and direct and indirect contribution to climate change mitigation (including based on rough estimates of carbon sequestration or accumulation in the medium term) - the investments made through this measure should result in benefits that would not have arisen without the measure;
    - Consider the current distribution of markets and capacity for timber harvesting and processing; and
    - Raise awareness about the opportunity for financial support for road rehabilitation, maintenance and construction, including using the networks available to the forest associations.

181. The current funding request of €700million, while seemingly significant, would (using data from the previous programming period) allow for rehabilitation of roughly 7500 km of road. This would augment the rehabilitated roads by 2.5m/ha of production forest or 1.15m/ha overall. This addition still leaves Romania well below accessibility levels found in other comparable EU28 member countries. A more detailed analysis is needed to determine how much of the total available funds for the sector should be reallocated to this measure while ensuring that it remains feasible to implement.

182. The measure on investing in new technology, marketing and processing is well justified because it helps forest companies that have not upgraded their technology, improving SFM and having positive impact on soil and efficiency of management. It will also increase efficiency and improve value-addition and revenue from these products. To ensure this measure delivers positive benefits, the agency should:
    - Give priority to co-financing environmentally friendly technologies;
    - Ensure that if technologies are being "imported", support is provided to adapt them to the conditions under which SMEs are operating in Romania;
    - Encourage the development of new technologies within Romania; and

- Provide information regarding what "environmentally friendly" entails;

183. The extent of private ownership of forests requires adequate policy measures and incentives for small and large private forest landholders to comply with the national objectives for forest resource management. This is especially the case for areas for protection that are designated Natura 2000 sites, of which 36% are on private landholdings. Prior to finalizing the measure on Natura 2000, it is necessary to assess the suitability of using compensation to improve compliance with Natura 2000 requirements. Use of compensation should be compared with the use of forest legislation to achieve Natura 2000 objectives (as is done elsewhere in Europe), and the possibility of using the funds to purchase private lands that are designated Natura 2000. Furthermore, the feasibility of compensation should be examined as EU regulations require a clear articulation of additionality to complying with Natura 2000 requirements to justify provision of compensation. If a compensation measure is put in place, it should involve a simple and straightforward mechanism for providing payouts. The funds should be accessible to all stakeholders groups, and the selection process must be inclusive.

184. Given the increased awareness of Natura 2000, the sector will be able to deliver on this measure more effectively during this programming cycle. Additional awareness raising, however, needs to be done among small landowners who would be eligible for the compensation payments. Furthermore, there is the need to address the institutional issues that constrained effective administration of the measure on Natura 2000 during the last programming cycle.

185. There is limited data to assess appropriateness of the requested funding allocation (€2.5 billion) for this measure. Based on 2009 data, an allocation of €150 million would provide all private landholders with Natura 2000 sites with compensation at 2009 levels. Determination of the appropriate funding level for this measure requires updated estimates of the cost of administering and monitoring Natura 2000 activities, cost for afforestation of degraded lands, establishment of forest belts, and provision of compensation payments.

186. The measure for Natura 2000, afforestation, forest belts, should be disaggregated and the afforestation, forest belt activities should be merged with the first afforestation of agricultural lands. Use of funds for afforestation projects should prioritize geographic areas where the activity can generate multiple benefits such as combatting desertification and improving degraded lands. For example, some areas in south-east Romania are more suitable for afforestation and would significantly benefit from such investments. Another approach would determine where to support investments in afforestation based on their potential benefit to adapting agriculture to climate variability.

187. The measure on first afforestation of agricultural lands can also help mitigate and adapt to climate change by enabling CO2 sequestration and contributing to resilience to climate change. The funding requested for this measure (€250 million) could enable the afforestation of somewhere between 38,000ha and 100,000 ha (depending on where the projects are implemented). This is an ambitious target, and will require establishing and effectively using existing supporting services (from private or public sector) such as availability of good quality seedlings and extension support. In addition, there is need to:

- Prioritize afforestation projects based on areas with high potential and notable co-benefits;
- Keep the application and eligibility requirements clear and simple;
- Adopt inclusive criteria for eligibility;
- Ensure a significant portion of the upfront costs are covered with this measure;
- Improve the implementation arrangements for this measure, drawing on lessons from previous attempts to implement afforestation; and
- Raise awareness.

