Project co-financed by the European Regional Development Fund through OPTA 2007 – 2013

Romania Climate Change and Low Carbon Green Growth Program

Output D 2.1
Monitoring, Reporting, and Verification

October 2015
This report corresponds to the deliverable “Report on the Design of MRV system in Romania” (Output D2.1) in the Advisory Services Agreement on Romania Climate Change and Low Carbon Green Growth Program signed between the Ministry of Environment and Climate Change and the International Bank for Reconstruction and Development on July 23, 2013.

The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of the Executive Directors of The World Bank or the governments they represent. They are entirely those of the author(s) and should not be attributed in any manner to the World Bank, or its affiliated organizations, or to members of its board of executive directors for the countries they represent. The World Bank does not guarantee the accuracy of the data included in this study and accepts no responsibility whatsoever for any consequence of their use. The boundaries, colors, denominations, other information shown on any map in this volume do not imply on the part of the World Bank Group any judgment on the legal status or any territory or the endorsement of acceptance of such boundaries.

1 Now called Ministry of Environment, Waters and Forests
# Table of Contents

## Contents

Acknowledgements ..................................................................................................................... i
Abbreviations and Acronyms .................................................................................................... i
Executive Summary .................................................................................................................. i

1. Introduction ......................................................................................................................... 1
   1.1 Terminology .................................................................................................................... 2
   1.2 Organization of the report ............................................................................................. 2

2. Overview of MRV Requirements ......................................................................................... 4
   2.1 The UNFCCC Requirements ....................................................................................... 5
   2.2 The European Union MRV Requirements ..................................................................... 6
   2.3 Additional EU Evaluation Requirements linked to Funding .......................................... 15
   2.4 Summary of Emissions-related Reporting Requirements ............................................. 16
   2.5 Sustainable Development Goals .................................................................................. 17

3. MRV of Emissions for Maritime ......................................................................................... 20
   3.1 Context and overview of the Maritime MRV Regulation ............................................... 20
   3.2 Maritime MRV Regulation Requirements .................................................................... 20
   3.3 The EU Maritime MRV Regulation in the context of other legislation ......................... 28
   3.4 The regulation in the Romanian context ....................................................................... 31
   3.5 Next steps regarding Maritime MRV ........................................................................... 39

4. MRV of Climate Change Actions by Local Governments .................................................. 41
   4.1 Overview of the Covenant of Mayors Initiative ........................................................... 41
   4.2 Sustainable Energy Action Plans (SEAPs) ................................................................... 42
   4.3 Additional Methodologies for local GHG inventories .................................................. 50
   4.4 Potential financing resources for SEAPs and Emissions Inventories ............................. 53
   4.5 Options and considerations for supporting local government actions on climate change .. 55

5. MRV: Research & Systematic Observation, and Education & Awareness .......................... 57
   5.1 Overview of the integration of climate change into public policy and institutions .......... 57
   5.2 Existing Institutional Approach .................................................................................... 58
   5.3 Options and Recommendations for Research and Systematic Observation .................. 61
   5.4 Education and Citizen Awareness on Climate Change Issues ...................................... 66
   5.5 Options and Recommendations for education and awareness .................................... 68
   5.6 Analyzing options for improved RDI & EA inputs in the National Communications ........ 70

6. Concluding Remarks ............................................................................................................. 74

References ............................................................................................................................... 75
Acknowledgements

This report is a product of the World Bank’s Romania Climate Change Reimbursable Advisory Service (RAS) project, at the request of the Government of Romania, through its Ministry of Environment, Waters and Forests (MEWF). It was drafted by Viorel Blujdea, Julia Larkin, Dumitra Mereuță, and Cathrine Sachweh, under the supervision of Michael McCormick.

The team would like to express its gratitude to the Romanian Government, particularly Sorin Deaconu, Narcis Jeler, Gabriela Popescu, Gherghiţa Nicodim, Mihaela Smarandache, and Mihaela Ștefănescu of the Climate Change General Directorate of MEWF, for their review and discussion of findings and recommendations, and excellent working relations throughout this assignment. The following individuals were interviewed during the development of the Maritime section: Daniela Ionescu, Heiko Kunst, Gherghiţa Nicodim, and Marian Popescu. Their input was instrumental.

The World Bank program is managed by Jian Xie and Erika Jorgensen, under the general guidance of Paula Caballero, Kulsum Ahmed, and Elisabetta Capannelli from the World Bank.
# Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCC</td>
<td>Action Plan on Climate Change</td>
</tr>
<tr>
<td>AVR</td>
<td>Accreditation and Verification Regulation</td>
</tr>
<tr>
<td>BEI</td>
<td>Baseline Emissions Inventory</td>
</tr>
<tr>
<td>BR</td>
<td>Biennial Reports</td>
</tr>
<tr>
<td>CC&amp;A</td>
<td>Climate Change and Adaptation</td>
</tr>
<tr>
<td>CCS</td>
<td>Carbon Capture and Storage</td>
</tr>
<tr>
<td>CNPSTI</td>
<td>National Council for Science Policy, Technology and Innovation</td>
</tr>
<tr>
<td>CP2</td>
<td>Second Commitment Period (under the Kyoto Protocol)</td>
</tr>
<tr>
<td>CPLAU</td>
<td>Climate Partnerships for Local Authorities Units</td>
</tr>
<tr>
<td>ECA</td>
<td>Energy Cities Romania</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EEA</td>
<td>European Environment Agency</td>
</tr>
<tr>
<td>EED</td>
<td>Energy Efficiency Directive</td>
</tr>
<tr>
<td>EFA</td>
<td>Environmental Fund Administration</td>
</tr>
<tr>
<td>EMSA</td>
<td>European Maritime Safety Agency</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>ESD</td>
<td>Effort Sharing Decision</td>
</tr>
<tr>
<td>ESIF</td>
<td>European Structural and Investment Funds</td>
</tr>
<tr>
<td>ESSF</td>
<td>European Sustainable Shipping Forum</td>
</tr>
<tr>
<td>ETS</td>
<td>Emissions Trading Scheme</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gases</td>
</tr>
<tr>
<td>GWP</td>
<td>Global Warming Potentials</td>
</tr>
<tr>
<td>IIE</td>
<td>Intelligent Energy for Europe</td>
</tr>
<tr>
<td>INDC</td>
<td>Intended Nationally Determined Contributions</td>
</tr>
<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>IPPU</td>
<td>Industrial processes and product use</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>LAU</td>
<td>Local Administrative Unit</td>
</tr>
<tr>
<td>LCDS</td>
<td>Low Carbon Development Strategy</td>
</tr>
<tr>
<td>LCGGP</td>
<td>Low Carbon Green Growth Programme</td>
</tr>
<tr>
<td>LULUCF</td>
<td>Land Use, Land Use Change and Forestry</td>
</tr>
<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
</tr>
<tr>
<td>MADR</td>
<td>Ministry of Agriculture and Rural Development</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>MEI</td>
<td>Monitoring Emissions Inventory</td>
</tr>
<tr>
<td>MER</td>
<td>Ministry of Education and Research</td>
</tr>
<tr>
<td>MESMEsBE</td>
<td>Ministry of Energy, Small &amp; Medium–Size Enterprises, and Business Environment</td>
</tr>
<tr>
<td>MEWF</td>
<td>Ministry of Environment, Waters and Forests</td>
</tr>
<tr>
<td>MTT</td>
<td>Ministry of Economy, Trade and Tourism</td>
</tr>
<tr>
<td>MMR</td>
<td>Monitoring Mechanism Regulation</td>
</tr>
<tr>
<td>MRDPA</td>
<td>Ministry of Regional Development and Public Administration</td>
</tr>
<tr>
<td>MRR</td>
<td>Monitoring and Reporting Regulation</td>
</tr>
<tr>
<td>MRV</td>
<td>Monitoring, Reporting and Verification</td>
</tr>
<tr>
<td>MP</td>
<td>Monitoring Plan</td>
</tr>
<tr>
<td>MS</td>
<td>Member State (of the European Union)</td>
</tr>
<tr>
<td>NAB</td>
<td>National Accreditation Body</td>
</tr>
<tr>
<td>NAP</td>
<td>National Adaptation Plan</td>
</tr>
<tr>
<td>NC</td>
<td>National communications</td>
</tr>
<tr>
<td>NCCC</td>
<td>National Commission for Climate Change</td>
</tr>
<tr>
<td>NCCS</td>
<td>National Climate Change Strategy</td>
</tr>
<tr>
<td>NEEAP</td>
<td>National Energy Efficiency Action Plan</td>
</tr>
<tr>
<td>NREAP</td>
<td>National Renewable Energy Action Plan</td>
</tr>
<tr>
<td>NIR</td>
<td>National Inventory Report</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>NRP</td>
<td>National Reform Programme</td>
</tr>
<tr>
<td>ODA</td>
<td>Official Development Assistance</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OP</td>
<td>Operational Programme</td>
</tr>
<tr>
<td>OPTA</td>
<td>Operational Programme Technical Assistance</td>
</tr>
<tr>
<td>P&amp;M</td>
<td>Policies and Measures</td>
</tr>
<tr>
<td>RDI</td>
<td>Research, Development and Innovation</td>
</tr>
<tr>
<td>RMA</td>
<td>Romanian Municipalities Association</td>
</tr>
<tr>
<td>RENAR</td>
<td>Romanian Association for Accreditation</td>
</tr>
<tr>
<td>RES</td>
<td>Renewable Energy Sources</td>
</tr>
<tr>
<td>QAQC</td>
<td>Quality Assurance and Quality Control</td>
</tr>
<tr>
<td>QELRT</td>
<td>Quantified Emission Limitation or Reduction Commitment</td>
</tr>
<tr>
<td>QEWERT</td>
<td>Quantified Economy-Wide Emission Reduction Commitment</td>
</tr>
<tr>
<td>RAS</td>
<td>Climate Change Reimbursable Advisory Service</td>
</tr>
<tr>
<td>SDGs</td>
<td>Sustainable Development Goals</td>
</tr>
<tr>
<td>Acronym</td>
<td>Full Form</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
</tr>
<tr>
<td>SEA</td>
<td>Strategic Environmental Assessment</td>
</tr>
<tr>
<td>SEAP</td>
<td>Sustainable Energy Action Plan</td>
</tr>
<tr>
<td>SEE</td>
<td>Financing Mechanism for the European Space</td>
</tr>
<tr>
<td>SME</td>
<td>Small and medium enterprises</td>
</tr>
<tr>
<td>S&amp;T</td>
<td>Science and Technology</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
</tbody>
</table>
Executive Summary

The World Bank Group prepared this report, which is one in a series, to assist the Romanian Government implement its National Climate Change Strategy (NCCS).

Effective climate change strategies require a complete and accurate understanding of greenhouse gas (GHG) emissions sources, quantities, and trends over time — collected and reported through GHG reporting programs, which also include information on adaptation and mitigation policies. Romania’s GHG reporting program provides valuable tools for identifying and reporting emissions-related risks as well as clean development opportunities.

Figure ES-1 illustrates several components involved in reporting national climate change data and information; reporting on local actions should also inform progress on national initiatives.

Figure ES-1: GHG Reporting Components

Romania has deep experience monitoring, reporting, and verifying (MRV) GHG emissions, as well as systems and processes that provide the foundation for monitoring and evaluating (M&E) public policies to address climate change.

However, knowledge of overall MRV requirements is not uniform throughout affected institutions; new regulations emerge; identifying options to encourage collaboration and support among national authorities and local governments is key to realizing GHG reduction potential, but still untapped; and while national organizations and institutions have the potential to inform policy development, research and education on climate change and adaptation are at an early stage in Romania.

Therefore, to address gaps in knowledge and complement its analysis on national MRV obligations, Romania’s Climate Change General Directorate, within its Ministry of Environment, Waters and Forests (MEWF), specifically requested that this report provide targeted information on the following four topics, which reflect its MRV needs and priorities.

1. **Current MRV requirements** and activities and requirements stemming from existing European Union (EU) and United Nations Framework Convention on Climate Change (UNFCCC) obligations;

2. **The EU maritime MRV regulation** for reporting CO₂ emissions and includes information on the regulation’s requirements for the Romanian government;

3. **MRV of Climate change actions by local governments**, including emission inventory development, within the context of the Covenant of Mayors, examples of emissions mitigation activities by municipalities, and options and considerations to support local government actions from the national government; and
Overview of MRV Requirements

The objective of MRV programs is to provide complete information on emissions inventories, adaptation and mitigation actions, and capacity building. They should also, as appropriate, include financial and technical support provided or received. The Romanian National Climate Change Strategy (NCCS) and Low Carbon Green Growth and the Climate Change Action Plan (LCGGP), which are under development, should aim for practical yet systematic improvements in monitoring, evaluation and reporting activities, building upon and enhancing existing systems and current institutions. It should also link with reporting on international Sustainable Development Goals.

Romania’s approach to MRV of strategic climate change objectives is expected to expand upon and integrate the required MRV efforts for GHG mitigation and climate change adaptation at the European Union (EU) and international treaty level, such as through the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. It will also incorporate existing data collection and observation already taking place to feed into emerging climate change monitoring objectives.

New reporting requirements relating to the 17 new Sustainable Development Goals (SDGs) will emerge over the next few years, which are part of the universal agenda on sustainable development, relating to all developed and developing countries. Romania is considering its response to the main climate change goal, Goal 13: Take urgent action to combat climate change and its impacts.

MRV of Emissions for Maritime

The European Commission has established new MRV regulations for maritime emissions. Romania must prepare to implement the regulation, which requires maritime shipping companies using EU ports to report their CO$_2$ emissions and other relevant data beginning in 2019 for 2018 emissions. The EU Maritime MRV Regulation creates an EU-wide legal framework for collecting and publishing verified annual data on CO$_2$ emissions from all large ships (over 5000 gross tons) that use EU ports, irrespective of where the ships are registered.

The regulation is primarily targeted at shipping companies, yet Romania has accreditation, compliance and information exchange requirements as both a flag State and a port State that can be easily integrated into existing institutional arrangements.

MRV of Climate Change Actions by Local Governments

Romania’s cities are increasingly taking action to combat climate change, and the national government can help drive mitigation and adaptation initiatives at the community-level. For example, by mid-September 2015, 63 municipalities and local administrative units (LAUs) in Romania have signed the EU Covenant of Mayors (CoM), in which they voluntarily agree to account for emissions and address climate change. Signatories commit to a target of at least a 20% reduction by

---

2 On 28 April, the European Parliament approved the Regulation of the European Parliament and of the council on the monitoring, reporting and verification (MRV) of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC
the year 2020 as compared to 1990 levels, through the implementation of strategies adopted at the local level.

Key CoM activities include development of a Baseline Emissions Inventory and a Sustainable Energy Action Plan (SEAP), and issuing periodic Implementation Reports and Monitoring Emissions Inventories that assess the effectiveness at achieving CO₂ reductions. Several approaches for developing local inventories exist to help local governments.

Municipal sustainable development activities do impact national GHG inventories, for example, local implementation of climate-related policies manifest positive changes in electricity and fuel use. Local governments should be encouraged to boost their activities through national support and assisted with integrating community initiatives with national-level policies. For instance, national-level policies regarding renewable energy use and energy efficiency can create an enabling environment that encourages the adoption of clean energy resources and efficient activities at the local level. Increased collaboration and information sharing that enhances awareness of policy options and opportunities can facilitate local government action. The national government can also provide tools and resources to help overcome legislative, organizational and financial hurdles faced by local authorities addressing climate change.

**MRV: Research & Observation and Education & Awareness**

Research, scientific observation (of natural processes), data collection and technical knowledge, as well as new technological development and innovation, can better support informed and responsible decision-making regarding climate change mitigation and adaptation. This is a key building block to help the government align its economy with the priorities set forth in the national climate change strategy and action plan.

“Systematic research” and education on climate change and adaptation to climate change are at an early stage in Romania. At the same time, institutions involved in relevant research and observation of natural processes do exist, and their efforts can be augmented. The EU does not require reporting on research, development and innovation (RDI) or on scientific or technological activities relating to climate action; however, Romanian institutions are fulfilling requirements to implement EU and UNFCCC guidelines, such as for adaptation reporting or preparing National Communications, which could be amplified to improve policy-making.

**Increased coordination, information exchange and training** will help ensure that a critical mass of scientists and professionals have integrated CC&A topics into their activities and are effectively sharing their results. This would stimulate knowledge production, such as through the development of dedicated CC&A research initiatives and leveraging public-private partnerships. Research and information should also be accessible by a wide community of researchers and policy makers, particularly at the local level, as well as the general public.

**Stakeholder engagement provides opportunities to facilitate support and buy-in of government policies within the business community, civil society, and community groups, among others.** Engaging the public increases the awareness of research by promoting it directly to interested parties, e.g. industry, farmers, population, etc. This could be institutionalized by involving appropriate regional or national institutions.
Improving the general public’s awareness and understanding of climate change delivers dividends when communicating public policy. The Romanian population generally appears to show little concern with regard to climate change risks. School curricula could be enriched to address CC&A-related topics. Central authorities could also explore methods to ensure appropriate training of teachers, professors and public officials at all levels. Public officials at all levels would benefit from their employees taking courses on CC&A themes. Romanian NGOs have experience of raising climate change awareness through education campaigns.

There are several options to improve reporting on RDI and education and awareness in National Communications, which would involve additional training for staff within MEWF, and potentially deeper involvement of the National Commission on Climate Change.
1. Introduction

The World Bank Group prepared this report, which is one in a series, to assist the Romanian Government implement its National Climate Change Strategy (NCCS).

Effective climate change strategies require a complete and accurate understanding of greenhouse gas (GHG) emissions sources, quantities, and trends over time – collected and reported through GHG reporting programs, which also include information on adaptation and mitigation policies. Romania’s GHG reporting program provides valuable tools for identifying and reporting emissions-related risks as well as clean development opportunities.

Figure 1 illustrates several components involved in reporting national climate change data and information; reporting on local actions should also inform progress on national initiatives.

Figure 1: GHG Reporting Components

Romania has deep experience monitoring, reporting, and verifying (MRV) GHG emissions, as well as systems and processes that provide the foundation for monitoring and evaluating (M&E) public policies to address climate change.

However, knowledge of overall MRV requirements is not uniform throughout affected institutions; new regulations emerge; identifying options to encourage collaboration and support among national authorities and local governments is key to realizing GHG reduction potential, but still untapped; and while national organizations and institutions have the potential to inform policy development, research and education on climate change and adaptation are at an early stage in Romania.

Therefore, to address gaps in knowledge and complement its analysis on national MRV obligations, Romania’s Climate Change General Directorate, within its Ministry of Environment, Waters and Forests (MEWF), specifically requested that this report provide targeted information on the following four topics, which reflect its MRV needs and priorities.

1. Current MRV requirements and activities and requirements stemming from existing European Union (EU) and United Nations Framework Convention on Climate Change (UNFCCC) obligations;

2. The EU maritime MRV regulation for reporting CO₂ emissions and includes information on the regulation’s requirements for the Romanian government;

3. MRV of Climate change actions by local governments, including emission inventory development, within the context of the Covenant of Mayors, examples of emissions mitigation activities by municipalities, and options and considerations to support local government actions from the national government; and
4. **MRV Research and “systematic observation,” and education and awareness** institutions and organizations.

1.1 **Terminology**

A national climate change strategy typically consists of goals, which are further articulated through specific objectives/broad policies and (quantifiable) targets. These objectives would then be met through the implementation of actions (e.g. policy instruments and programmes, sectoral activities) which could also then result in specific projects and activities. Indicators are typically used as part of an evaluation strategy to help monitor or document progress. The indicator data can also facilitate reporting to meet governmental and international requirements as well as to engage the public, such as to address environmental problems, to inform public debates, or to gain support for and legitimize policies.