188. The impact of forestry measures requires time. Steps should be taken to put the necessary supporting systems in place to avoid any further delays (e.g., afforestation measures will initially require increased capacity for seedling production). This reality underscores the importance of initiating the measure early in the programming cycle to achieve the desired outcomes and envisaged impact on GHG emissions.

189. The sector should also consider integrating measures for forests in other SOPs, where appropriate. For example the conditions necessary for research could potentially be delivered as part of other SOPs that have a focus on research. Additional examples include opportunities to integrate elements of the measures on afforestation into the NRDP measures for agricultural land; building climate resilience of infrastructure would include measures to maintain forests on slopes to mitigate landslides and reduce soil erosion; diversifying the energy mix (especially in rural areas) to include biomass based energy, helping shift to a low carbon energy portfolio.

190. In summary, the General Directorate of Forestry proposed measures comply with the EU requirement that 30% of the allocated funding have positive climate relevance. The measures with the larger funding request enable sustainable forest management. Several of the measures require additional funding to bridge the gap between the current situation and optimal potential. The proposed funding levels, however, are more realistic given the targets

that will need to be met (with the exception of the proposed funding for Natura 2000, afforestation, and forest belts).

191. An advantage of investing in the forest sector for mitigation is the co-benefits from SFM of production and protection forests. Improved forest management practices that internalize the potential impact of climate change can build the resilience of forests to climate variability, enhance the resilience of other sectors (e.g., agriculture), restore degraded lands, and provide a source of renewable energy for rural areas that has a low carbon footprint. Sustainable management of forests is instrumental for achieving Romania's international obligations and EU directives.

192. Providing support for the forest sector through the NRDP and SOPs can be a "no regrets" investment. Many of the measures in the forest sector can jointly address mitigation and adaptation issues (e.g., afforestation of degraded lands). It, however, is important to ensure they do not have unintended consequences (e.g., decrease in CO2 removal). Monitoring change in carbon sequestration and monitoring harvesting and planting using some of the recently available technology and low cost system would assist in preventing negative outcomes.

193. The table below summarizes the specific recommended mitigation and adaptation actions in the forest sector. The recommendations are presented based on forest classification – protection, production – and also for afforestation. Cross-cutting recommendations are presented at the end of the table. It should be noted that for these actions to have the intended impact will require enabling institutional, policy, and planning conditions in the sector. Some of these are briefly described under specific measures and in more detail in the rapid sector assessment.

Sectoral Focus	**Action**	**Type of action, Linkage with Proposed Measure, and Timeframe**
Production Forest	Update technical norms for management, to make production forest management more efficient and effective, and reduce unsustainable practices that could result in GHG emissions. The technical norms should better reflect advances in forest management, forest operations, and associated technologies (for example, nursery technology, seed quality, plant handling and site cultivation).	Technical Assistance Linked with proposed measure on innovation and collaboration Short term
	Update technical norms for harvesting and rotations to	Technical

	reflect advances in growth and yield modelling and stand dynamics or on the financial viability of the management prescription for a particular stand. This helps to make harvesting of forest management more efficient and effective and reduce unsustainable practices that could result in GHG emission.	Assistance Linked with proposed measure on innovation and collaboration Short term
	Simplify regulations for compliance with legal requirements for SFM for small privately owned forest areas. The simpler regulation should enable owners of forests under 10 ha to adhere to good forest practice and SFM guidance with simplified requirements for planning, marking, harvesting and sale of timber and non-timber forest products. This helps to make forest management more achievable for smallholders, reducing unsustainable forest management practices that could result in GHG emissions.	Technical Assistance Linked with proposed measure on innovation and collaboration Short term
	Review the modeling and analysis for CO2 removal from the three different scenarios examined by ICAS in recent climate modeling work (ICAS, 2012). This would require working with their existing permanent sample plots to undertake more growth and yield analysis. The objective is to confirm that having more intense management would increase CO2 removal.	Technical Assistance Requires additional measure on research Short term
Protected area	Increase area with management plans to enable sustainable forest management and therefore GHG removals: - Improve limited administrative capacity in the environment authority (also consider delegating authority to approve management plans to local agencies of MoEF). - Make available funds for implementation of management plans.	Technical Assistance Requires additional measure or should be reflected by broadening proposed measure on Natura 2000 Short and medium term
	Promote management practices that enhance resilience of protected areas: - Foster management practices that reconnect artificially divided natural areas and form a functioning network. - Restore degraded natural areas to create a new	Technical Assistance Requires additional measure or broadening of proposed measure

	space for animals, plants and leisure activities and prevent disasters.	on Natura 2000 Short and medium term
	Incentives for Natura 2000 that ensure sustainable forest management: - Revisit the funding request for the measure on Natura 2000, afforestation and forest belts. - Undertake a campaign to promote a wider understanding of the importance of biodiversity conservation, especially among private owners. - Align requirements for forest management and management of Natura 2000 sites. - Explore options for regulations to help implement Natura 2000 or use of available funds to purchase private land in areas designated for Natura 2000. - Make the compensation process for Natura 2000 more transparent.	Technical Assistance Linked to proposed measure on Natura 2000 Short term
	Biodiversity conservation to reduce degradation and therefore reduce GHG emissions: - Develop and finance implementation of management plans for natural habitats, to prevent and limit the degradation caused by climate change. Management plans should include appropriate measures to protect the natural and semi-natural habitats close to the agricultural areas.	Technical Assistance Requires an additional measure or extending measure on Natura 2000 Medium term
Afforestation	Incentives for Afforestation to enable sequestration of GHG: Owners need to be properly compensated to afforest their lands and keep part of their agricultural land under trees. Also need support to bear the upfront cost of afforestation.	Investment and Technical Assistance Linked to measure on afforestation and first afforestation of agricultural lands Short term
	'Infrastructure' for Afforestation: Achieving the	Investment and

	afforestation targets will require seedlings, technical support and extension services for management of afforested areas, and assistance to build market access for the sustainable extraction of poles or other wood products.	Technical Assistance Linked to measure on afforestation and first afforestation of agricultural lands Short term
Cross Cutting Actions	Information on Land Ownership: Carry out a forest cadastre to help with the implementation of incentive payments.	Technical Assistance Requires an additional measure on inventory/ cadastre or inclusion with other ongoing cadastres. Short term
	Improve accessibility: Invest in maintaining, rehabilitating, and in some places, constructing forest roads, to lower cost of SFM and enable forest monitoring and fire management, reducing unintended GHG emissions.	Investments Linked to measure on Improving forest accessibility Short and medium term
	Completion of National Forest Inventory and periodic inventory work to help with the implementation of SFM.	Technical Assistance Requires an additional measure on inventory and monitoring or inclusion with other measures on monitoring and data collection Short term
	Information on new technologies usable for forest management, harvesting and processing to increase likelihood of SFM.	Technical Assistance