Monitoring and evaluation is a broad field and the terminology used also varies depending on the context and primary purpose. There are a variety of overlapping concepts and associated acronyms. The following are the primary concepts used in this report:

- **E** = Evaluation
- **M&E** = Monitoring and Evaluation – relating to impacts from policies and measures
- **MRV** = Monitoring (or Measurement), Reporting, and Verification – associated with GHG emission inventories

This report uses MRV to refer to requirements or practices that primarily stem from national-level requirements to meet international GHG reporting standards, such as from the UNFCCC and the EU. However, MRV also applies to local government climate mitigation and activities, among other things. Broadly, MRV refers to the processes and procedures that support emission inventories, where evaluation is defined as the systematic and objective measurement and assessment of progress and performance of an intervention, such as to promote transparency, accountability, and continuous improvement.

1.2 **Organization of the report**

This report is organized into the following sections:

- Section 1 is the introduction.
- Section 2 includes an overview of MRV requirements at the national level to address climate change.
- Section 3 summarizes the EU regulation addressing greenhouse gas emissions for Maritime Shipping recently adopted and includes suggestions on how Romania can comply.
- Section 4 provides insights to existing climate actions at the local level through the EU Covenant of Mayors initiative and provides suggestions on how the national government can further support these efforts.

---

Section 5 addresses how research, development innovation and education activities in Romania currently address climate change and provides options and considerations encouraging these activities in the future, as well as suggestions to improve capacity to report such measures in the National Communication to the UNFCCC.

Section 6 contains closing remarks.
2. Overview of MRV Requirements

This section provides an overview of monitoring, reporting and verification (MRV) for climate change at the national level. Mature MRV systems for climate change provide complete information on adaptation, emissions inventory, mitigation actions, adaptation actions, capacity building, and financial and technical support provided or received.⁴

Romania’s approach to MRV of strategic climate change objectives is expected to expand upon and integrate the required monitoring, reporting and verification (MRV) efforts for GHG mitigation and climate change adaptation at the European Union (EU) and international treaty level, such as through the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. It will also incorporate existing data collection and observation already taking place to feed into emerging climate change monitoring objectives.

Romania’s M&E and Reporting strategy for climate change issues would be expected to address the following overlapping topics:

- Requirements at the UNFCCC level, such as for national inventories, national communications, biennial reports, and intended nationally determined contributions (INDCs)

- Requirements at the EU level, both those that role up to EU-level UNFCCC reporting as well as those that serve other needs. For example, the COM ‘Decent Life for All by 2030 decision proposes principles for an overarching framework for post-2015’ intended to provide a coherent and comprehensive response to the universal challenges of poverty eradication and sustainable development in its three dimensions, environmental, social and economic.⁵ Topics to be addressed include:
  - GHG emissions for all relevant sectors and sources
  - Related public funding in-country, EU-level, and international
  - Related sustainable development and adaptation benefits or costs (e.g. economic, social, health, other environmental)
  - Financial and technology support provided to developing countries

- National policies and actions addressing mitigation, adaptation, or support, as prioritized. Examples: building code, appliance standards, renewable feed-in tariff, public transit policy

The most significant international obligations derive from the UNFCCC and the Kyoto Protocol. EU Member State (MS) requirements relating to the EU-level climate and energy package and related initiatives as well as the deepening evaluation culture at the EU level are also important drivers.

---

⁴ This section adapts elements of Section 2 of Output A2.7 Developing Monitoring and Evaluation Systems for the National Climate Change and Low Carbon Green Growth Strategy and Action Plan in Romania also in this series.
2.1 The UNFCCC Requirements

As a party to the Treaty creating the United Nations Framework Convention on Climate Change in the 1990s, Romania has experience with meeting its commitments to submit the following to the UNFCCC:

- **Emissions inventories (GHG Inventory)**: cataloguing current and historical emissions trends.\(^6\)
- **National communications (NC)**\(^7\): comprehensive reports including emission trends as well as information on a country’s mitigation and adaptation efforts, and
- **Biennial reports (BR)**: outlining progress in achieving emission reductions and the provision of financial, technology and capacity-building support to other countries, submitted in between national communications.

Adaptation to climate change reporting requirements are included in the NC in a dedicated section addressing three areas: expected impacts, vulnerability assessment, and adaptation measures. Objectives and targets are designed and established at national level, as there is no specific international requirement, so far.

The GHG Inventory, NC and BR are also submitted to the EU Commission who compiles information from all MSs and reports at the EU-level to the UNFCCC. The specific requirements for MSs are described in the EU Monitoring Mechanism Regulation, discussed in the next subsection.

The Kyoto Protocol

The Kyoto Protocol under the UNFCCC is a binding agreement, ratified by Romania in 2001. Under this agreement, 37 countries and the European Union committed to:

- Binding national emissions targets and international monitoring and reporting requirements to verify the achievement of these targets\(^8\), and
- National inventory systems with more specific requirements\(^9\) than those required by UNFCCC and penalties for non-compliance.\(^10\)

Commitments under the UNFCCC

For the second commitment period (CP2, 2013-2020), agreed through the Doha Amendment, Romania has assumed a target of 20% GHG emissions reduction, compared to 1990 levels, as has the EU. It is referred to as a quantified emission limitation or reduction commitment (QELRT) and it incorporates the impact of the obligations set under various internal instruments on a strict linear

---


\(^7\) Approximately every 4-5 years, depending on the reporting schedule agreed in decisions at Conferences of Parties.

\(^8\) Romania’s target under the Kyoto protocol was an 8% reduction of GHG emissions between 2008 – 2012, relative to 1989 levels.

\(^9\) The additional requirements to comply with the Kyoto protocol are addressed in the EU Monitoring Mechanism Regulation and are summarized here: [http:// unfcc.int/national_reports/reporting_and_review_for_annex_i_parties/items/5689.php](http:// unfcc.int/national_reports/reporting_and_review_for_annex_i_parties/items/5689.php)

\(^10\) In 2011, Romania was temporarily suspended from participation in the Kyoto market mechanisms.
pathway from 2013 to 2020, but excludes international aviation. Furthermore, land use, land use change and forestry (LULUCF) is excluded from target setting but included in CP2 target achievement by accounting for Kyoto Protocol LULUCF commitments of individual MSs.

For subsequent commitment periods, the domestic emissions reduction or limitation pledge is defined as quantified economy-wide emission reduction target (QEWERT) for 2013-2020 and as an intended nationally determined contribution (INDC) for 2020-2030. The EU has set a QEWRT of 20% by 2020 compared to 2005, implemented through Climate Energy package. This is the same percentage (20%) as for the second Kyoto Protocol’s CP2, but uses a different base year and structure with regard to sources, such as by including international aviation and excluding LULUCF\textsuperscript{11}.

For the third commitment period, 2020-2030, the EU has pledged an INDC of 40% compared to 1990 levels, which includes a 43% contribution from the EU Emission Trading Scheme (ETS) and 30% from non-ETS sources of vs. 2005 (all sectors of economies have to contribute, including LULUCF)\textsuperscript{12}.

2.2 The European Union MRV Requirements

The EU has established its implementing framework for its low carbon development strategy and associated policies, called the EU climate and energy package, which evolves and expands over time. Current versions of the related EU legislation focus on efforts to reach 2020 goals, yet the EU Commission is currently discussing a package to reach 2030 goals. The four key components of the 2020 goals package, each with associated reporting requirements, include\textsuperscript{13}:

- EU Emissions Trading System updates, covering around 45% of the EU’s greenhouse gas emissions\textsuperscript{14}
- Effort Sharing Decision addressing sectors not covered in the ETS, such as housing, agriculture, waste and transport
- Establishing a legal framework to facilitate carbon capture and storage.

While energy efficiency was not directly addressed in the formal 2020 climate and energy package, there is related legislation, centering on the Energy Efficiency Directive and the related Energy Performance of Buildings, Energy Labelling and Eco-design Directives. For example, the Energy Efficiency Directive requires MS to develop National Energy Efficiency Action Plans (NEEAPs) that set out estimated energy consumption, planned energy efficiency measures and the improvements individual EU countries expect to achieve. NEEAPs are to be updated every three years.

In addition, there are complementary initiatives at the EU-level addressing, for example: reducing F-gases, promoting innovative technologies and developing climate change adaptation strategies. Most, if not all, of these topics would be expected to be incorporated into Romania’s Climate Change

\textsuperscript{11} Commission Staff Working Document - Preparing the EU’s Quantified Emission Limitation or Reduction Objective (QELRO) based on the EU Climate and Energy Package at http://ec.europa.eu/clima/policies/international/negotiations/docs/swd_13022012_en.pdf


\textsuperscript{13} http://ec.europa.eu/clima/policies/package/

\textsuperscript{14} http://ec.europa.eu/clima/policies/ets/
Strategy, as relevant, in addition to locally-driven measures, and should be addressed, as feasible, in the M&E system.

At the EU-level, climate and energy package achievements are being monitored following the internationally-agreed compliance framework, the cornerstone of which is the EU Monitoring Mechanism Regulation outlining requirements for Member States (MS), and is evaluated with assessments through the European Semester as well as through in-depth evaluation of specific elements.

**EU Monitoring Mechanism Regulation**

The current version of the Monitoring Mechanism Regulation (MMR)\(^{15}\) entered into force on 8 July 2013 and addresses EU and MSs’ joint obligations under the EU climate & energy framework and UNFCCC and aims to bring together all EU climate change mitigations instruments in a consistent EU MRV framework. It specifies the reporting rules on GHG emissions to meet requirements arising from current and future international climate agreements discussed above for GHG Inventories, NCs and BRs, as well as for key components of the EU climate and energy package that relate to the required reporting for national policies and measures (P&Ms).\(^{16}^{17}\)

It aims to improve the overall quality of data reported as compared to earlier versions, help the EU and MS keep track of progress towards meeting their emission targets for 2013-2020 and facilitate further development of the EU climate policy mix. The current MMR also introduced new elements, such as reporting of:

- MS and EU low-carbon development strategies;
- Financial and technical support provided to developing countries, and commitments arising from the 2009 Copenhagen Accord and 2010 Cancún Agreements;
- MS use of revenues from the auctioning of allowances in the EU ETS. MS have committed to spend at least half of the revenue from such auctions on measures to fight climate change in the EU and developing countries.
- Emissions and removals from LULUCF;
- MS adaptation to climate change.\(^{18}\)

**Supporting regulations**

There are also implementing and delegating acts to support the MRR, as described below.

- *Commission Implementing Regulation (EU) No 749/2014 of 30 June 2014 on structure, format, submission processes and review of information reported by Member States pursuant to*…

---

\(^{15}\) Regulation (EU) No 525/2013 of the European Parliament and of the Council on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change.

\(^{16}\) Information on the EU climate and energy package can be found here: http://ec.europa.eu/clima/policies/package

\(^{17}\) Readers should note that much of the EU climate legislation was approved earlier than related international agreements were concluded, and is updated periodically. Therefore, it is important to check whether there are any updates on the EU Commission website or with another reliable source.

\(^{18}\) http://ec.europa.eu/clima/policies/g-gas/monitoring
Regulation (EU) No 525/2013 of the European Parliament and of the Council provides details on the implementation of each relevant reporting requirement set under 525/2013/EU, and makes explicit the procedures for Union Expert Review of greenhouse gas emissions. This regulation facilitates the assessment of the actual progress towards meeting the Union’s and the MSs’ commitments under UNFCCC, Kyoto Protocol and “Energy and Climate Package,” by defining what, how and when the information is transmitted to EU and how it is reviewed.

- **Commission Delegated Regulation C(2014) 1539 establishing substantive requirements for a Union inventory system and taking into account changes in the global warming potentials and internationally agreed inventory guidelines pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council**, transposes into EU legislation into obligations for the Union for the second commitment period of Kyoto Protocol, and includes the latest changes required of MSs and the EU for reporting GHG inventories. It defines provisions for the EU’s national system and annual GHG inventory submission, quality assurance and quality control programme (QAQC), the gap-filling procedures in cases of missing data in MSs’ submission, and the timescales for cooperation and coordination during the annual reporting process and the UNFCCC reviews.

There are two other decisions that relate to reporting requirements referred to in the MMR.

- **Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community’s greenhouse gas emission reduction commitments up to 2020, i.e. the so-called effort sharing decision (ESD).** A policy commitment to develop a highly energy-efficient and low GHG economy for Europe is initiated through this decision. It is the key piece of EU’s “Climate and Energy package”. The ESD, together with EU ETS, cover some 95 % of the EU emissions. Flexibility in reaching emission limitation has an important role in achieving ESD targets. Reporting involves estimates from the GHG inventory for concerned sectors, which reduces the MS’s effort by benefiting from the EU and UNFCCC reviews. Its mitigation component requires reporting on projected progress, including associated national policies & measures and projections, as well as information on additional national actions to limit GHG emissions beyond the limits set by decision.

- **Decision 529/2013/EU of the European Parliament and of the Council of 21 May 2013 on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities provides for the preparation of the accounting framework for LULUCF activities by MSs.** This is part of preparedness and inclusiveness of mitigation actions across all economy sectors in post-2020 emission reduction regime.

**Roles under the MMR**

Overall responsibility of MMR implementation at the European Union is with the European Commission (specifically DG CLIMA) which administers, maintains and continuously improves the EU inventory system. Reports to the European Parliament are prepared by European Commission.

The European Environmental Agency (EEA) assists the European Commission on numerical tasks and estimation issues, compilation of reports and disseminating the information. The EEA has a
partnership with European Topic Centre for Air Pollution and Climate Change Mitigation (ETC/ACM), which consists of a consortium of 14 European organizations, to provide technical support to MSs.

Additionally, the European Commission is assisted by the Climate Change Committee. This Committee has working groups with representatives from the MSs and is chaired by the Commission. As part of its role this Committee develops proposals for further improvement or simplification in order to avoid duplication to UNFCCC legislation.

At the MS level, reporting is the responsibility of each State’s competent authority. In order to support data aggregation and comparability among various EU climate change instruments and with the GHG inventory, the MMR requires MSs to ensure competent authorities have access to data and methods used.

The MMR also covers penalties and corrective actions in cases of non-compliance or deviation from the reporting schedule, such as quantitative thresholds above which penalties apply (e.g. under the ESD, a deduction of 1.08 % of excess emissions from the next year’s amount).

The various initiatives addressed in the MMR have different governance structures that provide different degrees of flexibility for MS. For example, according to the relevant decisions, the EU ETS is administered by the European Commission and implemented nationally, ESD targets are defined at the EU level but MSs manage target achievement directly according to national policy broken out by economic activity (i.e. transport, buildings, waste management, agriculture and certain industrial installations). The EU is open to more ambitious targets, more comprehensive approaches to non-CO₂ climate-relevant anthropogenic emissions, and changes in Global Warming Potentials (GWPs) of GHGs, as well as other measures to support the enhanced environmental integrity of emission reduction targets or obligations (e.g. Article 24 Procedures for unilateral inclusion of additional activities and gases from Directive 2003/87/EC).

Details on specific reporting obligations under the MMR

This section outlines specific MRV reporting obligations under the MMR, and subsequent legislation. The specific reporting format and structure are provided in annexes of the CIR 749/2014, which are consistent with requirements under UNFCCC.

Low – carbon development strategy updates

Following the Cancun Agreement (1/CMP16) and subsequent UNFCCC decisions (e.g. 2/CMP17), MSs and the EU have to prepare a low carbon development strategy (LCDS) outlining how to address the long term vision of a low-carbon society built on opportunities, economic growth and sustainable development. After preparation of the initial national LCDS, required by March 2015, MSs submit updates every 2 years to the European Commission. MS and EU reports should highlight the contribution of European and national policy to both national and European commitments.

Policies and Measures

The national system for Policies and Measures (P&M) and projections are key instruments in achieving climate objectives, while aiming to minimize negative side effects on the economy or society. Measures are the operative means of implementing policies or climate oriented actions; they are typically measurable through indicators. National P&M should be undertaken under the umbrella of LCDS, and included in updates in biennial reports and national communication.
The MMR requires setting up a national and an EU-wide system for P&M and projections, which is intended to ensure that all relevant institutional, legal and procedural arrangements are in place, so adequate information on data available and is collected and used in a consistent way. It seeks to ensure all GHG relevant policies are captured in projections, regardless of whether they result in larger or smaller emissions. The system also aims to ensure P&M feedback is integrated into LCDS is functioning, and both EU and national P&M are sufficiently captured.

The MMR’s P&M monitoring procedures facilitates transparent information disclosure on countries’ progress toward implementing existing national or EU’s P&M. Reporting includes quantitative GHG projections over a period of four future years for each individual or group of P&M. For example, countries distinguish between EU ETS and ESD-related P&M in their reports. Estimated and realized costs and other benefits should also be reported for each individual or group of P&M. Reporting also covers non-GHG indicators, to complement quantitative GHG indicators to express GHG impacts, including both ex-ante and ex-post assessments of each individual or group of P&M. The MMR requires MSs to communicate any substantial change of the reported information even before the deadline for following update report submission.

**Biennial Report and National Communications**

Biennial report (BR) and national communications (NC) follow UNFCCC reporting guidelines. The submissions to UNFCCC and reports on P&M and emissions projections under MMR have to be fully consistent. Submissions to the European Commission are scheduled to facilitate having sufficient time to perform reviews and improve reports prior to UNFCCC deadline for both the EU and MS.

The biennial update shall report aggregated national projections of anthropogenic GHG emissions by sources and removals by sinks for a period of four future years. Reporting includes projections organized by gases and IPCC sectors, or aggregated according to the two EU mitigation instruments (ETS, ESD). The reports should show the contribution of P&M according to their implementation stage in the following scenarios:

- WOM (without measures),
- WEM (with existing measures e.g. business-as-usual) and
- WAM (with additional measures).

Projection-based analysis provides support for certain mitigation actions under various P&M scenarios; thus each country reports their most up to date national projections to European Commission. Sensitivity analysis is also required, to assess possible changes due to policy developments. Incomplete national estimates trigger gap filling efforts for the respective MS in order to develop the EU projections.

Methodologies to model or simulate the impacts of P&M are defined by each country. Some EU-supported projects provide guidelines. Projection reporting is still not addressed by comparable methodologies within MMR or UNFCCC, thus transparency on assumptions and methods used are key to consistent reporting.

**Reporting on national GHG inventories**

The national GHG inventory provides the reference points for emissions reductions targets. Parties included in Annex I to the UNFCCC develop, update and publish national inventory of anthropogenic
emissions by sources and removals by sinks of all anthropogenic greenhouse gases not controlled by the Montreal Protocol. Parties to the Kyoto Protocol report anthropogenic emissions and removals in order to demonstrate compliance with their respective emission reduction or limitation targets.

Under the MMR, MSs and the EU are required to establish inventory systems able to perform the planning, preparation and management of data and information according to UNFCCC Guidelines for national inventories. Timing of reporting is detailed in the secondary legislation, CIR 749/2014/EU and CDR (2014) 1539, which ensures deadlines for submission to UNFCCC are respected by both MS and the EU. CDR (2014) 1539 also addresses other issues for national GHG inventories, e.g. methodologies and GWPs, to ensure accuracy.

MSs are responsible for the quality of activity data, emission factors and other parameters and for application of methodologies consistent with Intergovernmental Panel on Climate Change (IPCC) Guidelines. MSs are required to report on consistency of data reported for other pollutants (inventories under 2001/81/EC and United Nations Economic Commission for Europe (UNECE) Convention on Long-range Trans-boundary Air Pollution, fluorinated gases) and energy data. The purpose is to allow adequate and transparent preparation and verification of national GHG inventory.