		Linked to measure on training and consultancy Short and medium term
	Research on impact of pests, invasive species and climate change on forest systems and tree species to assist with management and prevention of biotic factors that can cause GHG emissions from forests.	Technical Assistance Requires an additional measure on research or inclusion in another SOP that has research Short and medium term (has long term benefits)
	Capacity building for small holders to help with SFM and climate resilience. Training and extension support is needed on how to manage the forest resource to maximize its multiple benefits, and how to account for ecosystem services, how to plan for climate change impacts and adapt forest management.	Technical Assistance Linked to measure on training and consultancy Short and medium term
	Greater understanding of the economics of forest management and access to markets to make SFM profitable and therefore help sequester GHGs.	Technical Assistance Requires an additional measure on research or inclusion in an SOP that has research Short and medium term
	Facilitate the establishment of producer groups to assist private owners to find SFM profitable.	Technical Assistance Linked to measure on support for

		organizing the supply chain in forestry Medium term
	Put in place a forest monitoring system to help reduce degradation of forests and therefore reduce GHG emissions.	Technical Assistance/ Investment Requires an additional measure on inventory/ monitoring Short and medium term

7. CONCLUSION

194. Based on the results of rapid assessments on climate risks and actions in six key sectors—energy, transport, urban, water, agriculture, and forestry—this report recommends climate actions the Romanian government should consider in order to meet the EU's requirement for devoting 20% of spending to tackling climate change in the operational programming of EU funds for 2014-2020. These actions address both mitigation and adaptation, covering a wide range of approaches from policy reform schemes to physical investments, from urban energy efficiency to multimodal transport, from irrigation to sustainable forestry management.

195. The six sector rapid assessments were carried out over just 2 to 4 months in the fall of 2013. Due to time limitations on the rapid assessments, and unavailability during the period of the government's drafting of OPs and other sector plans which serve as their basis, these assessments have not yet evaluated and prioritized specific investment proposals based on cost-effective analysis. The climate actions recommended in this report are therefore generic.

196. Nevertheless, the report, together with the six sector reports on which it is based, presents rich information on the links between sector interventions and climate change and provides many practical recommendations to Romania. It will be a good starting point for the government as they begin to consider integrating actions that address climate change into their sectoral operational programs for 2014-2020.

197. Moving forward, as the draft OPs become available for review the World Bank will continue to advise the government units and their consultants on how to integrate climate-related recommendations into them. As outlined in the climate change program, the World Bank will continue analysis through in-depth sectoral overview and modeling across the six sectors, further identifying and prioritizing a wide range of interventions addressing climate change, and further assisting the Romanian government in developing an action plan for addressing climate change and operationalizing its national climate change strategy.

LIST OF SECTOR RAPID ASSESSMENT REPORTS PREPARED FOR THIS REPORT

- Energy Sector Rapid Assessment Report
- Transport Sector Rapid Assessment Report
- Urban Sector Rapid Assessment Report
- Water Sector Rapid Assessment Report
- Agricultural and Rural Sector Rapid Assessment Report
- Forest Sector Rapid Assessment Report

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ANNEX

EC Methodology for Tracking Climate Change Related Expenditure

The EC has prepared a draft methodology for tracking climate change related expenditure.[21] This annex provides a brief summary for the convenient reference of the governments.

Where operations supported from the ERDF and the Cohesion Fund involve several intervention field codes, the managing authority has two options:

- To use the most prominent part of the operation to choose the intervention field code.
- To use several codes, allocated based on the approximate pro rate divisions of expected costs across different intervention fields.

The Commission recommends managing authorities the use of multiple codes for major projects. The approach involves two phases; (a) attaching weights to the codes under the intervention category; (b) in the case of intervention fields with a zero weighting, the information could be filtered through Thematic Objective No.4 "supporting the shift to the low carbon economy in all sectors" and Thematic Objective No.5 "promoting climate change adaptation, risk prevention, and management." The financial data reported (in connection with codes which generally having a weighting of 0 percent) under these two climate related thematic objectives would be counted as contributing to the climate objective with a 40 percent weight.

The draft nomenclature of categories of interventions for **transport** has the following coefficients for the calculation of support to the climate change objectives:

- Railways: 40%
- Roads: 0%
- Multimodal transport: 40 %
- Airports: 0%
- Seaports: 40%
- Inland waterways and ports: 40%
- Urban transport infrastructure: 40%
- Intelligent transport systems for urban transport: 40%

[21] Source: European Commission (2013), Fiche 2, Implementing Act on the Nomenclature of Categories of Intervention and the Methodology for Tracking of Climate Related Expenditure Under Cohesion Policy. Version 2 – 27/05/2013 and Draft Implementing Act On The Climate Change Tracking Methodology for the ESI Funds, the Arrangements for the set-up of the performance framework, the categories of intervention for the IGJ Goal and for the ETC Goal, Based on fiches no 2 and 24A, Version 1 – 29 November 2013.

What this means is that roads and airports have a weight of zero, and do not contribute to reaching the 20 percent target, unless the case can be made that they address Thematic Objective No.4 or Objective No.5. Thus a new motorway that is built with revised design standards that has made the infrastructure resilient to expected climate patterns (increased heat or flooding) could contribute to the climate objective.

The decision on how the 20 percent of climate change expenditure for all Operational Programs will be applied is a decision left to each member state. It remains to be defined how this target will be applied, and whether transport will need to make a contribution larger than 20 percent or not. It will potentially affect the final modal composition of the proposed infrastructure investments.

The same logic applies to other sector-related actions identified within the different categories of interventions.

The draft nomenclature of categories of interventions for **energy** has the following coefficients for the calculation of support to the climate change objectives:

- Electricity (storage and transmission): 0%
- Natural gas: 0%
- Renewable energy: wind 100%
- Renewable energy: solar 100%
- Renewable energy: biomass 100%
- Other renewable energy: (including hydroelectric, geothermal, marine energy and other) and renewable energy integration (including storage, power to gas, renewable hydrogen infrastructure) 100%
- Energy efficiency renovation of public infrastructure, demonstration projects and supporting measures: 100%
- Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures: 100%
- Intelligent Energy Distribution Systems at medium and low voltage levels (including smart grids, ICT systems): 100%
- High efficiency co-generation and district heating: 100%

The draft nomenclature of categories of interventions that link to **urban, waste and water** related actions can be found under the **environmental infrastructure** and environment fields of the fiche 2. It has the following coefficients for the calculation of support to the climate change objectives:

- Household waste management: minimization, sorting, recycling measures 0%
- Household waste management: thermal treatment, incineration and landfill measures 0%
- Commercial, industrial or hazardous waste management: 0%
- Provision of water for human consumption (extraction, treatment, storage and distribution infrastructure): 0%
- Water management and drinking water conservation (including river basin management, water supply-specific climate change adaptation measures, district and consumer metering, charging systems, leak reduction): 40%
- Waste water treatment: 0%
- Environmental measures aimed at reducing and / or avoiding greenhouse gas emissions (including treatment and storage of methane gas, composting): 100%
- Cycle tracks and footpaths: 100%

The draft nomenclature of categories of interventions that link to **ARD** and **forestry** can be found under the environment field of the fiche 2. It has the following coefficients for the calculation of support to the climate change objectives:

- Air quality measures: 40%
- Integrated prevention and pollution control (IPPC): 40%
- Protection and enhancement biodiversity, nature protection and green infrastructure: 100%
- Protection, restoration and sustainable use of Natura 2000 sites: 0%
- Adaptation to climate change measures and prevention of climate related risks (including erosion, fires, flooding, storms and awareness raising): 100%
- Risk prevention and management of non-climate related natural risks (i.e. earthquakes) and risks linked to human activities (including awareness raising, civil protection and disaster management systems and infrastructures): 0%
- Rehabilitation of industrial sites and contaminated land: 0%
- Development and promotion of the tourism potential of natural areas: 0%
- Protection, development and promotion of public tourism assets: 0%
- Development and promotion of public tourism services: 0%
- Protection, development and promotion of public cultural heritage assets: 0%
- Development and promotion of public cultural heritage services: 0%