To improve the review effectiveness and ensure consistent implementation of the methodologies, changes and recalculations have to be reported annually. Completeness checks of the MS inventories within the MMR and UNFCCC review allow identification of sources not estimated, where methods are available, unless explanation is given based on a threshold for significance (following section reporting from 24/CP19 and art 31 of CIR 749/2014/UE). Uncertainty estimates are required for emission levels and trends, as well as for activity data and emission factors or parameters used at the most detailed level possible.

Annual national GHG inventory submissions include:

- Time series of emissions and removals inventory for period since 1990 to X-2 (x – current year);
- Inventory report or updates on data, information on macroeconomic indicators;
- Assumptions and methodologies used;
- Information on indicators and description of registry changes and its operations in the previous year (including credits from projects and transactions for the purpose of the Decision 406/2009/EC).
- Information on changes to national systems: information on any improvement, especially steps considered to implement recommendations or adjustments from review teams. Under the annual reporting cycle, minimization of effort is reached by highlighting changes in information submitted previously.

Annual reporting by MS to the EU shall also contain information on the consistency of ETS-verified emissions with corresponding source categories in the GHG inventory, in terms of total emissions and the ratio of verified emissions to the total, as well as the results of checks performed on data used for GHG inventory estimation as compared with inventories on other air pollutants.

Compilation of the EU GHG inventory is a multi-step task involving MSs and EU. The EU’s GHG inventory (and supplementary LULUCF reporting to the Kyoto Protocol) is the sum of MSs’ national
GHG inventories. Overall, the EU inventory is expected to be more accurate and precise than any individual MS's inventory. For accounting purposes under the Kyoto Protocol as well as for EU-wide targets, the MMR establishes a procedure to estimate missing data or discrepancies in consultation and close cooperation with the European Commission and MSs concerned, following CDR (2014) 1539.

Verification consists of activities and procedures that can support the reliability of reported information by source category, sector or for the entire inventory (as section G. Reporting para 40 and 41 of 24/CP19 and Ch.6 of IPCC 2006). Typically and widely accepted by reporting parties under UNFCCC, verification requirements are triggered by a reporting agency when methods external to the inventory are being used, e.g. comparisons of input data or inventory estimates with values developed in contexts and/or methods totally different to the national system. A meaningful verification process requires transparent disclosure of assumptions and data. Verification techniques include individual data checks (e.g. on parameters used), inventory inter-comparison, comparison of intensity indicators, comparison with atmospheric concentrations and source measurements, and outputs from modelling/simulation exercises.

**Emission Registries**

The EU emission registry system has specified operational and enforcement rules defined in the Monitoring Mechanism Regulation. Accurate processing of emissions reduction transfers is ensured by one central EU Registry for both the ESD and EU ETS, within which MS administer their own accounts and the accounts of their installations/aircraft operators. MS’ national registries are to be maintained until the Kyoto Protocol expires in order to ensure fulfillment of national obligations. Registries are updated annually. Registry rules to comply with the Kyoto Protocol’s accounting and reporting requirements address issuance, acquisition, holding, transfer, cancellation, retirement and carry-over of assigned amount units, removal units, emission reduction units and certified emission reductions.

Emission credits from projects that under flexible instruments, such as those from international emissions trading, the Clean Development Mechanism and Joint Implementation, must follow internationally negotiated and agreed MRV rules. As stated in EU legislation, “credits from project activities used by Member States represent real, verifiable, additional and permanent emission reductions and have clear sustainable development benefits and no significant negative environmental or social impacts”.  

**National adaptation actions to climate change**

National adaptation planning to climate change is defined as a continuous, progressive and iterative process. Monitoring and reporting of the progress and actions in national adaptation plans to address residual climate change is required. Reports to the European Commission should contain adaptation strategies as well as current and planned actions to facilitate adaptation to climate change. They should facilitate an assessment of MS’ preparedness and exchanging information and help identify best practices on each type of risk and the adaptation measures implemented.

---

Climate finance and technology transfers to other countries

MSs and the EU, as developed country parties to UNFCCC, cooperate and provide MS as well as EU-level information on funding or transfer of technology to developing countries. This includes financial assistance – public and/or private flows – for any mitigation or adaptation activities, which provides transparent information on funding or on capacity building and technology transfer. Complete information requires noting if the support is new and additional to existing official development assistance (ODA) already engaged.\textsuperscript{20}

Reporting on the use of auction revenues and project credits

Explicit reporting of the use of revenue from allowances from the EU ETS, both for installations and aircraft operators, is required for the previous calendar year. The purpose is to ensure achievement of long term emission reductions, as well as correct the recording of any allowances not actually used and to be carried-over to subsequent years. One reason MSs report on the use of EU ETS auctioning revenue is so that at least 50\% of these revenues are allocated toward further energy and climate related activities, like renewable energy promotion, development of low carbon administration and support or forestry, expected to lead to more GHG emission reductions.

Reporting for the purposes of decision no 529/2013/EU (“LULUCF accounting decision”)

As mentioned above, annual submissions under MMR require both inventory of anthropogenic GHG emissions by sources and removals by sinks from Land Use, Land Use Change and Forestry sector (LULUCF) and anthropogenic GHG emissions by sources and removals by sinks from LULUCF activities elected under Decision 529/2013/EU. To avoid double reporting, if all information required in Decision 529/2013/EU is included in latest National Inventory Report (NIR) to the UNFCCC, no additional reporting to the EU is necessary.

For 2013-2020, it is mandatory to account for all forest-related activities and for Cropland Management and Grazing Land Management activities that were not necessarily voluntarily selected by a MS under the Kyoto Protocol. To report GHG estimates for such activities, the development of a national system was required to provide annual preliminary estimates immediately and binding annual estimates by the year 2022.

Reporting on aviation and maritime shipping impact on climate change

According to the European Council, “all sectors of the economy should contribute to achieve emission reductions, including international maritime shipping and aviation”.

For aviation, the CO\textsubscript{2} emissions from intra-EU flights are included in EU ETS, but are not required to be reported under UNFCCC and the Kyoto Protocol. Non-CO\textsubscript{2} emissions and other climate impacts from aviation will be assessed regularly and options for addressing these impacts in context of the MRR are to be proposed by the European Commission.

\textsuperscript{20} Romania’s most recent report on financial and technology support provided to developing countries pursuant to Art. 16 of Regulation (EU) no. 525/2013 (2014) is available here: http://cdr.eionet.europa.eu/ro/eu/mmr/art16_finance/envvguzvw/index_html
Refer to Section 2 for more information on the new regulation that requires maritime shipping companies using EU ports report their CO₂ emissions and other relevant data. The EU Maritime MRV Regulation creates an EU-wide legal framework for collecting and publishing verified annual data on CO₂ emissions from all large ships (over 5000 gross tons) that use EU ports, irrespective of where the ships are registered.

The EU Maritime MRV Regulation is distinct from other prominent EU regulations on MRV, e.g. the two regulations on monitoring and reporting (MRR) and for accreditation and verification (AVR) for the EU ETS, due to the fact that MS authorities have no responsibility in approving shipping companies’ monitoring plans or reviewing their verified emission reports, not to report these emissions to the European Commission. Control over the quality of reported data is in the hands of private sector entities, namely third party verifiers, which will assess and verify that companies are meeting the requirements. MSs’ role is limited to enforcement procedures.

**EU Review Processes**

**EU’s annual expert review of greenhouse gas inventories**

One key component of the EU MRV system is the ‘union expert review’ whose purpose is to review MS estimates of GHG emissions and monitor MSs’ achievement under the ESD, focusing on the specific sectors and sources within the scope of that decision. The European Environment Agency (EEA) acts as the secretariat, and it is independent of the parallel UNFCCC review. Although, some crosschecks performed under MMR, i.e. completeness and QAQC, are similar.

Union expert review is performed annually. Comprehensive reviews also occur as needed, and focus on consistent implementation of methodologies and implement technical corrections over a period of time. Under the ESD, an initial comprehensive review in 2012 was also designed to assess the limitation level for each MS, which is the maximum allowed GHG emissions as compared to the 2020 target.

A comprehensive review is planned in 2016 for the year 2014 reporting, to allow recalculation after implementing 2006 IPCC Guidelines for national GHG inventories, and again in 2022 reviewing the year 2020 reporting. Identification of significant issues in the annual review, e.g. unaddressed recommendations from earlier Union or UNFCCC reviews or inaccurate estimates, also trigger a comprehensive review for that MS. MSs coordinate with the European Commission and the EEA for both types of reviews. After review and implementation of any technical corrections, the European Commission issues a final GHG emissions value for that year. After issuance of final data, there is 4 month of ‘true up’ window when MS implement corrective actions in the registry.

**Progress towards 2020 targets: Assessment through the European Semester**

The progress of each MS towards meeting the “20-20-20” targets of the climate and energy package is assessed every spring as part of the annual Europe 2020 policy coordination exercise, known as the

---

21 On 29 April 2015, the European Parliament approved the Regulation of the European Parliament and of the council on the monitoring, reporting and verification (MRV) of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC

European Semester. The assessment is based on MS' National Reform Programmes, plus the projections of future greenhouse gas (GHG) emissions reported under the MMR.

MS progress towards meeting their national emission target for 2020 under the Effort Sharing Decision and their national renewable energy target for 2020 under the Renewable Energy Directive are assessed. On the basis of its analysis the EU Commission can propose specific recommendations to MS to help strengthen the mainstreaming of climate action into broader economic policies.23

EU Emissions Trading System (ETS)

Under the EU ETS (Directive 2003/87/EC), operators of covered installations and aircraft must annually report their greenhouse gas emissions, based on the monitoring plan specifying their emissions monitoring methodology, to the national competent authority. The monitoring reports generated by the operators must be verified by a third party, before being submitted. Data reported include activity data, emission factors, oxidation factors, total emissions, and uncertainty.

MS have to report annually on arrangements for the allocation of allowances, the operation of registries, the application of the monitoring and reporting guidelines, verification and issues relating to compliance with the Directive and on the fiscal treatment of allowances. The directive also requires MS to ensure covered installations and aircraft operators monitor and report emissions in accordance to the EU ETS Monitoring and Reporting Regulation (Commission Regulation 601/2012) to the national competent authority.

Specific monitoring and reporting provisions for companies related to emissions from installations covered by the EU ETS are covered by separate implementing legislation and not addressed in this document.24

2.3 Additional EU Evaluation Requirements linked to Funding

Climate action is a priority for the EU and the European Commission has agreed that at least 20% of its budget for 2014-2020 period – as much as €180 billion – should be spent on climate change related action25 within the EU. To achieve this, mitigation and adaptation actions will be integrated into all major EU spending programmes, including Operational Programmes (OPs) for cohesion policy, regional development, energy, transport, research and innovation and the Common Agricultural Policy (European Structural and Investment Funds). These are expected to be linked to reporting discussed above in the various Action Plans for each MS.

As mentioned above, all MS – including Romania - are obliged to report on climate spending under the five European Structural and Investment Funds (ESIF) using a methodology defined in EU Regulation No 215/201426. Progress will be monitored annually using a common tracking methodology integrated into methodologies for measuring performance of all EU programmes. The climate tracking methodology for climate related expenditure is adapted from an Organization for

---

23 See for example the latest country reports under the European Semester: http://ec.europa.eu/clima/policies/g-gas/progress/studies_en.htm
Economic Co-operation and Development (OECD) methodology (the ‘Rio markers’) to provide quantified financial data, reflect the specificities of each policy area. Expenditures are marked in one of the three categories:

- Climate related only (100%);
- Significantly climate related (40%); and;
- Not climate related (0%).

In addition, each Operational Programme (OP) must incorporate an indicator framework that captures the targets, outputs and results of climate action (mitigation and adaptation) for the priorities and measures in the OPs.


2.4 Summary of Emissions-related Reporting Requirements

Table 1 summarizes the major current reporting requirements for MS for the EU climate and energy package, illustrating the overlaps between UNFCCC and EU Commission reporting.
Table 1: Current EU MS climate and energy reporting requirements

<table>
<thead>
<tr>
<th>Full title (legislation)</th>
<th>Reporting output requirements</th>
</tr>
</thead>
</table>
| United Framework Convention on Climate Change (UNFCCC) | - National GHG Inventory Report (NIR) covering up to two years prior to reporting year (annual)  
- Biennial reports (BRs) and National Communications (NCs) (regular intervals; 7th NC no later than 2018), incl. information on emissions, mitigation policies, etc.; MS submit copies to Commission (MMR)  
- Low-Carbon Development Strategies (LCDs) (once; still to be negotiated). Progress reported to Commission will follow on a biennial basis from 2015 as part of report on policies and measures (P&Ms)/projections (MMR)  
- National Adaptation Plans (NAPs). Progress reported to Commission every 4 years from 2015 (MMR)  
- Information on financial support and technology transfer (S&TT) activities to developing countries (annual; reported in 2014 as part of BR) (MMR) |
| Monitoring Mechanism Regulation (MMR) Regulation (EU) No 525/2013 | - NIRs with GHG data (annual)  
- National P&Ms and GHG emission projections by sources and removals by sinks (biennial) - Technical table format (Excel) and separate narrative report  
- Information on use of auctioning revenue and project credits (AR/PC) (annual)  
- No specific strategy required for covering a possible gap between projections and targets |
- MS monitoring through Progress Reports (biennial) |
- National long-term strategies for mobilizing investment in the renovation of the national building stock to improve EE in residential and commercial buildings (triennial, part of NEEAPs).  
- Monitoring of public building renovation activities (annual)  
- Monitoring of progress towards the national EE target as part of European Semester (annual) |
| Europe 2020 strategy/ European Semester | - National Reform Programmes (NRPs) report on progress towards all objectives (annually, April)  
- Adoption of Country Specific Recommendations (CSRs), adopted jointly by Council, as appropriate) |


2.5 Sustainable Development Goals

There will also be new reporting requirements relating to the 17 new Sustainable Development Goals (SDGs) which are part of the universal agenda on sustainable development (for all the developed and developing countries).
Romania is considering its response to the main climate change goal, Goal 13: Take urgent action to combat climate change and its impacts\textsuperscript{27}, which has the following indicators:

- 13.1 strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries.
- 13.2 integrate climate change measures into national policies, strategies, and planning.
- 13.3 improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning.
- 13.a implement the commitment undertaken by developed country Parties to the UNFCCC to a goal of mobilizing jointly USD100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible.
- 13.b Promote mechanisms for raising capacities for effective climate change related planning and management, in LDCs, including focusing on women, youth, local and marginalized communities.

Yet, climate change mitigation and/or resiliency activities will link to all goals, for example, Goals 2, 6, 7, 9, 11, 14, 15, 16, 17:

1. End poverty in all its forms everywhere;
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture;
3. Ensure healthy lives and promote well-being for all at all ages;
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all;
5. Achieve gender equality and empower all women and girls;
6. Ensure availability and sustainable management of water and sanitation for all;
7. Ensure access to affordable, reliable, sustainable and modern energy for all;
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all;
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation;
10. Reduce inequality within and among countries;
11. Make cities and human settlements inclusive, safe, resilient and sustainable;
12. Ensure sustainable consumption and production patterns;
13. Take urgent action to combat climate change and its impacts*;
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development;
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss;

\textsuperscript{27} Acknowledging that the UNFCCC is the primary international, intergovernmental forum for negotiating the global response to climate change.
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels;
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development.
3. MRV of Emissions for Maritime

This section provides a comprehensive overview of the new EU Maritime MRV Regulation and which steps are to be taken in order to comply with the requirements. After summarizing the requirements of the EU Maritime MRV Regulation, this section outlines the specific responsibilities of the Romanian government and identifies steps to be taken to comply with the Regulation.

3.1 Context and overview of the Maritime MRV Regulation

Essentially, as of 2018, all shipping companies will have to monitor and report the verified amount of CO₂ emitted by their large ships on voyages to, from and between EU ports to a central database. Shipping companies must also upload other information, such as data to determine the ships' energy efficiency. A document of compliance issued by an independent verifier must be carried on board ships and will be subject to inspection by Member State (MS) port authorities. Verifiers must be accredited by a recognized body, i.e. National Accreditation Bodies (NAB).

Further specifications are to be developed by the European Commission until December 2016 to clarify additional technical implementation details, including the verification and accreditation procedures, and to provide a reporting database and submission templates. The accreditation process for verifiers has to be in place and the first year monitoring plans submitted to verifiers by 2017, as the first monitoring period starts in 2018.

While the majority of compliance activities will be handled by ship owners and verifiers, MSs with maritime ports and with ships flying under their flag, such as Romania, need to prepare for the new requirements as well.

The main issues that need to be addressed at the MS level are:

- Define procedures for compliance checks
- Penalty scheme for non-compliance with requirements of the Regulation
- Clarify enforcement roles and responsibilities within the MS
- Establishing an effective information exchange
- Defining a process for receiving reported data
- Ensure the national accreditation body has the appropriate mandate.

3.2 Maritime MRV Regulation Requirements

This section summarizes the requirements, roles and responsibilities outlined in the new EU Maritime MRV Regulation.

---

28 This applies to all shipping companies with qualifying voyages (ships entering the EU/leaving the EU or intra-EU voyages on ships over 5,000t) regardless of where that ship is registered.
29 In accordance to procedures established through the Directive 2009/16/EC on port State control
30 In accordance with Regulation No. 765/2008/EC
Terminology

Shipping company
The ship-owner or any other organization or person, such as the manager or the bareboat charterer, which has assumed the responsibility for the operation of the ship from the ship-owner.

Detention or expulsion
Formal prohibition for a ship to proceed to sea due to established deficiencies which, individually or together, make the ship unseaworthy.

Document of compliance
A document specific to a ship, issued to a company by an accredited verifier, which confirms that that ship has complied with the requirements of this Regulation for a specific reporting period;

Flag state
Member State with ships flying the MS’ flag, i.e. being entered in the MS’ ship registry

Other relevant information
Information related to CO₂ emissions from the consumption of fuels, to transport work and to the energy efficiency of ships, which enables the analysis of emission trends and the assessment of ships’ performances;

Port authority
Maritime authority responsible for port State control in accordance with Directive 2009/16/EC.

Port State control
Process of inspection of foreign ships when entering into ports of other states by officers of the port State authority for verifying that requirements of international conventions are being complied with

Key Maritime MRV Requirements by responsible party

This section describes the key requirements of the EU Maritime MRV Regulation for shipping companies, MSs, and other stakeholders.

The EU Maritime MRV Regulation prescribes shipping companies’ obligations in regards to MRV of CO₂ emissions and other ‘relevant information’. As of 1 January 2018, all shipping companies are obliged to monitor CO₂ emissions and other ‘relevant information’ for each of their vessels above 5,000t on a per-voyage basis and on annual basis31 for each incoming voyage (into the EU), outgoing voyages and intra-EU voyages. For example, ships traveling between Turkey and Romania (i.e. from outside the EU arriving into an EU port) are subject to the requirements of this regulation. Monitoring information for the entire voyage is necessary and they would need an appropriate document of compliance, as discussed further below. Table 2 summarizes the MRV requirements, highlighting the responsible parties.

---

31 Shipping companies are exempt to report on a per-voyage basis if the ship only does intra-EU voyages or if it performs more than 300 voyages per year, e.g. ferries
### MRV requirements

<table>
<thead>
<tr>
<th>Monitoring Plan</th>
<th>The basis for the yearly monitoring is the monitoring plan (MP). The MP describes what data are monitored and reported, and which monitoring method is being used. Currently there are four monitoring methods available for monitoring CO₂ emissions and two for monitoring other relevant information. The European Commission is expected to develop a standard template for MPs. Shipping companies will be obliged to use this template and prepare one MP per ship.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conformity assessment</td>
<td>Before implementing the MP, shipping companies need to submit it to an accredited third-party verifier for a conformity assessment. During this assessment, the verifier checks whether it is in line with the requirements of the Regulation. Shipping companies are also required to regularly review the MP of their ships (at least once a year) to confirm that it still reflect the specific characteristics and functioning of the ship. Any modification to an MP needs to be assessed by a verifier.</td>
</tr>
<tr>
<td>Monitoring</td>
<td>As of 1 January 2018, shipping companies need to follow the monitoring method chosen in the MP to gather data on the CO₂ emissions and ‘other relevant information’ caused during voyages from, to or within the EU. ‘Other relevant information’ is required for the purposes of analysing emission trends and assessing ships’ performances and includes consumption of fuels, to transport work and to the energy efficiency of ships.</td>
</tr>
<tr>
<td>Verification</td>
<td>The data gathered during a reporting period needs to be compiled into an emissions report and submitted to an accredited third-party entity for verification. If an emission report is found to satisfy all the requirements, the emission report gets verified and a compliance document is issued. The verifier also needs to inform the European Commission, flag States and port States of the issuance of this document. This will be done through an electronic tool, provided through the European Maritime Safety Agency (EMSA), to which these entities have access to. Shipping companies need to prove compliance by carrying a valid compliance document on-board of their ships at all times. The verification statement can also contain recommendations for improving the MP for the following reporting period. Shipping companies need to take into account these recommendations in a review of their MPs.</td>
</tr>
<tr>
<td>Reporting</td>
<td>By 30 April of each year, starting 30 April 2019, shipping companies need to submit verified emission reports to the European Commission for reporting purposes and to the competent authority of the flag state for informational purposes. Reporting will be done through automated systems using electronic templates.</td>
</tr>
</tbody>
</table>

Figure 1 depicts the compliance cycle that shipping companies have to undergo each year from 2018 on in order to meet the obligations of the EU Maritime MRV Regulation.
Beyond the MRV requirements that shipping companies are facing, the EU Maritime Regulation defines the procedures and requirements around accreditation and enforcement, including inspection and related communication, which are obligations for MSs or MSs’ NABs.

Next to the MRV requirements for ship-owners, the EU Maritime MRV Regulation provides a first set of rules for accreditation of third-party verifiers and a framework for enforcement. From the perspective of an EU MS, these aspects are the crucial ones as they require legal, institutional and procedural arrangements. The requirements for accreditation, enforcement and information exchange from an MS’ perspective are elaborated and the responsible entity identified in Table 3.

From a shipping company’s perspective, if they plan to operate ships over 5,000t for trips arriving, leaving, or traveling in between EU ports, they would be subject to this regulation. However, shipping companies are exempt to report on a per-voyage basis if the ship only does intra-EU voyages or if it performs more than 300 voyages per year, e.g. ferries.

Effectuated shipping companies would develop a monitoring plan, and choose an appropriate accredited verifier, which may have been accredited by Romanian Association for Accreditation (RENAR) or another authorized accreditation body within the EU (such as a National Accreditation Body in another MS).

Similar to the EU ETS system, the Romanian Government must ensure its National Accreditation Body is authorized for the EU Maritime MRV scope, but the Government does not have a direct role in which verifier is chosen to perform verifications for a specific ship.

If a ship owner is not from an EU country and the ship is registered also in non-EU country, but comes at a Romanian (or other EU) seaport, they would be required to have secured the services of a verifier accredited in the EU.

As discussed below, further details relating to shipping company and verifiers will be elaborated in upcoming implementing and delegating acts from the European Commission.
### Table 3: Maritime MRV Obligations from a Member State Perspective

<table>
<thead>
<tr>
<th>MS Obligations</th>
<th>NABs’ obligation</th>
<th>MS’ obligation</th>
<th>MS’ obligation in its position as a flag State</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accreditation</strong></td>
<td>To assess monitoring plans and verify emission reports, third-party verifiers need to be accredited by a NAB in line with the EU accreditation framework provided by Regulation No. 765/2008/EC. The methods for accreditation relating to maritime shipping will be specified by the Commission in a delegated act. Where no specific provisions will be defined in regards to accreditation for the purpose of the EU Maritime MRV Regulation the provisions of the Regulation No 765/2008/EC apply. MSs therefore need to task their NABs, which they appointed in line with Regulation No 765/2008/EC, with the accreditation activities defined by the EU Maritime MRV Regulation and relevant delegated acts. Furthermore, they have to ensure that their NAB’s are equipped with appropriate resources, in terms of staffing and financing, to fulfil this task. <strong>NABs’ obligation</strong>&lt;br&gt;&lt;br&gt;<strong>MS’ obligation</strong>&lt;br&gt;&lt;br&gt;NABs will have to develop the accreditation procedures and methods in line with Regulation No 765/2008/EC and the relevant delegated acts to the EU Maritime MRV Regulation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enforcement</strong></td>
<td>Enforcement of the monitoring and reporting requirements of the EU Maritime MRV Regulation lies in the hands of MSs that have maritime ports and ships flying their flag. Yet, it makes use of existing systems for inspections and enforcement procedures. MSs will have to set up a penalty system that applies in case shipping companies are found to not comply with the monitoring and reporting requirements. The penalties that are to be defined “shall be effective, proportionate and dissuasive”. By 1 July 2017, MSs need to notify the Commission about the penalty system and thereafter anytime it is going to be amended. Such a penalty system should also include more stringent penalties, such as expulsion for cases of either repetitive noncompliance (for two or more consecutive reporting periods), or of enforcement procedures implemented by MSs not leading to compliance, e.g. the shipping company failing to pay the imposed penalties.</td>
<td><strong>MS’ obligation</strong>&lt;br&gt;&lt;br&gt;<strong>MS’ obligation</strong>&lt;br&gt;&lt;br&gt;MSs face enforcement responsibilities from two angles, from its status as flag States and that of a (maritime) port State. In its position as a flag State, a MS is being tasked to ensure compliance with monitoring and reporting obligations by each ship flying its flag. From the MS’s perspective the fact a valid compliance document has been issued a ship is sufficient proof of compliance. This means in practice that a MS authority will need to check that each ship flying the MS’ flag has been issued a compliance document from April 2019 onwards, i.e. after the first verification took place. The information on whether a compliance document has been issued to a ship will be provided by verifiers to the MS authority and the Commission electronically through automated systems.</td>
<td></td>
</tr>
<tr>
<td><strong>Penalty system</strong></td>
<td><strong>Enforcement procedures</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

32 Article 4(9) of EC No. 765/2008  
33 Preamble (32) of the Regulation
For ships found to not comply with the requirement, i.e. no compliance document for the relevant reporting period has been issued, the defined penalties will have to be enforced.

As a port State, a MS is in charge of checking whether ships entering or leaving a port under its jurisdiction meet the obligation of carrying on board a valid compliance document. The means to fulfil this task is the inspection regime established in accordance to Directive 2009/16/EC on port State control.\(^{34}\)

The MS is in charge of ensuring that the validity of the compliance document is checked as part of ship inspections by its port authorities. The number of inspections undertaken by a MS is determined in accordance to a formula establishing a fair share of inspections undertaken by each MS. In accordance to that maximum number of inspections for each MS and using a risk-based approach, an EMSA IT tool provides the schedule of inspections to each MS’ port authorities.

If the issuance date and expiry date of the compliance document or the identity of the relevant verifier is not available, the MS authority may want to check that a valid compliance document is carried on board when entering or leaving its port.

In case the enforcement procedures of a MS result in expulsion, every MS is obliged to refuse entry of the expulsed ship until the shipping company is able to demonstrate it is compliant with MRV requirements by presenting valid compliance document.\(^{35}\) Yet, MSs are also required to have effective procedures in place for ship-owners to have remedy before a court or tribunal against such an expulsion order.

MSs have obligations in regards to information exchange in order to enable effective enforcement procedures nationally and across the EU. The obligations require the following actions:

- MSs have to ensure effective information exchange and cooperation between the national authorities in charge of ensuring and checking compliance of ships flying the MS’ flag and the authorities entrusted with implementing the penalty system. This serves the purpose of enabling each authority to fulfil its obligation in an effective and timely manner.
- Also, a MS’ authority needs to inform ship-owners, operators of a ship or its representative in the MS of the right to an effective remedy before a court or tribunal against an expulsion order.
- If a MS imposes a penalty in accordance to its national penalty system or issues an expulsion order against a ship, it needs to inform the European Commission, EMSA, other MSs and to the flag State concerned about the measures.


\(^{35}\) This does not apply to ships in distress

\(^{36}\) Article 20 of the Regulation
Figure 2 depicts the different bodies involved in the implementation of the EU Maritime MRV Regulation, their obligation and how they interact with each other.

**Figure 2 Processes between entities involved in the implementation of the EU Maritime MRV Regulation**

**Forthcoming specifications for the regulation**

In order to enable MSs to undertake the necessary steps to ensure compliance with, and implementation of, the new EU Maritime MRV Regulation, particularly for the accreditation and enforcement procedures, the delegated acts and implementation acts will have to be adopted in a timely manner. For example, for the monitoring plans to be ready for submission by 2017 to allow for first reporting of emissions in 2018, the accreditation procedures for verifiers and the enforcement process have to be in place. Shipping companies will need to have the standardized monitoring plan template available in due time and know the technical requirements, including potential other monitoring methods. The European Commission is therefore tasked to further specify a number of technical requirements and approaches under the EU Maritime MRV Regulation through so called delegated acts\(^\text{37}\) and implementing acts\(^\text{38}\) by December 2016.

Table 4 provides an overview of the areas that will be addressed through delegated acts and implementing acts:

---

37 To be developed in accordance with Article 24 of the EU MRV Regulation.
38 To be adopted by the Commission in accordance with the procedure referred to in Article 25(2) of the EU MRV Regulation.
Table 4 Aspects of Maritime MRV to be specified through delegated acts or implementation acts

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Obligations to be further clarified</th>
<th>Type of Act</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring and reporting</td>
<td>Review certain technical aspects of monitoring and reporting of CO\textsubscript{2} emissions from ships</td>
<td>Delegated acts</td>
</tr>
<tr>
<td>Standardized Monitoring Plan</td>
<td>Define technical rules establishing the templates for the monitoring plans</td>
<td>Implementing act</td>
</tr>
<tr>
<td>Monitoring methods</td>
<td>Amend the methods and rules set out in Annex I and Annex II of the Regulation</td>
<td>Delegated acts</td>
</tr>
<tr>
<td>Format of the emission report</td>
<td>Technical rules establishing the data exchange format including electronic templates</td>
<td>Implementing act</td>
</tr>
<tr>
<td>Verification</td>
<td>Specify the rules for the verification activities based on the principles for verification provided in Art. 14 of the Regulation and taking into account the elements set out in Part A of Annex III of the Regulation</td>
<td>Delegated acts</td>
</tr>
<tr>
<td>Accreditation</td>
<td>Specify the methods of accreditation for verifiers, taking into account the elements set out in Part A of Annex III of the Regulation</td>
<td>Delegated acts</td>
</tr>
<tr>
<td>Compliance document</td>
<td>Determine technical rules establishing the data exchange format including electronic templates that are to be used by verifiers to transmit compliance related information to the Commission and the authority of the Flag State</td>
<td>Implementing acts</td>
</tr>
</tbody>
</table>

The Commission envisages the following schedule for developing the delegated acts and implementing acts, including multiple consultations rounds with stakeholders from both MS and industry:

- Bringing the stakeholder process to the attention of the European Sustainable Shipping Forum (ESSF)\(^{39}\) at its plenary in June 2015 to form working groups on the topics ‘accreditation and verification’ and ‘monitoring’.
- Stakeholder process to start in July 2015 within the ESSF. A report on the outcomes of the stakeholder process is expected in spring 2016.

On some of the technical aspects, the European Commission will be supported by EMSA, which was established by Regulation No. 1406/2002/EC to provide the necessary support to ensure effective and harmonized implementation of the port State control system. EMSA already facilitates technical cooperation between MS and the Commission for the exchange of EU vessel traffic information supports EU operational reporting services, including the electronic transmission of reporting formalities.\(^{40}\)

EMSA has, therefore, been tasked to support the European Commission in the implementation of the EU Maritime MRV Regulation, specifically in the development and implementation of a new IT module. This module will be used to communicate on information relevant for this regulation, e.g. reported data and information related to compliance, between MS authorities, the Commission, verifiers and

---

\(^{39}\) The ESSF is tasked to support the Commission in its development of legislative proposals and policy design for the shipping sector, bringing together national authorities, sector associations (industry stakeholders), unions, non-EU states representatives and companies

3.3 The EU Maritime MRV Regulation in the context of other legislation

The EU Maritime MRV Regulation builds on four other legal acts on EU level:

- Directive 2009/16/EC of 23 April 2009 on port State control\textsuperscript{42} to which the EU Maritime MRV Regulation is an amendment
- Directive 2009/21/EC of 23 April 2009 on compliance with flag State requirements\textsuperscript{43}
- Regulation No 765/2008/EC of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93\textsuperscript{44} (Regulation on accreditation)
- Regulation No 525/2013/EC of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at the national and EU level relevant to climate change and repealing Decision No 280/2004/EC\textsuperscript{45} (Regulation on monitoring and reporting GHG emissions).

Figure 3 illustrates the interplay of existing Directives and Regulations with the EU Maritime MRV Regulation and indicates the areas where existing instruments are being used. It facilitates identifying relevant national legal, institutions and procedural arrangements that are already in place and should to be considered when developing procedures to implement the EU Maritime MRV Regulation.

The strongest overlap is with the Directives on post State Control and compliance with flag State requirements and the Regulation on accreditation and market surveillance as each of them prescribe certain procedures. These will be discussed in more detail in Section 3.4.

The least overlap is found with the Regulation on monitoring and reporting GHG emissions at the national and EU level (MMR). This is due to the fact that the MMR addresses MRV requirements for MS to the Commission. Whilst the EU Maritime MRV Regulation is about requirements for ship-owners about emissions, which are currently not subject to international reporting under the UNFCCC Convention. Only the Climate Change Committee established by the MMR is being utilized in order to consult with MSs on the implementing acts to be developed by the European Commission. However, this is not a national procedure but a process on the EU level.

\textsuperscript{41} THETIS is the information system that supports the new Port State Control inspection regime. http://emsa.europa.eu/psc-main/thetis.html
The national laws, regulations and administrative provisions developed in MSs to comply with the Directives on port State control and on compliance with flag State requirements constitute, as discussed above, the instruments of the enforcement system for the EU Maritime MRV regulation.

The Regulation on accreditation builds the framework for general accreditation procedures and requires each MS to appoint a NAB in charge of the implementing the accreditation process and to assign an entity to supervise the accreditation body. The requirements of Regulation on accreditation will be complemented by sector specific requirements for accrediting verifiers for the maritime transport sector through delegated acts with further specifications.

The Regulation on monitoring and reporting GHG emissions plays only a limited role in the implementation of the EU Maritime MRV Regulation since MSs do not have any obligation of monitoring and reporting CO₂ emissions from the maritime transport sector. Yet, it establishes the Climate Change Committee, which needs to be consulted when further refining the verification and accreditation procedures or modifying monitoring methods and rules through delegated/implementing acts under the EU Maritime MRV Regulation.

Figure 4 provides the timeline for the implementation of the EU Maritime MRV Regulation, including the development of the delegated acts and implementation acts discussed above. It depicts the various steps that need to be taken in order to ensure compliance with the regulations. Each stakeholders’ obligations and the respective deadlines are also illustrated.
## Figure 4 Timeline for the implementation of the EU Maritime MRV Regulation

<table>
<thead>
<tr>
<th>European Commission</th>
<th>delegated acts on verification and accreditation</th>
<th>implementing act on monitoring requirements</th>
<th>publish information on reported emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>national government</td>
<td>notify Commission of penalty scheme</td>
<td></td>
<td>compliance checks</td>
</tr>
<tr>
<td>national accreditation body</td>
<td>accreditation</td>
<td></td>
<td>inspections &amp; enforcement</td>
</tr>
<tr>
<td>verifiers</td>
<td>accreditation</td>
<td>MP conformity assessment</td>
<td>verification of ER issuance of CD</td>
</tr>
<tr>
<td>companies</td>
<td>submit MP for continuous monitoring</td>
<td>submission of verified ER carrying CD</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>July</th>
<th>July</th>
<th>August</th>
<th>January</th>
<th>April</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>2016</td>
<td>2017</td>
<td>2018</td>
<td>2019</td>
<td></td>
</tr>
</tbody>
</table>

**Milestones**

- Regulation entering into force
- Start of 1st reporting period

* Ships falling into scope of the regulation after 31 August need to submit MP to verifier within 2 months

**Abbreviations**

- MP: Monitoring Plan
- ER: Emissions Report
- CD: Compliance Document
3.4 The regulation in the Romanian context

This section examines the requirements for accreditation, enforcement and information exchange in the Romanian context and discusses options and considerations on how Romania can comply with the EU Maritime MRV Regulation. It addresses potential provision for institutional, procedural and legal arrangements, taking into account the requirements of the regulation and the national circumstances in Romania; to facilitate Romania’s ability to optimally fulfil its obligations.

Romania’s facilitative role in Accreditation

Romania already has institutional arrangements in place from which it can draw to meet requirements on accreditation. According to the EU Maritime MRV Regulation, accreditation of verifiers needs to be in the hands of the National Accreditation Body (NAB) appointed by Romanian in accordance to Regulation No 765/2008/EC. Table 5 summarizes the relevant arrangements relating to compliance.

Since 2009, the Romanian Association for Accreditation (RENAR) is the NAB in accordance to Regulation No 765/2008/EC. It is under the supervision of the Ministry of Economy. Since 2013, RENAR is in charge of accrediting verification bodies for the EU ETS and has established relevant accreditation procedures in accordance with ISO14065 and the Accreditation Verification Regulation (AVR).

For RENAR to be able to act as the NAB in line with Article 16 of the Regulation, i.e. to accredit verifiers for the activities under the scope of the EU Maritime MRV regulation, the Romanian Government needs to issue a decision to appoint RENAR as the relevant body to carry out the accreditation of verifiers in that field. A comparable process took place for the accreditation of verification bodies for the EU ETS, for which, in accordance to the Accreditation and Verification Regulation introduced in 2012, also the unique NAB had to be assigned. Through the government decision no. 66/2013, RENAR was appointed as the relevant body to carry out the accreditation of verifiers in the field of EU ETS.

The EU Maritime MRV Regulation also stipulates that MSs must equip their NABs with appropriate resources to fulfil this task. A relevant provision already exists in Romania, as the national law on accreditation (Ordinance 23/2009)46 foresees that RENAR is provided with the relevant technical expertise and financial support by the Romanian Government.

Table 5 Relevant arrangements for compliance with accreditation requirements

<table>
<thead>
<tr>
<th>Legal</th>
<th>Institutional</th>
<th>Procedural</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires a government decision appointing RENAR as the relevant body</td>
<td>National Accreditation Body RENAR will be in charge of accrediting verifiers</td>
<td>RENAR will be in charge of defining procedures to accredit verifiers for the Scope the EU Maritime MRV Regulation, its delegated acts and the Regulation No 765/2008/EC</td>
<td>the NAB needs to be enabled to provide accreditation services by 2017</td>
</tr>
</tbody>
</table>

Furthermore, the government could consider engaging with RENAR during the stakeholder procedures organized by the European Commission to specify the rules for verification and methods of accreditation to draw on RENAR’s expertise from other schemes, like the EU ETS.

Also, coordinating closely with RENAR will help to identify which type(s) of financial or technical support RENAR will be needed in order to fulfil its task and to monitor that steps are taken in line with the required timeline.

Depending on further institutional arrangements, the Romanian government may wish to establish some kind of “convention” describing the modalities and procedures for communication between RENAR and the relevant government body in charge of compliance with the EU Maritime Regulation. This is most easily done by expanding the scope of communication between the Ministry of Economy, Trade and Tourism and RENAR, as a similar scope and relationship already exists for accreditation activities for the EU ETS. In case the responsible ministry will not be the Ministry of Economy, the other two viable candidates are the Ministry of Transport as having direct supervision over the Romanian Naval Authority who will be involved in day-to-day Maritime MRV compliance activities in Romania’s ports or Ministry of Environment, Waters and Forests (MEWF) as having the most direct responsibility for issues relating to emissions generally, including the national inventory. This issue is discussed further in the section on facilitating information exchange below. The relevant Ministry should be enabled to monitor that RENAR is meeting the accreditation-related requirements. In the end, ship-owners will only able to comply with their MRV obligations if they can find an accredited verifier that can undertake verification or reported emissions in time for the reporting deadline.

Also, organizing and facilitating workshops with national entities involved, e.g. RENAR, verifiers expressing interest to become accredited for the scope of activities defined by the EU Maritime MRV Regulation and ship-owners can be considered as an effective means to inform them of relevant requirements and timelines and facilitates compliance from all ends.

**Romania’s obligations for enforcement**

The enforcement of the MRV obligations set out in the EU Maritime MRV Regulation is in the hands of MS’s authorities. It is based on four main pillars that are established or need to be established in each MS:

- First, MSs need to define a penalty system.
- As second and third pillars, the Regulation utilizes two existing frameworks of enforcement; the enforcement regime in ports, defined by the Directive 2009/16/EC, and the enforcement regime by flag States as provided by Directive 2009/21/EC and transposed in each MS.
- The forth pillar is the document of compliance, which is the means by which MSs can assess whether ship-owners are in compliance with the Regulation.

**Penalty system as a key element for enforcement**

The first enforcement pillar, the penalty system, has to be developed by Romania by 1 July 2017, addressing which penalties will be imposed on ship-owners and ships found in noncompliance with the monitoring and reporting requirements. The penalties “shall be effective, proportionate and dissuasive”. MSs need to notify the European Commission about the penalty system created, as well as any time it is going to be amended thereafter. The penalty system should also include more stringent penalties, such as detention and refusal of access to the port, for cases of either repetitive noncompliance (for two or more consecutive reporting periods), or where enforcement procedures
implemented by MSs are not leading to compliance, e.g. the shipping company failing to pay the imposed penalties.

Table 6 summarizes the relevant arrangements for compliance with penalty requirements.

Table 6 Relevant arrangements for compliance with penalty requirements

<table>
<thead>
<tr>
<th>Legal</th>
<th>Institutional</th>
<th>Procedural</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government decision defining the penalty scheme</td>
<td>Institutional arrangements will be defined by the choices made around enforcement as a flag State</td>
<td>No additional procedure required</td>
<td>By 1 July 2017</td>
</tr>
</tbody>
</table>

There are two relevant penalty systems in Romania:

- Penalties defined in by the Government Decision no. 780/2006 establishing the EU ETS ranging from €4,500 up to the maximum €11,000.

The 4th EU ETS Compliance Review identified the relatively low effectiveness of the penalties imposed for infringements within the EU ETS, with a low deterrent effect. In light of this, these penalties could be reviewed to come up with more effective, proportionate and dissuasive penalties for infringements related to the ship-owners and their obligations under the EU Maritime MRV Regulation.

**Enforcement obligations as flag State**

In its capacity as a flag State, Romania is responsible for ensuring that each ship flying its flag is compliant with the MRV requirements of the EU Maritime MRV Regulation. Romania has transposed Directive 2009/21/EC on compliance with flag State requirements, which builds the second enforcement pillar, through the Minister order no. 250/2011, appointing the Ministry of Transport as responsible ministry and designated the Romanian Naval Authority as specialized technical body for ensuring compliance with the flag State requirements. Relevant enforcement and information exchange procedures are therefore already in place to build on and to extend for the purpose of ensuring compliance with the EU Maritime MRV Regulation.

The issuance of a compliance document by an accredited verifier, which is the fourth pillar of the enforcement system, indicates to the relevant authority whether a ship is compliant for that reporting year. Therefore, the Romanian government needs to take the following steps in order to be able to comply with the requirements by 2019, when verifiers are expected to issue the compliance document for the first reporting period and ship-owners are required to hold such document:

a. Appoint a national authority responsible for checking compliance
b. Enable the authority to impose the penalties provided in the EU Maritime MRV related penalty system

---

47 Article 19 (1)
c. Define a procedure for undertaking the compliance checks in the required intervals.

d. Extend existing remedy procedures to allow for appeals by ship-owners against enforcement actions.

e. Define the process for ship-owners to submit emission reports by 30 April each year to the designated national authority.

The information on issuance of a compliance document will be communicated to MS authorities through two channels. On the one hand, MSs will, by 30 June each year, receive information compiled by the Commission on the reported CO₂ emissions and the issuance of compliance documents of all ships subject to the EU Maritime MRV Regulation. The comprehensive information on compliance and reported emissions will be provided through the submitted emission reports and information entered relating to the issuance of compliance documents entered by verifiers into an automated electronic system maintained by EMSA. The compiled information serves as the basis for MS authorities to check and ensure compliance by the ships flying their flag. Yet, verifiers are also required to communicate to the designated authority of the MS flag State when they issue a compliance document to a ship flying the flag of that state.

The process for compliance checks basically entails a cross check that all ships in the Romanian ship register that are subject to the EU Maritime MRV Regulation have been issued a valid compliance document for the preceding reporting year, based on the information given by verifiers and compiled and provided to Romania by the European Commission. As distinct from the role of inspections as a port State described in the next section, at no time in this cross checking process as a flag state is required to verify the authenticity of the compliance document or that is being carried on board a ship.

The process will need to be undertaken on a regular basis, e.g. in 12-month intervals, as compliance documents are issued for one reporting year only and expire 18 months after issuance. The process can start at its earliest after April 2019, once the first compliance documents are issued after successful verifications; or the process can start at the latest by publication of the aggregated information provided by the European Commission at the end of June 2019.

One consideration when nominating the authority responsible for checking compliance is that the Romanian Naval Authority already has relevant procedures in place. These include but are not limited to procedures of:

- Access to the Romanian ship register
- Detaining ships and refusing entry of the ships for which an expulsion order has been issued
- Informing other MSs of detentions
- Receiving information on detained ships that fly the flag of Romania
- Overseeing the process of a ship being brought into compliance with the relevant requirements
- Using THETIS, the IT system provided by EMSA to support the national inspection regimes

The Romanian Naval Authority has relevant technical expertise to decide when certain enforcement procedures should not be implemented due to safety issues, e.g. when a ship is in distress. Therefore,
they are the suggested authority to check that the appropriate compliance document is on file once a year, such as in May or June.

Yet, the expertise on MRV requirements lies with the MEWF therefore the Romanian government may want the MEWF to be involved in the process of ensuring compliance by ship-owners. The involvement relates less to the experience of reviewing and checking appropriateness of Monitoring Plans and quality of reported emission data, as this is entirely in the hands of accredited verifiers, but rather to ensuring that ship-owners are informed about and understand the obligations, processes and timelines.

When developing the institutional arrangements, for example, it could therefore be considered whether to have the primary role with the Romanian Naval Authority and then have the MEWF play a facilitating role in the process of getting ship-owners ready to submit Monitoring Plans for assessment to verifiers in 2017, to implement monitoring methods in 2018 and to report relevant data in the required format in the first quarter of 2019.

Table 7 summarizes the relevant arrangements for compliance as a flag State.

<table>
<thead>
<tr>
<th>Legal</th>
<th>Institutional</th>
<th>Procedural</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government decision appointing a government body to implement compliance cross-checking procedures and a body to receive emission reports</td>
<td>Appoint national authority for ensuring compliance with EU Maritime MRV requirements, e.g. the Ministry of Transport, Romanian Naval Authority, National Company Maritime Ports Administration Constanta, or MEWF. Appoint national authority for receiving the emission reports. This is suggested to be the same authority as is responsible for ensuring compliance (e.g. the Romanian Naval Authority) who would then share information with the MEWF, if requested.</td>
<td>Procedure to define the work flows, information sources as well as the steps to be taken once any non-compliance is identified. Define process for submitting emission reports to the appointed authority and communicate to ship-owners with ships flying the Romanian flag.</td>
<td>By June 2019 Well before 30 April 2019</td>
</tr>
</tbody>
</table>
Enforcement from a port State perspective

The third enforcement pillar, the Directive 2009/16/EU on port State control, was transposed by the Government Decision No. 811/2010\textsuperscript{49}, appointing the Romanian Naval Authority as the Romanian State port authority, and tasking it, among other relevant port State related tasks, with the inspection, control and supervision of shipping, and sanctioning offences. (See Table 8)

The EU Maritime MRV Regulation, which is an amendment to the Directive on port State control, defines inspection in regards to compliance with the MRV obligations become an integrated part of the existing inspection regime of ships. Inspection in this context means checking that a valid compliance document is being carried on board of each ship subject to the Regulation, not limited to those flying the flag of Romania. The compliance document therefore should then be added to the list of certificates and documents referred to in Annex IV to Directive 2009/16/EC therefore to Annex 4 of Romania’s Government Decision No. 811/2010\textsuperscript{50}.

The number of inspections to be undertaken by the Romanian Naval authority, the selection of ships to be inspected and the inspections schedule remain, in principle, the same. Yet, if, at the time of entry into a Romanian port, the information on the date of issue and the expiry date of the document of compliance and the identity of the verifier that assessed the emissions report is not available, the Romanian Naval Authority may want to verify that a valid document of compliance is carried on board.

Table 8 Relevant arrangements for complying as a port State

<table>
<thead>
<tr>
<th>Legal</th>
<th>Institutional</th>
<th>Procedural</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government decision amending and supplementing Decision no. 811/2010 on Port State control</td>
<td>Extend inspection authority of Romanian Naval Authority to checking that a valid compliance document is being carried on board.</td>
<td>Annex No. 4 of Government decision No. 811/2010 needs to be amended as the compliance document needs to be added to the ‘List of certificates and documents’ to be checked when carrying out an initial inspection and more detailed inspection in accordance to Article 13 of the Government decision mentioned before. Information dissemination process to inform relevant staff of the Romanian Naval Authority about the new responsibilities, penalty system and requirements. The Government may also want to develop a process by which the port State authority checks the database for each ship entering a Romanian port to ensure information on the issuance and expiry dates and the verifier is available. If absent, the Romanian Naval authority may want to verify that a valid compliance document is being carried on board.</td>
<td>In time for inspections after ships will have been issued a compliance document by 30 April 2019</td>
</tr>
</tbody>
</table>

\textsuperscript{49} \url{http://www.rna.ro/servicii/riie/acte_normative/oct2010/Hotarare%20nr.%20811%20din%202010.html}, and subsequently modified the Minister Decision - \url{http://mt.ro/web14/documente/acte_normative/2014/12_06/text_proiect.pdf} to reflect an amendment to the Directive.

\textsuperscript{50} Article 19 (3)
Summary of flag State and port State obligations

This section provides a short summary of the obligations relating to ships flying Romanian flags versus ships registered in any country that enter a Romanian maritime port from within or outside the EU, to ensure the different roles are clear. The information in Table 9 presents the requirements discussed in the previous two subsections; it does not include additional requirements.

Table 9 Summary of arrangements for complying as both a flag State and a port State

<table>
<thead>
<tr>
<th><strong>Comparison of Enforcement Obligations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flag State</strong></td>
</tr>
<tr>
<td><strong>Port State</strong></td>
</tr>
<tr>
<td><strong>Which ships:</strong></td>
</tr>
<tr>
<td><strong>Who checks:</strong></td>
</tr>
</tbody>
</table>
| **What is checked:** | Check EMSA database to ensure all effected ships have a compliance document on file from an accredited verifier | (A) Check EMSA database to ensure the ship has a compliance document on file from an accredited verifier  
(B) If needed, request to see document on board.  
(C) If selected, conduct ship inspections as per existing protocols |
| **How often:** | “Regularly”; suggested this be interpreted as annually in July or August | Every time a ship over 5000t arrives at a Romanian maritime port |
| **When does it start:** | Ongoing beginning 2019 | Ongoing beginning May 2019 |

Preparation needed*

<table>
<thead>
<tr>
<th><strong>Legal</strong></th>
<th>Government decision appointing a government body to implement compliance cross-checking procedures and a body to receive emission reports</th>
<th>Government decision amending and supplementing Decision no. 811/2010 on Port State control</th>
</tr>
</thead>
</table>
| **Institutional** | Appoint national authority for ensuring compliance with EU Maritime MRV requirements, e.g. the Ministry of Transport, Romanian Naval Authority, or MEWF.  
Appoint national authority for receiving the emission reports. This is suggested to be the same authority as is responsible for ensuring compliance (e.g. the Romanian Naval Authority) who would then share information with the MEWF, if requested. | Extend inspection authority of Romanian Naval Authority to checking that a valid compliance document is being carried on board. |
## Comparison of Enforcement Obligations

| Procedure | Procedure to define the work flows, information sources as well as the steps to be taken once any non-compliance is identified. Define process for submitting emission reports to the appointed authority and communicate to ship-owners with ships flying the Romanian flag. | Annex No. 4 of Government decision No. 811/2010 needs to be amended as the compliance document needs to be added to the ‘List of certificates and documents’ to be checked when carrying out an initial inspection and more detailed inspection in accordance to Article 13 of the Government decision. Information dissemination process to inform relevant staff of the Romanian Naval Authority about the new responsibilities, penalty system and requirements. The Government may also want to develop a process by which the port State authority checks the database for each ship entering a Romanian port to ensure information on the issuance and expiry dates and the verifier is available. If absent, the Romanian Naval authority may want to verify that a valid compliance document is being carried on board. |

*Repeats information from Tables 8 & 7

### Information exchange

MS have obligations in regards to information exchange in order to enable effective enforcement procedures nationally and across the EU. (See Table 10). The obligations require Romania to:

- Romania must ensure effective information exchange and cooperation between the national authorities in charge of ensuring and checking compliance of ships flying the MS’ flag and the authorities entrusted with implementing the penalty system. This serves the purpose of enabling each authority to fulfil its obligation in an effective and timely manner.
- Whenever Romania imposes a penalty in accordance to its national penalty system or issues an expulsion order against a ship it needs to inform the European Commission, the EMSA, other MSs and the flag State concerned for that ship.
- The appointed national authority in charge of implementing the penalty system needs to inform ship-owners, operators of a ship or its representative in the MS of the right to an effective remedy before a court or tribunal against an expulsion order.

Defining relevant modes and procedures could be in the form of an agreement between the different authorities as is currently being worked on between the NAB and MEWF.
### Table 10 Relevant arrangements for complying with information exchange requirements

<table>
<thead>
<tr>
<th>Legal</th>
<th>Institutional</th>
<th>Procedural</th>
<th>Timeline</th>
</tr>
</thead>
</table>
| Information exchange procedures could be enshrined in the two government decisions discussed above, on appointing a government body to implement checking procedures and receiving emission reports amending and supplementing Decision no. 811/2010 on Port State control, defining each entities’ requirement to provide information to whom and when. | All entities that hold relevant information, incl. Ministry of Transport, Romanian Naval Authority, MEWF, RENAR, verifiers will be involved in ongoing information exchange. It is suggested that MEWF lead in facilitating setting up these procedures as it builds upon existing activities. | The procedure needs to consider at a minimum:  
   a) which entities hold relevant responsibilities  
   b) what does each entity need fulfil this responsibility  
   c) which entity holds relevant information  
   d) time by when information becomes available  
   e) time by when information needs to be made available to the respective entity | No binding timeline required by the Regulation, yet needs to be operational by May 2019 |

#### 3.5 Next steps regarding Maritime MRV

As of 1 July 2015, the EU Maritime MRV Regulation enters into force and Romania will have to start introducing implementing measures in order to comply with its obligations. Yet, this Regulation is quite different to other EU Regulations that define MRV requirements – as at no point in the process is the Romanian government obliged to monitor, report or verify GHG emissions, which is the case for the MMR, nor to review any reported data, such as is the case for the EU ETS. Romania’s obligations for this new regulation are primarily about ensuring that ship-owners that face the actual MRV obligations are compliant.

Due to the process of further specifying technical details through delegated acts\(^{51}\) and implementation acts\(^{52}\), which only starts in June this year, some open issues remain. These relate to, on the one hand, technical aspects of monitoring methods and, on the other hand, to procedural issues related to verification and accreditation procedures, submission of reported data and verification information. Romania as a member of the ESSF, represented through a transport attaché, and of the EU Climate Change Committee, is able to actively participate in the stakeholder consultation processes though which these open issues will be addressed. Yet, these do not relate to the

---
\(^{51}\) to be developed in accordance with Articles 23 of the EU MRV Regulation,  
\(^{52}\) to be adopted by the Commission in accordance with the procedure referred to in Article 24(2) of the EU MRV Regulation, involving the Climate Change Committee
obligations of Romania in its responsibility as flag State and port State. Therefore, further refinement of technical and procedural aspects are unlikely to impact the procedural arrangement and institutional set-up that is described in this report and the related options and considerations.

The Government of Romania can therefore start defining the legislative, institutional and procedural arrangements at any time. The three areas which require actions in order for Romania to meet its obligations under the EU Maritime MRV Regulation are:

- Accreditation,
- Enforcement and
- Information exchange.

Each of the areas requires a government decision to be issued, appointing a national authority for the different tasks as well as defining the procedures.

The EU Maritime MRV Regulation makes use of existing national frameworks, i.e. institutions and procedures, which have been introduced in Romania already to comply with other regulations. Therefore, the number of options, in terms of which institutions to assign to which task, is limited. For two areas, the institutional set up is already defined. Accreditation needs to be covered by the unique NAB, which Romania appointed to comply with Regulation (EC) No 765/2008. The inspection regime, in which the check for compliance with the requirement to carry a valid compliance document on board has to be embedded, has been assigned to the Romanian port authority when transposing Directive 2009/16/EC.

Developing an effective, proportionate and dissuasive penalty regime can draw on two existing schemes, the one for port State control and the other one for EU ETS related enforcement procedures. Yet, findings on how effective these existing penalty systems are should be taken into account.

For the appointment of a national authority for undertaking compliance checks, i.e. fulfilling obligations from a flag State perspective, a number of considerations should be taken into account. The Ministry of Transport and the Romanian Naval Authority have relevant experience with related procedures of checking ships' compliance with maritime conventions. The MEWF holds the expertise in regards to obligation relating to MRV of CO₂ emissions. To leverage these different sets of expertise, the Romanian government should consider, when appointing one of the entities, also defining specific supporting roles for the other entity. Such a reporting role could, for example, entail the organization of workshops with stakeholders, including ship-owners and verifiers, to inform of the upcoming requirements, processes and timelines under the EU Maritime MRV Regulation.

Lastly, defining procedures for effective information exchange between the different national authorities, as well as with other MSs, EMSA and the Commission will need to be developed in accordance to the institutional setup for compliance checks. While existing communication channels should be made use of, their effectiveness in terms of timeliness and comprehensiveness should be assessed to ensure that every stakeholder is enabled to meet their obligations.

Defining relevant modes and procedures could be in the form of a convention between the different authorities as is currently being worked on between the NAB and the MEWF.
4. MRV of Climate Change Actions by Local Governments

Local mitigation activities affect national emissions inventories and emissions reduction policies in measures, as emissions impacts become aggregated at the national level. These local activities should be encouraged as well as inform, be integrated with and supported by national-level policy to the fullest extent feasible.

An initiative for local governments gaining momentum in Romania is the EU Covenant of Mayors (CoM), through which municipalities voluntarily agree to account for, report, and reduce GHG emissions. By September 2015, 63 municipalities and local administrative units (LAUs) in Romania have signed the CoM.\(^53\)

This section provides information on emission inventory development at the local level, within the context of the CoM and its requirements. It includes examples of emissions mitigation activities by Romanian municipalities as well as other EU member States, and provides information on GHG inventory methodologies. Lastly, it provides options and considerations to encourage participation in the CoM and supporting local government actions from the national government.

4.1 Overview of the Covenant of Mayors Initiative

The Covenant of Mayors initiative was started in 2008 by the European Commission, following the launch of the Energy Climate Change package. It is based on the belief that municipalities and their citizens can play an important role in combating climate change, citing that around 80% of worldwide GHG emissions are produced by cities, which are responsible for two thirds of the total energy consumption.\(^54\) The CoM is an open platform and the agreement can be signed by any municipality, regardless of size, whether small or large, metropolitan area or county council anywhere in the world.

The objective of CoM is to reduce GHG emissions within the municipality, and signatories commit to a target of at least a 20% reduction by the year 2020 as compared to 1990 levels, through the implementation of strategies adopted at the local level.\(^55\) The recommended strategies focus heavily on energy efficiency measures and the use of renewable energy sources for reducing local emissions levels.

By signing the CoM, a municipality commits that within a year of signing it will submit a Baseline Emissions Inventory (BEI) and Sustainable Energy Action Plan (SEAP) from which to monitor progress, after which signatories agree to issue SEAP Implementation Reports every two years, accompanied by a Monitoring Emissions Inventory report (MEI) every four years, assessing the effectiveness of the implemented measures at achieving CO\(_2\) reductions as compared to the baseline inventory. The SEAP and MEI both need to be approved by the Local Council or other appropriate unit with local decision-making power. If these responsibilities are left unfulfilled, the municipality loses its membership in the CoM.

The BEI is carried out by the municipality and compiled at the local level, using different sectoral categories and methods than the national GHG inventory described in Section 2.2. Table 11 highlights

---

\(^{53}\) For the current list of CoM signatories, go to: http://www.covenantofmayors.eu/about/signatories_en.html

\(^{54}\) http://www.covenantofmayors.eu/about/covenant-of-mayors_en.html

\(^{55}\) http://www.eumayors.eu/IMG/pdf/covenantofmayors_text_en_pdf
the differences between the legally-required national inventories and as compared to activities for a municipality voluntarily producing its emissions inventory.

Table 11 Differences between national GHG inventories and local inventories for the CoM

<table>
<thead>
<tr>
<th>Requirement</th>
<th>National GHG Inventory</th>
<th>Municipality Emissions Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal aspects</td>
<td>Binding, as part of the UNFCCC, Kyoto Protocol and EU membership</td>
<td>Voluntary, due to signing the CoM</td>
</tr>
<tr>
<td>Geography</td>
<td>National Borders</td>
<td>Municipality/Town Borders</td>
</tr>
<tr>
<td>Sectors</td>
<td>• Energy</td>
<td>• Municipal buildings, equipment/facilities</td>
</tr>
<tr>
<td></td>
<td>• Industrial processes and product use (IPPU)</td>
<td>• Tertiary (non-municipal) buildings, equipment/facilities</td>
</tr>
<tr>
<td></td>
<td>• Land Use, Land Use Change and Forestry (LULUCF)</td>
<td>• Municipal public lighting</td>
</tr>
<tr>
<td></td>
<td>• Waste</td>
<td>• Residential buildings</td>
</tr>
<tr>
<td></td>
<td>• Other</td>
<td>• Transport</td>
</tr>
<tr>
<td>GHG</td>
<td>All GHGs (e.g. CO₂, NH₃, N₂O, SF₆, PFCs, HFCs)</td>
<td>CO₂, CO₂e (also including N₂O, CH₄ when SEAP addresses waste and water treatment)</td>
</tr>
<tr>
<td>Data Sources</td>
<td>Mainly statistical data from the National Statistics Institute (NSI), energy balance, industrial production and line ministries</td>
<td>Data from final consumers who are active in the town</td>
</tr>
<tr>
<td>Emission Factors</td>
<td>National and continuously improved approach</td>
<td>A choice between the default 2006 IPCC approach, national or life cycle evaluation</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>Performed annually with data for the year n-2 and re-evaluation of the entire series starting from the base year under the Kyoto Protocol</td>
<td>BEI, the base inventory delivered with the SEAP and bi-annually or every four years at most along with MEI</td>
</tr>
</tbody>
</table>

Source: 2006 IPCC Guidelines for National GHG Inventories and SEAP Guidebook

4.2 Sustainable Energy Action Plans (SEAPs)

For municipalities that join the CoM, the SEAP is a long term planning document on energy efficiency, the use of renewable energy supply (RES), and efficient transport at the local level, which supports local authorities’ efforts to fulfill targets set by signing the CoM.

Preparing the SEAP is a complex process, and a guide has been developed that offers recommendations for each stage, beginning with establishing a vision, followed by planning, implementation, monitoring and evaluation. For example, the SEAP guide highlights key elements for successful design and implementation of the SEAP, including:

- Obtaining the support of local actors
- Establishing long-term political commitment so that implementation is independent of the electoral cycle
- Providing funding sources where multi-annual budgets are not available
• Producing an accurate BEI
• Ensuring that project management is fair and professional
• Having competent personnel and appropriate special training programmes
• Mobilizing civil society, and
• Communicating with other CoM signatories in order to identify and share best practices.

**SEAP mitigation policies**

The SEAP describes the policies to be implemented for each of the key sectors selected. As shown in Table 11 above, local activities under the CoM are organized into the following sectors:

- Municipal buildings, equipment/facilities
- Tertiary (non-municipal) buildings, equipment/facilities
- Residential buildings
- Municipal public lighting
- Transport

For example, as the use of renewable energy does not reduce energy use in buildings itself (instead it affects the emissions intensity of energy use, thus less of an impact on the environment) municipalities may wish to develop policies to address the energy efficiency of the building sector by:

- Standards for energy performance of new and/or renovated buildings and/or broader urban planning regulations;
- Promoting high quality energy audits;
- Energy efficiency and conservation awareness and training;
- Credits and financial incentives, such as for energy audits or implementation of measures;
- Popularizing best efficiency practices.

To increase the sustainability of transport policies, for example, the existing transport modes and possible connections or any synergies between multiple transport modes can be adapted to local geographical and demographic characteristics of the town. Transport policies and measures require a long term vision and allocation of financial resources for infrastructure development and vehicles. Sustainable transport policies may target:

- Increasing the attractiveness of alternative transport modes through improved public transport;
- Promoting efficient public transport;
- Investing in walking or bicycling infrastructure;
- Decreasing the attractiveness of using individual auto vehicles, such as by adding fees for transport in the center of towns or increasing parking fees;
• Cutting emissions from the vehicle stock owned by municipalities and encouraging the purchase of low emissions vehicles for the general public.

**Monitoring requirements for SEAPs**

As discussed above, the Baseline Emissions Inventory report contains the evaluation of GHG emissions at the municipal level, starting from the base year. They are the foundation on which the targets for emission reduction targets for 2020 or 2030 are established in the SEAP.

Municipalities issue SEAP Implementation Reports every two years, accompanied by a Monitoring Emissions Inventory report (MEI) every four years, assessing the effectiveness of the implemented measures at achieving CO$_2$ reductions as compared to the BEI.

The updated inventories must adhere to the same methodology as the BEI and act as a monitoring instrument for the SEAP. In order to ensure the consistency and comparability with the BEI, activity data is to be collected on energy consumption from the same sources using the same emission factors used when compiling the BEI. By comparing the inventory results with the results of the BEI, municipality can evaluate the pathway of CO$_2$ emissions and whether they are on track to fulfill their CoM CO$_2$ emissions reduction target by 2020. Depending on the results of these periodic evaluations, the SEAP may need to undergo modifications, so as to ensure that the target is reached.

The most general performance indicators regarding GHG emissions are:

- “The emissions reductions” indicator expressed as absolute value (tCO$_2$) as the difference between the emissions in the BEI and those in the reporting year and/or:

- “The emissions reductions per capita” indicator, which is determined by first calculating the absolute emissions reductions and afterwards dividing it by the size of the population.

**Project-level monitoring**

In addition to monitoring GHG emissions at the municipal level, municipalities also should evaluate baseline data, including CO$_2$ emissions, prior to implementation of a specific project and establish the environmental impact indicators for the project. In many cases, baseline information can be calculated simply multiplying the energy consumption prior to implementation with the emission factor in order to assess the initial CO$_2$ emissions levels and the approach to establishing a baseline should not be a constraint for project development.

Once energy usage before and after implementation of the project is known, the difference of the two, multiplied by the emission factor, will be the CO$_2$ emissions reduction associated with the project.

It is important to remember that the same specific fuel emission factor must be used as when compiling the BEI.

The project management system should include a form with clear data regarding energy consumption prior to project implementation, average energy consumption post project implementation and CO$_2$ emissions levels before and after implementation. A database of these values should be maintained under the overall SEAP. It can be used in a benchmarking analysis on key projects from the same sector and for choosing the most effective projects in the future implementation of SEAP.
Examples of mitigation activities and GHG inventories in Romania

As mentioned above, 63 municipalities in Romania have signed the CoM, among which 49 have sent SEAPs and are undergoing various stages of evaluation. Table 12 provides a synthesis of the results from the three Romanian municipalities who have begun implementing their SEAPs and have transmitted monitoring reports by mid-2015.

For towns in Romania that have signed the CoM, 2015 is the first reporting year. The experience gathered through implementing projects and particularly the quantification of results in terms of energy savings and GHG emissions reductions provides support for analyzing and revising the SEAP.

Table 12 SEAP monitoring results from three Romanian municipalities

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Project Title</th>
<th>Time period</th>
<th>Indicators/ key values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key sector: renewable energy production</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Alba Iulia    | Solar panels for the Olympic pool | 2011-2013 | • Reduction: 35 tCO₂e/year  
• Energy savings (ES): 40 MWh/year  
• Renewable Energy Production (REP): 60 MWh/year  
• Costs: €170,000 (European funds and own funds) |
| Alba Iulia    | Renewable energy sources for 4 public buildings | 2009-2011 | • Reduction: 215 tCO₂e/year  
• REP: 350 MWh/year  
• Costs: €2.1 million (European funds and own funds) |
| Mizil         | Local renewable energy production through photovoltaic plants | 2012-2014 | • Reduction: 1192 tCO₂e/year  
• ES: 2260 MWh/year  
• REP: 2660 MWh/year  
• Costs: €7.74 million (European funds and own funds) |
| **Key sector: buildings** |
| Bistriţa      | Apartment blocks rehabilitation | 2011-2020  
2011-2013 (24 buildings) | • Reduction: 20,100 tCO₂e/year  
• ES: 100,000 MWh/year  
• Costs: €96.8 million (European funds and own funds) |
| Bistriţa      | Energy efficiency in old buildings | 2011-2012 | • Reduction: 71tCO₂e/year  
• ES: 352 MWh/year  
• Costs: €629,500 (European funds and own funds) |
| **Key sector: transport** |
| Alba Iulia    | Urban mobility for bicycles in the historical areas | 2011-2013 | • Reduction: 210 tCO₂e/year  
• ES: 800 MWh/year  
• Costs: €170,000 |
| Bistriţa      | Low pollution public transport (purchase of 11 Euro 6 buses) | 2012 | • Reduction: 111.09 tCO₂e/year  
• Costs: €1.85 million |
Other sectors

<table>
<thead>
<tr>
<th>Sector</th>
<th>Details</th>
<th>Year</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Mizil  | City Hall website containing the SEAP data | 2011 | - Reduction: 1t Co2e/year  
- Costs: own funds |

Programmatic mitigation support: Energy Cities Romania

Energy Cities Romania (ECR) is an NGO established in 1995 through a Programme of Community aid to the countries of Central and Eastern Europe (PHARE) project, with the support of the European Energy Cities network. Energy Cities was started to support local energy efficiency initiatives for urban public services (e.g. heating, public lighting, water supply and the collection, storage and transportation of household waste). Established in 2009, ECR is the national support structure for cities in Romania that have become signatories of the CoM and ECR has participated in European projects as the national coordinator. Examples of ECR’s projects include:

- NET-COM (NETworking the Covenant of Mayors) co-financed by the European Programme Intelligent Energy (IEE). This project aims to create synergies between national initiatives in energy and CoM, including the creation of a platform for dialog between members of ECR on implementation of energy sustainable concept;

- MODEL (Management of Local Energy) also financed by IEE – developed under the logo “My city is my model” – support municipalities implementing energy efficiency measures;

- ROBUST – Build up Skills in Romania, is a project which sought to create a platform for dialogue amongst all stakeholders interested developing skilled labor for energy efficiency and renewable energy, and established roadmap for workforce qualification in the two areas. One example is “The Green Path towards Sustainable Development,” initiated by Environmental Protection Agency (EPA) Sibiu in 2014, with support from the Financing Mechanism for the European Space (SEE). The project develops strategies and action plans regarding climate change adaptation for three towns: Sibiu, Brașov and Târgu Mureș.

Good Practice Examples of local Romanian GHG inventories

Developing GHG inventories can help local entities understand ongoing activities and major sources of emissions; identify areas to focus policies and measures to reduce energy consumption; establish and track progress toward goals; refine or improve existing projects; build and maintain support for programs; compare results with other programs; or facilitate decision-making about future policies or goals.

The examples below used the approach to establish an emissions inventory according to the following methodology: “How to Develop a Sustainable Energy Action Plan (SEAP) – Guidebook. Part II: Baseline Emissions Inventory.”

Giurgiu: The baseline year for the inventory is 2010, as activity data (i.e., fuel use and electricity consumption) to calculate emissions is not comprehensively available for selected key sectors in prior years.

Key sectors included in the inventory:

- Municipal buildings and equipment/facilities
- Non-municipal commercial buildings and equipment/facilities
- Residential buildings
- Municipal public lighting
- Municipal transport fleet
- Public transport
- Private and commercial transport
- District heating, CHP.

Giurgiu used IPCC default emission factors to calculate emissions. Important factors that led to the successful development of the inventory include the commitment of staff time from the local authority as well as an organizational structure that supported **comprehensive data collection by involving all relevant stakeholders, including the school inspectorate, the Local Environmental Agency and local agency for energy efficiency, electricity supplier companies, commercial societies, and housing associations.**

Annex 1 provides snapshots of the energy consumption for selected key sectors and CO$_2$ emissions; Giurgiu also separately calculates urban heating and combined heat and power energy use and CO$_2$ emissions.

**Moinesti** signed onto the CoM in 2011, and in 2012 submitted its SEAP with a emissions inventory using 2010 as the baseline year. As Moinesti also followed the inventory methodology in the SEAP Guidebook, it used same IPCC default emission factors and included the same key sectors as Giurgiu.

Important factors that led to the successful development of Moinesti’s inventory include the use of an Energy Management System (EMS), which was developed through Intelligent Energy Europe and ADEME- France. The system monitored energy consumption in buildings which are under administration of Local Council, thus leading to the rapid creation of its inventory baseline, as well as SEAP development within a year of signing the CoM. **Ultimately, Moinseti found that EMS implementation leads to improved procedures to collect and organize quality data.**

**SEAP Examples from other Member States**

This section highlights examples of successful initiatives from two other cities in the EU who have signed onto the CoM, Vienna and Milan.

**Vienna, Austria**

As a signatory to the CoM the city of Vienna commits to reducing its CO$_2$ emissions by 21% by 2020. Key facts for Vienna:

- 1,757,000 inhabitants, about 20% of the country’s population
- In 2010, 20% - 30% of all new houses in Vienna were built to passive house standards
• Almost 60% of the Viennese households live in subsidized homes. 220,000 of these are rented public housing.

When it comes to quality of life, Vienna, the capital of Austria, always appears at the top of international rankings. The city’s innovative housing policy certainly contributes to achieving these impressive results. Creating affordable high quality living spaces that meet architectural and environmental standards and offer high levels of comfort to its residents is a top priority for the local administration.

**Green social housing for all.** In Vienna, almost 60% of the households live in subsidized homes. Every year, the city supports the completion of 5,000 to 7,000 social apartments, which corresponds to around 85% of the volume of the new homes constructed annually. All new housing projects that receive subsidies are subjected to a competition launched by the city, which aims at ensuring that tailored housing solutions are found, encouraging innovative architectural techniques and the preservation of the environment.\(^{57}\)

Since 2007, the environmental standards and legal regulations for constructing new social housing have been raised as well as the level of grants and subsidies for environmentally-friendly buildings. As a result, low-energy consumption (max. 30 kWh/\,m^2/year for heating) has become the norm in new houses, with more and more reaching “passive house standards” (less than 15 kWh/m^2/year for heating) – which actually allows new houses to be built in Vienna without any heating systems at all. In 2010, 20 to 30% of the new homes were built to passive house standards.

**SMART-flats** is a programme for those who have limited savings and are unable to take on a mortgage. The city is stepping up the construction of the so-called SMART flats: low-cost homes of compact size that are ideal for young people at the start of their career, but also for single parents or senior citizens. Because of the reduced living space, the consumption of energy is also decreased. Until 2011, a total of 900 flats, apartments and shared flats were built in the area of the former railway stations. The architects and developers built eight different buildings with attractive open spaces and social infrastructure. An important strategy to keep the rents low is to provide compact flats and offer community spaces instead.

**Bike City** – Built as part of Vienna’s efforts to encourage the use of bicycles, this social housing project aims at reducing car-parking space by 50% (the usual requirement being one plot per apartment) to make room for bike facilities such as bike storage rooms, bike repair centers and large elevators for those who want to take their bicycles up their flats. Bike City is situated right on a large inner-city park, next to a subway station and connected to the city’s cycling network, allowing to reach both the city center and the Danube embankments within just a few minutes. Experiments with car-free or bike-friendly dwellings have been very successful in Vienna. Thus the city is looking into new solutions within the “Smart Cities” concept together with private companies.\(^{58}\)

**Wood in the city** – Vienna is also home to Austria’s largest and tallest wooden housing complex. The seven-story building is made of 2400m^3 of wood, a construction material known for the warmth and comfort it brings to residents, but also for its sustainability. Even though wood is not the most economical construction material (it typically costs 10 to 15% more than alternatives), according to

---

\(^{57}\) KlIP II-Climate Protection Programme – http://www.wien.gv.at/english/environment/klip/case-study-housing.htm

\(^{58}\) http://www.eltis.org/discover/case-studies-bike-city-vienna-austria; ELTIS-The urban mobility observatory
developers and architects, savings can be achieved during the construction process, which is much faster for wood than with other building materials. A major advantage of this kind of construction is the livability it brings to the residents while meeting high environmental standards.\(^5^9\)

**Milan, Italy**

As a signatory to the Covenant of Mayors, the city of Milan voluntarily commits itself to reducing its CO\(_2\) emissions by at least 20% by 2020. Key facts for Milan:

- City population – 1,308,981
- Signed up to the Covenant of Mayors on 18 December 2008
- Baseline year against which commitments are measured is 2005
- CO\(_2\) emission reduction target by 2020 is at least 20% compared to 2005 levels.
- The business as usual scenario for the period 2005-2020 shows an increase of population (9%). This implies an increase of CO\(_2\) emissions by 8.3% according to the same scenario.
- The city of Milan will reduce its direct CO\(_2\) emissions from 4795 ktCO\(_2\) in 2005, to 3,836 ktCO\(_2\) in 2020. A reduction effort of 959 ktCO\(_2\), despite a projected population increase of 9% during the same period.

**Congestion charge for a clean city** - Drivers entering the ‘Cerchia dei Bastioni’ (city center also referred to as ‘Area C’) of Milan with certain categories of vehicles will be required to pay a fee from mid-January 2012 onwards. The revenue collected will finance the city’s sustainable transport facilities.

The objective of this new scheme is to reduce road traffic in the city center by 20 to 30%, reduce CO\(_2\) emissions by 20 to 25% and to use the revenue for improving the public transport network, expanding cycle lanes, pedestrian zones and 30kph zones.

Overall, quality of life will improve with fewer vehicles on the road and controlled parking, less noise and reduced local air pollution.

The congestion charge is part of Milan’s Sustainable Energy Action Plan, an ambitious roadmap charting the city’s progress towards CO\(_2\) emission reductions and adopted as part of its commitment to the Covenant of Mayors. With 76.6% of the vote in favor of the scheme at a local referendum, public acceptance is already secured and will allow inhabitants and visitors to directly benefit from a safer and cleaner city center.

Surveillance cameras have been installed at access points around the city center to detect entering vehicles and transmit the collected data to a computer system which recognizes the vehicles, their classification (residents, duty vehicles, free access vehicles) and the corresponding charge. Residents and duty vehicles are charged reduced fees.

Vehicles exempt from charges include bicycles, scooters, electric cars, vehicles for disabled people, and until 31 December 2012, also hybrid, methane powered, and liquid petroleum gas and biofuel cars.

\(^5^9\) [http://info/en/sightseeing/excursions/vienna/woods; Wood in the city](http://info/en/sightseeing/excursions/vienna/woods)
4.3 Additional Methodologies for local GHG inventories

The following section provides information on the GHG inventory methodologies for local governments, in addition to the SEAP Guidebook. The tools provide two basic approaches for developing a local inventories, which can be used as part of a SEAP process or separately.

1. **The local government operations approach** is for entities that want to understand the GHG emissions of only government facilities and operations (e.g., government buildings and other facilities, streetlights and traffic signals, vehicle fleet). This may be appropriate for government entities interested in promoting green government operations and reducing emissions under their operational control. The Local Government Operations Protocol (below) follows this approach.

2. **The community-wide approach** is for entities that want to understand the GHG emissions of their community as a whole, which can include local government operations. This approach may be more appropriate for entities who want to implement projects to engage the community or adopt a policy to affect change in the community.

Under either approach, local governments may consider partnering with other communities in their region. For local government operations inventories, entities can partner to provide mutual technical assistance and share resources, lessons learned, or best practices. For community inventories, entities can partner to estimate regional GHG emissions. This option can be valuable for small communities that may not have the capacity or resources to conduct inventories independently or that may want to collaborate with other communities on the resulting emissions reduction activities.

The exact process for developing a greenhouse gas GHG inventory for a local government will vary by entity. The following methodologies provide key steps that are likely to be part of any inventory process. However, they are not necessarily intended to be pursued in linear order, and may require multiple iterations, as shown in Figure 5. For example, data collection will occur over time and can influence decisions about other components of the inventory.

**The Local Government Operations Protocol**

The industry standard for local government GHG inventories in the United States is the Local Government Operations Protocol (LGOP), developed in partnership by the California Air Resources Board, the California Climate Action Registry, ICLEI-Local Governments for Sustainability, and The Climate Registry.

The LGOP is a program-neutral GHG inventory protocol that is designed to allow local governments to quantify and report GHG emissions resulting from their operations. It provides guidance on calculation methodologies, emission factors, and other aspects of inventory development.60

---

The Global Protocol for Community-Scale Emissions

The Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) is a joint project by ICLEI-Local Governments for Sustainability (ICLEI), the World Resources Institute (WRI) and C40 Cities Climate Leadership Group (C40), with additional collaboration by the World Bank, UNEP, and UN-Habitat. As a global reporting standard, the GPC enables cities and communities to consistently measure and report GHG emissions and develop climate action plans and low-emission urban development strategies.61

The GPC also underpins the global Compact of Mayors, a leading cooperative effort among cities to reduce GHG emissions, track progress and prepare for the impacts of climate change.62 The Compact has adopted the GPC as part of its core activities to raise the level of ambition and quality of city GHG inventory reporting. Using GPC, cities can report emissions through the Carbonn Climate Registry, the Compact’s designated central repository.

Ex-Ante and Ex-Post Evaluation Tools

ECORegion63

The internet-based tool, ECORegion, enables the calculation of municipal energy and CO₂ inventories. It provides series of energy and CO₂ inventories, for example per energy carrier and per sector. It is suitable both for monitoring the overall CO₂ reduction in a municipality during a certain period and for monitoring progress within a specific sector. The tool provides an inventory that can be used retroactively back to 1990. The following sectors are considered: public facilities, households, private sector and transport. Due to country specific data provided by the tool a first starting inventory can be calculated by entering a limited amount of data.

As the tool is internet based, no software installations are needed. The country specific and comprehensive database for energy, emissions and further environmental factors are updated each year, making the tool easy to handle without oneself having to care about current energy data. The standardized methodology to prepare the energy and CO₂ inventory supports a long-term process

---

62 The Compact of Mayors is a similar, but separate initiative as the EU Covenant of Mayors.
63 http://www.climatealliance.org/co2-monitoring0.0.html
with regular inventory updates, realized by different departments within the municipality and for comparison with other municipalities.

CO₂ reduction targets set in the framework of a CoM target or other individual reduction targets can be inserted as reduction paths against which the current data of the local authority can be compared. The European Commission has officially recognized ECORegion as an efficient tool for the preparation of SEAPs under the CoM.

Clear Path⁶⁴
ClearPath is an advanced web application for energy and emissions management, available only to ICLEI members. The tool contains several modules:

- Inventory Module. There are two types of accounts within Inventory Module of ClearPath: community-scale and government operations.
- Forecasting Module. Users can develop new energy and emissions forecasts scratch or connect directly to the outputs of a completed inventory, and apply custom growth rates, and can account for the impact of actions taken by higher levels of government such as renewable portfolio standards or fuel economy standards.
- Planning Module. This module enables analysis of emissions reductions potential from Climate Action Plan measures. Users still have access to a wide range of reduction measures, but can interactively apply them in a scenario planner to visualize their impact on the emissions forecast in real time.
- Monitoring Module. Local governments monitor and track government operations and community scale implementation measures created in the Planning Module. Users can interpret their data and support a process of continuous improvement in climate performance.

U.S. Environmental Protection Agency Local Greenhouse Gas Inventory Tool⁶⁵
A free, interactive spreadsheet, the tool calculates GHG emissions for many sectors, including residential, commercial, transportation, and waste and water management. It is comprised of two separate modules: one for community-wide inventories, the other for inventories of local government operations only. Users may choose to apply one or both modules.

The tool is pre-programmed with default emission factors and system assumptions needed to calculate emissions or local governments may enter municipality-specific information. The tool is scalable to accommodate different levels of activity data (ranging from city-wide to individual meters) to meet the needs and constraints of different local governments.

Designed to facilitate data collection and compilation, and generating summary reports, the tool is for local governments interested in compiling a relatively quick and simple GHG inventory, and:

- Create an emissions baseline,
- Track emissions trends,

⁶⁴ http://icleiusa.org/clearpath/clearpath-modules/
⁶⁵ http://www3.epa.gov/statelocalclimate/resources/local-GHG-inventory-tool.html
• Assess the relative contributions of emissions sources,
• Communicate with stakeholders,
• Partner with other municipalities to create a regional inventory,
• Develop mitigation strategies and policies, and
• Measure progress toward meeting GHG reduction goals.

Romanian nationwide buildings’ GHG emissions reporting platform

The Romanian nationwide buildings GHG emission reporting platform is online, accessible via a regular browser and will be operated by the Romanian Ministry of Regional Development, and opened to all building administrators (public and private), municipalities, state agencies. It is scalable both in terms of number of entries and further reporting functionalities.

Focusing on energy use in buildings, including all types of residential and commercial structures, the tool provides data for major macroeconomic decision-making, such as:

• Monitoring and evaluation of the energy performance in buildings throughout Romania and across all buildings’ categories, ownership structures, etc.
• Prioritization of public spending (or other sort of incentives) for increasing energy efficiency in buildings, GHG savings, social aid dependency;
• Real-time assessment of the living and working conditions (e.g. heating) for all dwellers/employees in Romania;
• Utilities’ consumption in buildings and, as such, the carbon footprint of each building;
• Energy efficiency measures deployed (with cost and impact on utilities and GHG emissions);
• Various real-time statistics across counties, type of buildings (hospitals, schools, admin buildings, production facilities, etc.).

4.4 Potential financing resources for SEAPs and Emissions Inventories

This section provides examples of possible funding sources for Romanian municipalities who sign onto the CoM.

Support for the development of local GHG inventories and SEAPs

Financing for developing SEAPs and emissions inventories has been delivered through local or international funds, such as the Intelligent Energy for Europe (IIE) and the Financing Mechanism for the European Space (SEE), among others.

The Romanian Municipalities Association (RMA), an implementing organization for CoM, has participated in a successful project (called SEAP-PLUS) that supported the development of two BEIs -- for Ploiesti and Pitesti – as well as a SEAP for Zalau. The RMA also disseminated good practices through an SEAP Guide and the CoM E-learning platform.

66 www.RegistruCladir.ro. At this time, the platform is in the beta-testing stage and is expected to be open for public use, via a dedicated website at the end of 2015.
The ELENA (European Local Energy Assistance) facility serves Local Authorities (LAUs), including municipalities, and helps them develop SEAPs. It has several components: consolidating administrative capacity, hiring experts and preparing bankable projects and investments. LAUs in Romania have not taken advantage of this opportunity so far (http://www.welcom.europe.com/european-funds-energy-assistance-758+658.html#tab-onglet-details).

The LIFE Programme for the Environment and Climate Change 2014-2020 is divided into two sub-programmes: environment and climate action. It will finance pilot projects, good practices and community awareness and information dissemination (http://ec.europa.eu/environment/life/).

The Romanian Environmental Fund Administration (EFA) provides funds to support LAUs. It extends technical assistance for the development of the BEIs and SEAPs. Furthermore, the legislation governing the use of funds by EFA allows for the use of funds for climate change and RES projects (www.afm.ro).

Support for the implementation of SEAP mitigation actions and measures

As noted above, the SEAP is a plan that aims to combat climate change and establish a well-defined target for reducing GHG emissions by 2020. The EU financial framework for the period of 2014-2020 requires that 20% of European Structural and Investment Funds (ESIF) be used for climate change related projects, which can be a good, if not the primary, funding source for mitigation actions established in local SEAPs.

Table 13 provides a summary of the priorities and project categories for relevant Operational Programmes (OPs).

Table 13 Operational Programmes that could support SEAPs

<table>
<thead>
<tr>
<th>Operational Programme (OP)</th>
<th>Priority Axis</th>
<th>Project categories</th>
</tr>
</thead>
</table>
| Regional OP               | 3 – Supporting energy efficiency in public buildings | • energy efficiency in public buildings;  
|                           | 4 – Supporting sustainable Urban Development | • using RES; |
| Large Infrastructure OP   | 6 – Promoting clean energy and energy efficiency in order to support a low carbon economy | • energy efficiency in residential buildings;  
| Technical Assistance OP   | 1 – Strengthening the capacity of beneficiaries to prepare and implement ESIF funded projects and the dissemination of information regarding the funds | • energy efficiency in public lighting;  
|                           |               | • sustainable urban mobility plans;  
|                           |               | • the creation or rehabilitation of biomass and geothermal energy productions capacity; |

Sources: www.fonduri-ue.ro, www.mdrap.ro
Also, the Quick Reference Guide of Financing Opportunities for Local Sustainable Energy 2014-2020\(^67\) suggests funding programmes for implementing SEAP's projects including:

- LIFE-Environment and Climate Action subprogrammes,
- ELENA (Energy Local Energy Assistance),
- CIVITAS-Activity Fund Sustainable Mobility,
- HORIZON 2020 (Call EE 20).

The Quick Reference Guide includes information on types of projects, focus areas, recommended project size, co-funding size, etc.

4.5 Options and considerations for supporting local government actions on climate change

This section provides considerations for the Romanian national government to support Romanian municipalities on the development of emissions inventories and SEAPs (including institutional arrangements). It also addresses a structure for improving information dissemination (e.g. partnership between the Association of municipalities of Romania and MEWF) and the implications for administrative capacity.

**National support for local government climate actions**

To support action at all levels, local authorities that have signed the CoM can be recognized as partners with the national government in the fight against climate change and the Romanian goal of becoming a low carbon economy and reducing its GHG emissions. The municipalities also can be supported in developing the planning documents and in the implementation of the local policies and measures, which can also help increase consistency across municipalities, while still allowing enough flexibility for local initiatives. National-level policies regarding energy efficiency and the use of RES can create an enabling environment that encourages the adoption of the most efficient policies at the municipal level, depending on local conditions and characteristics.

Legislative actions at the national level could help remove barriers faced at the local level, such as by eliminating restrictions on the use of local budgets for long term planning for the SEAP, supporting programmes for increasing climate change knowledge and capacity for using ESIF funds, and improving financing opportunities through European Programmes, such as ELENA and LIFE.

Increased communication, information sharing and collaboration would benefit all parties. One way to facilitate this would be to create an organized discussion and collaboration forum between municipalities, local government associations (e.g., RMA and Energy Cities Romania\(^68\)), and line ministries and national agencies with responsibilities regarding climate change, utilities and energy.

For example, a collaboration structure could be facilitated through the leveraging the existing National Commission for Climate Change (NCCC), which acts as a consulting body for the MEWF. In its current


\(^{68}\) The Romanian Municipalities Association (RMA) and Energy Cities Energy Romania (ECRCER) are two NGOs which act as supporting bodies for CoM by informing and providing technical assistance for awareness raising and increasing the public CC knowledge levels as well as for identifying best energy efficiency and RES practices.
form, the NCCC has a technical group containing representatives from over 30 institutions with fairly broad responsibilities.

A distinct technical group, or subcommittee within the NCCC, may also be helpful, which would be focused on the issues encountered by municipalities specifically in implementing energy efficiency and renewable energy measures. It would make sense if representatives of the other line ministries with direct links to local activities, such as Ministry of Energy, Small and Medium Enterprises and Business Environment (MESMMEsBE) and the public affairs department of the Ministry of Regional Development and Public Administration (MRDPA), also participate within this subcommittee.

An additional option (instead of or in addition to the above) would be to support establishment of Climate Partnerships for Local Authorities Units (CPLAU). The CPLAU could raise awareness of SEAP options and opportunities and help overcome legislative, organizational and financial hurdles faced by local authorities while implementing the SEAPs.

The CPLAU could also provide climate change adaptation support, which is the second pillar of the European climate change policy. The EU Cities Adapt initiative was in fact developed as a platform for dialogue following the adoption of the European Adaptation Strategy. It could be further employed by Romanian LAUs to exchange adaptation knowledge and practices.

To coordinate efforts internally, MEWF could consider establishing a team (a nr. of people) with responsibilities written in the job description regarding climate change policies at the local level. This team could communicate directly with and likely increase the number of localities joining the CoM and/or implementing measures to reduce GHG, address climate change adaptation and to use RES. The team could, for example, hold capacity building workshops for municipalities.

Joining several cities, the CoM, and the support of central authorities, into a team coordinated by MEWF, addressing policies for climate change locally, also can contribute substantially to achieving Romania’s commitments on climate and energy 2020, thus preparing the path for 2030.
5. MRV: Research & Systematic Observation, and Education & Awareness

This section examines the current level of integration of climate change knowledge and awareness into public authorities and research institutions supporting the development of scientific and technical knowledge, as well as the level of overall education and general public awareness on climate change issues. It also assesses the current level of education regarding the necessary of scientific and technical disciplines and awareness of climate change and provides recommendations for improving Romania’s awareness and preparedness for tackling climate change.

While EU regulations do not require explicit reporting on research, development and innovation (RDI) activities to support to climate actions, there are implicit requirements in order to effectively implement EU and UNFCCC guidelines, such as for adaptation evaluation or preparing National Communications. Effectively, the reporting requirements are to provide updated information on research and systematic observation (RSO) as well as on education and public awareness (EA). As precedent, other EU processes require Member States (MS) to ensure that metadata are created for the spatial data sets documenting community environmental policies or activities that may have an impact on the environment (INSPIRE Directive (2007/2/EC)), access to background information used for compliance under community legislation (e.g. GHG inventories under 525/2013/UE, GHG trading scheme under 2003/87/EC) and technical expert background for EU internal negotiation of emerging policies.

The information in this section relies on a review of online documentation made available by the central authorities, i.e. line ministries, and research and higher education institutions. Further information was also collected from direct discussions with researchers, collected in various working groups and workshops organized throughout the project.

5.1 Overview of the integration of climate change into public policy and institutions

Currently, climate change is partially, but inconsistently, integrated into public policy and institutions. Regarding security, climate change does not appear to be explicitly recognized as a national threat. For example, the environment is not represented in the National Council of National Security and ‘climate change’ is not mentioned in any of its reports (http://csat.presidency.ro/). Existing academic studies focused on national security do not yet mention climate change as a threat explicitly, although associated climate change phenomena, such as extreme weather events and flooding, are recognized as becoming more extreme than historical patterns (e.g. Dolghin N, Sarcinschi A and Dinu MS, 2004).

Systematic and coordinated research and education on climate change and adaptation (CC&A) seem to be still at an early stage in Romania. Currently, CC&A does not appear to be consistently prioritized on research agendas of research institutions or universities nor for relevant RDI at the national ministry level. Although, there is an existing foundation, as there are relevant activities relating to systematic nature observations and research as well as a good participation of Romanian institutions in international projects on such matters.

So far, there has been insufficient connection between research entities and implementing organizations (authorities, national or local public, private) on climate change issues, which limits the contribution of the research that is already happening to public policies increasing the preparedness of Romania to address anticipated climate change challenges.
5.2 Existing Institutional Approach

Romania has a public policy on research, development and innovation which is implemented in cycles mirroring European policy cycles. The current cycle covers 2014-2020, matching the European Union’s (EU) Jobs and Growth Strategy for 2020, which is operationalized through EU instruments. The *Strategy for Research, Development and Innovation 2014-2020* (SNCDI 2020) is implemented mainly through two specific type of instruments:

- National Plan for Research, Development and Innovation 2014-2020 (PNCDI3), and
- Priority Axis on Research, Technological Development and Innovation to support business and competitiveness, included under other public policies related to other sectors (e.g. fiscal incentives, educational programmes):
  - POR (Regional Operational Programme),
  - POS-CU (Operational Programme on Human Capital),
  - POD-CA (Development of Administrative Capacity),
  - PNDR (National Programme of Rural Development).

The National research and innovation policy is coordinated by the National Council for Science Policy, Technology and Innovation (CNPSTI). The council is directly subordinate to the Prime Minister and includes representatives of ministries (e.g. Education, Environment, Energy, etc.). Its main task is to facilitate and ensure mainstreaming of RDI within country’s development strategies, to coordinate RDI strategic planning, and to ensure coordination of innovation policy by the relevant sectoral policy entities. CNPSTI prepares for launching the future policy cycles, including the facilitation of approval of the strategic planning. CNPSTI is supported by the Center for Public Policies for RDI, which provides expert input and analysis through various consultative bodies and committees.

Funding to support RDI usually comes from public rather than private sources. Total public expenditure on research and innovation reached 0.48% of the GDP of which 80% were public investments according to the National Institute of Statistics, although there is an official target of 2% in 2020 to be equally shared between public and private funding. Currently, Romania allocates the smallest percentage of GDP across EU for RDI activities.

Regarding climate change and adaptation specifically, the Romanian Strategy for Research, Development and Innovation for 2014-2020 establishes a direction of action including specialization in several priority areas relevant for CC&A: bio-economy, energy efficiency, environment and climate change, health, space and security. Yet, “climate change” research as such is not highlighted as a priority. Operationalization of the RDI strategy may bring more focus on this issue over time.

The National Climate Change Strategy (NCCS) and its associated National Action Plan for Climate Change, which are in an advanced finalizing phase, highlight research and technological needs for mitigation and enhanced resilience through adaptation for all economy sectors (e.g. transport, agriculture, land use) and communities, which will need to be integrated with and leverage existing institutions.
Government institutions with responsibilities relevant for CC&A issues

This section lists several Romanian ministries with direct responsibilities for, or with topics relevant to RDI and/or climate change and adaptation issues.

**Ministry of Education and Research (MER)** coordinates and organizes the national education, research and technological development and innovation activities, and is in charge of implementation of the national strategy for RDI. MER is entitled to implement strategic activities by delegation of activities to specific agencies. Research activity is achieved through coordinated networks (e.g. Romanian Academy, sectoral academies); units of public or private research (as branches of public or private organizations) and research dedicated organizations. Institutional responsibility for monitoring and evaluation of the latest RDI strategy for 2014-2020 is with MER.

**Ministry of Environment, Waters and Forest (MEWF)**, itself or through the Environmental Fund coordinates and financially supports policy implementation-related research, applied research on environmental risks management, as well as climate-related and sustainable adaptation planning. MEWF coordinates the activity of national, regional and local agencies for environmental protection, which are in charge of implementation of environment policy within their respective jurisdictions.

**Minister of Energy, Small and Medium–Size Enterprises, and the Business Environment (MEIMM)** and **Ministry of Economy, Trade and Tourism (MININD)** are in charge of sustainable industrial development, promotion of measures to increase energy efficiency, use of renewable sources and energy supply security. The Environment Protection Department has specific functions related to emissions transactions and GHG reduction (i.e. Carbon Capture and Storage) and sectoral research agenda.

**Ministry of Agriculture and Rural Development (MADR)** is in charge of policies related to the agriculture and food industry, rural development and land reclamation/improvement. Scientific activities related to such objectives is well defined, linking directly central authority departments to subordinated research institutions (e.g. Academy of Agricultural and Forestry Sciences - ASAS) and to other research institutions. Innovation and research is key in the functioning of this Ministry. It also has a unit in charge of mainstreaming climate change issues in all development processes and proposes assessments or research on specific topics. Climate change concerns are taken into account in all programmes and approaches of this ministry.

**Ministry of Transport (MT)** is the state authority addressing roads, railroads, aviation, naval and maritime transport and related infrastructure policy and regulation, as well as implementation (by dedicated technical bodies). It may order studies related to its policy making and is involved in monitoring of traffic parameters (e.g. on Danube and river navigability or road transport, airport traffic) and regulation of standards for safe and environmentally-friendly transport.

**State-owned national companies or national-level administration** of important natural resources or infrastructures (e.g. National Forest Administration-Romsilva, Administration of Maritime Ports Administration Constanta, and Administration of Navigable Channels) may implement their own research programmes in order to fulfill their mandate. Most are represented directly in the National Commission for Climate Change.

**Regional and local, decentralized administrations** do not have obligations to implement or develop research programmes, but can utilize and/or participate in research partnerships. In Romania, regional or local administrations (as well as public companies and the private sector) do not perform research
or observation on climate change issues regularly, unless they are involved in specific projects. There is no specific assessment of the actual economic effect of their participation as partners in research programmes. Lately, there has been an increasing trend for innovation and technology development toward increased competitiveness at the regional level implemented through the Agencies for Regional Development, e.g. innovation clusters supported by EU regional funding.

Few Romanian NGOs (e.g. Federation Climate Action Network Romania) focus on CC&A related research, instead they usually focus on community awareness activities and helping local authorities develop and implement programmes to reduce GHG emissions.

Scientific Research Institutions relevant for climate change issues

The research agenda pursued by Romanian RDI institutions is focused on historical themes and dominated by observational sectoral studies; clear CC&A components and related socio-economic studies are rarely identifiable in the online information. Yet, relevant information for CC&A seems to be available through existing research (e.g. observation of nature and data processing, experimentation, modeling) and systematic observation.

Based on international literature and UNFCCC requirements, research related to climate change issues can be split in three domains:

- Understanding natural processes (e.g. atmospheric processes and trends of climate at global and regional scale),
- Emission reductions, mitigation actions and transformation to a low-carbon society, bio-economy and green growth, and
- Adaptation to residual climate change.

Systematic observations are usually implemented by monitoring programmes of publicly-financed research institutions. Monitoring includes long term assessments of natural parameters collected in national coverage networks (see table of 36 institutions or umbrella organizations and their RSO activities in Annex 2).

There are few reports from these research institutions available online (e.g. from the National Meteorological Administration, http://www.meteoromania.ro/anm/). Yet, in a good example of promoting sustainability and information exchange, the National Center for Monitoring Risk in the Community Environment, which is subordinated to National Institute of Public Health, prepares an annual report entitled, "Impacts of climate change on human health." It also maintains a database of annual information sheets for each county. These outputs are part of a larger report called the "Report on health and environment"69. As discussed below, increased sharing scientific reports on related topics can help improve public understanding and perceptions of climate change impacts.

Assessment of climate change objectives in government and research institutions

Most of the central authorities, e.g. ministries, have departments explicitly dealing with climate change, while research institutions (i.e. research institutes, universities) typically do not. Also, there is limited infrastructure in Romania specifically addressing climate change research; there is no integrated regional or European institute or facility recognized at international level. For national

69 For example, one is available at: http://www.insp.gov.ro/cnmrmc/images/rapoarte/Raport-SM-2013.pdf.
strategies that address scientific activity, there is limited information if and how research objectives were reached and how results are to be utilized.

Increasing public funding mechanisms and/or stimulating private co-funding for science explicitly addressing CC&A would increase related outputs, and would be particularly valuable when combined with increased information sharing.

For example, increasing the transparency of online information on CC&A topics in annual reports of the research institutions will make it easier to assess actual capacity available. Currently, it is not possible to obtain the number or percentage of researchers involved, or the number or scope of projects annually contracted on related fields.

**Climate change in the national research programmes.** Research agendas addressing climate change or adaptation specifically have been limited to date; relevant subjects represent a small part of the observation and research effort. Increased research activities addressing climate change impacts and adaptation of social, public health and urban and rural community sustainable development pathways will be particularly valuable going forward.

**Climate change in the EU research cooperation.** The main driver for climate change research in Romania so far has been through cooperation in EU programmes. As good practice examples, Romanian institutions are partners in numerous research projects under the EU 7th Framework Programme, and actively participated in European Cooperation in Science and Technology program (COST) actions as well as in other European Programmes addressing climate issues (e.g. the South Eastern European Transnational Cooperation).

**Romanian participation in international research on climate change.** Also representing good practices, Romania is involved through various research institutions and projects in international scientific cooperation within the framework of Earth Science Systems Partnership (ESSP); the International Geosphere-Biosphere Programme (IGBP), the World Climate Research Programme (WCRP); the International Human Dimensions Project (IHDP) and the International Biodiversity Programme (DIVERSITAS). Romanian scientists are also contributing to the work of the Intergovernmental Panel on Climate Change (IPCC), as authors or reviewers in both assessments and methodological reports.

5.3 Options and Recommendations for Research and Systematic Observation

The current picture is defined by numerous RDI institutions engaged in potentially relevant activities, but only inconsistently addressing CC&A-related research specifically at an institutional level. This section highlights several suggestions on how the relevant research outputs can be further targeted in order to reach a broader audience (e.g. relevant policy makers, economic actors or the general public) in the future.

**Communication within and among research institutions improvements**

- Central authorities can consider taking a proactive role in regards to CC&A research needs and help update the research agenda of RDI institutions according to international developments and national needs on CC&A: for example, the government could call for a focus on GHG mitigation research for all economic sectors, developing regional projections on climate impacts, and innovation on adaptation technologies as
well as a deeper understanding of the adaptation needs by requesting risk and vulnerability assessments, and solutions to improve or maintain living standards of concerned communities.

- **Evolve away from a traditional sectoral focus by stimulating cross-sectoral and interdisciplinary research in inter-institutional settings.** Such interdisciplinary approaches would facilitate win-win solutions by minimizing trade-offs among relevant economy sectors and activities. Multi-institutional and multi-stakeholder approaches to CC&A research would also minimize duplication of efforts amongst RDI institutions resulting in a more efficient use of funds. This can be pared with strategies to provide more open access to data, such as through development and maintenance of databases by the relevant research institutions in order to stimulate inter-sectoral use of data. More in-depth analysis of data is also needed to better understand its implications.

- **Through outreach programmes, RDI institutions can help ensure that a critical mass of scientists and professionals are aware of and involved in how CC&A issues relate to their own research subject, and are informed about global controversies (e.g. IPCC report vs. climate skeptics), as well as the technical implications of global negotiations on climate change and commitments.**

- Efforts would be further supported by broader and more proactive information sharing, such as where researchers and scientists transparently share results as well as the uncertainty of estimates/approaches/conclusions/solutions to relevant stakeholders, so they can contribute to CC&A processes and decisions. A fair amount of climate change related data involves quantitative estimates for which uncertainty can be derived by statistical means, e.g. estimates of emissions or emission reductions of various GHGs over time. Data that is more qualitative in nature will require different approaches on e.g. adaptation.

- RDI institutions could publish more of their outputs online with short summaries for potential user groups, and also to organize or participate in regular public outreach activities. It would be particularly valuable to increase RDI institution engagement with the National Commission for Climate Change (NCCC).

**Coordination of RDI activity with CC&A policy making**

- **Having central authorities and RDI institutions explicitly recognize climate change and climate adaptation as national security risk would increase the profile, leading to increased integration into research agendas.** Extreme weather-related events appear to be communicated as isolated events, rather than as a part of anthropogenic global climate change. CC&A research on the impact to Romania’s economy or on social and human community aspects would then increase. The national government could also stimulate such knowledge by developing dedicated CC&A research programmes.

- Professionals and technical can be encouraged to become more involved in developing independent scientific and technical evidence in support of policy making. These efforts could be coordinated through bodies like the NCCC.
In addition to government efforts, researchers could be further encouraged to facilitate use of scientific data in policy making. If research institutions would develop sharable databases and integrated frameworks for modeling to support projections for the understanding of medium and longer terms CC&A challenges this would better support CC&A-related policy making needs. Formal protocols for research and scientific contribution could be operationalized through specialized technical groups subordinated to NCCC.

**Communication with business community for implementation of CC&A research in economy**

- To stimulate increased CC&A awareness, related research activities, and incorporation into policy making, the Romanian Government, could consider an annual consultation process with relevant stakeholders, for example via MEWF and NCCC, targeting the business community and or community organizations. The relevant central authorities could also be encouraged to establish mechanisms to stimulate direct utilization of CC&A research by each of the economic sectors, including by small and medium enterprises (SMEs) and start-ups, as relevant. To optimize efficiency, central authorities could also consider regularly assessing the impacts of joint participation in CC&A research projects.

- For topics not sufficiently covered in public institutions, central authorities may wish to consider implementing strategies to stimulate RDI through public-private partnerships on CC&A issues, such as by providing funding or other incentives for knowledge and technology transfer, demonstration projects and testing of new and innovative technologies.

- The more the relevant research outputs including results, conclusions, recommendations and good practice guidelines resulting from public research projects can be made publically available, particularly at the regional level, the more likely it will be integrated into decision making. To facilitate this, central authorities can encourage decentralized initiatives, promote increased cooperation at regional or local, e.g. urban level, among the research community and civil society, and other economic actors. This would potentially include increasing the awareness of the research by promoting it directly to interested parties, e.g. industry, farmers, population, etc. The Regional Environmental Protection Agencies (REAPs) or other appropriate regional or national institution would be well-positioned to facilitate local outreach, and could be also in charge of information exchange, such by operating a web page clearing house, organizing stakeholder meetings, product demonstrations, etc.

**Communication of RDI results to citizens**

- To increase public awareness, RDI institutions could be enlisted to help communicate environmental principles and risks from global climate change for Romania, such as by publicizing quantitative and qualitative information on emissions and other environmental costs and timetables for impacts, ‘what if’ scenarios and strategies for action. RDI institutions can directly increase public awareness by ensuring highlights from their research outputs are regularly shared with the general public, such as through
broadcast and print media, websites, trainings, public visit days to scientific institutions, and public conferences. To optimize effectiveness, messages should be informative, address any uncertainties and be appropriately tailored to the targeted groups, taking into account the anticipated education level and general familiarity with the topics presented.

- MEWF, via NCCC, could also consider regularly, e.g. annually, preparing a public report synthesizing the latest information, highlighting contributions from Romanian institutions on climate change issues as part of a broader information dissemination strategy.

**Development of climate change RDI actions**

MEWF is the main entity responsible for the design and implementation of climate change policy nationally, including mitigation and adaptation, although other public and private entities have important roles. Thus MEWF is best positioned to identify ways to help ensure CC&A issues are included on agenda of all central and research institutions or educational curricula, and to facilitate incorporating research results into CC&A decision making. Similarly positioned agencies have found it helpful to draft a CC&A vision with clear steps, which is then implemented in a sustained way. To achieve this, MEWF could involve NCCC more significantly, while using GHG inventory information (e.g. highlighting the most important GHG sources within Romania), as the foundation for identifying national needs on CC&A RDI activity. Options for MEWF to further stimulate RDI actions relating to CC&A include:

- **Option 1** – MEWF acts independently, taking leadership to identify issues and directly obtains expertise from other entities as needed, for example MEWF could organize scoping discussions through meetings or workshops with the technical expert groups of NCCC. This path assumes that NCCC is fully functional, such as through fluid information sharing at regular meetings with rich participation. MEWF could also issue tenders to obtain more information on points of concern, assuming there is sufficient time and financial resources for a tendering procedure.

  It is important to ensure information circulates both ways, from scientists to policy makers and vice versa. This appears to be a good solution to obtain the appropriate expertise on any particular issue. MEWF would need sufficient technical capacity to identify the relevant issues (supported by NCCC) and to manage input from consultants, e.g. to assess its quality or to understand cost-effectiveness as well as mitigation and adaptation potential of the RDI proposals. As analytical outputs become available, MEWF could proactively share such knowledge and/or establish mechanisms to reach the most interested parties, as discussed above.

- **Option 2** – MEWF relies on institutional arrangements, as defined in national legislation, to identify issues and obtain needed scientific and technical input for reporting obligations implementation or to stimulate research. Central or public institutions, e.g. ministries and research institutions, may or may not be mandatorily involved, increasing the risk that a particular expertise may not be easily reached (e.g. if expertise is within the private sector). The relevant public institutions would need to ensure and maintain adequate capacity and knowledge on sectoral climate change issues within their institutional mandate. Individual
institutions would be responsible for publicizing and sharing information, whereas MEWF would only monitor the transfer of results to interested parties.

A combination of above options is also possible: for example, Option 1 may be a better fit for academic subjects, including projections and economic analysis, while Option 2 may work better for technological development.

Specifically, in developing such a system it is helpful to consider the following issues:

- **The MEWF Public Policy Unit could facilitate the process of ensuring that CC&A RDI questions are addressed by all national and sectoral policies, strategies and action plans, as appropriate.** The development of objectives for the different components would be most effective when coordinated and also integrated with the national and sectoral RDI priorities defined by NCCC technical expert groups. A good way to operationalized this is through NCCC technical groups, such as by using multi-year themes to be addressed in meeting agendas and regularly scheduled outputs that are reviewed by the MEWF and other central authorities, and include mechanisms for NCCC to provide feedback on the implementation of actions plan and strategies. Also, NCCC technical groups could review regularly CC&A-related reports produced under public tenders. Also, the MEWF can also leverage the NCCC to facilitate increased awareness of senior ministry and agency officials regarding CC&A RDI needs, as this will also help minimize duplication of public spending by different central authorities.

- **MEWF may consider increasing the use scientific and technical analysis as the foundation for national policy making on CC&A, this could include disaggregating GHG emissions projections, major emission sources, or adaptation needs to the sub-national/regional level, impact assessments using ex-ante and ex-post estimates of GHG emission reductions from new policies and measures, optimization of national as well as decentralized institutional efforts for GHG mitigation and adaptation activities, etc.** This would facilitate a more proactive strategy with long-term planning for CC&A. This, in turn, can promote paradigm shifts away from isolated studies of environmental change to more holistic approaches that more deeply address economic and societal dimensions, facilitating development of a low carbon economy and adaptation to climate change. In addition, this would further facilitate RDI efforts in the public and private sectors as well as national economic development toward low carbon pathways. RDI coordination, such as through NCCC technical groups, can also facilitate multidisciplinary analysis and more holistic perspectives.

- **MEWF may find it useful to regularly assess the existing technical expertise and capacity needs to support Romania’s international negotiations as a Party to the UNFCCC as well as within the EU as a Member state.** This expertise could be coordinated via technical groups of NCCC, ensuring coverage of the major GHG-emitting sectors. Techniques for the MEWF and/or NCCC to enhance capacity include improved communication, focused meetings or workshops, open participation meetings (that include expert non-members e.g. with peer-reviewed published papers on relevant topics) and MEWF staff and NCCC technical group members’ active participation in international scientific and technical meetings.
MEWF coordination with other relevant central authorities will help ensure availability of robust and accurate information on climate risks and vulnerability for each of the geographic zones, communities and economic activities at the national and regional scale in Romania. These assessments require substantial scientific capacities and technical skills. Re-assessment, approximately every 5 years, is recommended as the conditions as well as the scientific measurement techniques evolve.

MEWF could consider, in coordination with other central authorities, initiating a national RDI programme to support climate change and adaptation research. Such a work programme could be developed by NCCC technical groups and subject to inter-ministerial approval and implementation (for example, through an annual research plan for each ministry). This programme could, for example, include targeted research on highest priority needs identified for Romania, such as major CC&A themes already being discussed: smart cities, low carbon footprint for food supply, water supply management, emigration and immigration, adaptation and resilient energy supply. The research needs could be further prioritized based on sector-specific objectives, e.g. each sectors’ most significant sources and sinks contribution to national GHG inventory, GHG emissions reduction potential, anticipated sectoral trends, benefit-cost analysis, adaptation potential, as well as addressing environmental and social risks. Relevant central authorities could have open tendering procedures for the necessary technical studies and applied research. As discussed above, MEWF may also wish to consider organizing high level information exchange to ensure the national CC&A research agenda is sufficiently captured by the subordinated research institutions.

MEWF may wish to perform regular independent assessments of the level of institutional CC&A-related RDI support in Romania. The current approach consists of a large number of research institutions and other groups engaged in independent RDI activities that inadequately address CC&A policy making needs. Increasing coordination will reduce the risk of overlaps or redundant public spending. Several other countries have established dedicated public institutions to address this issue (e.g. CzechGlobe in Czech Republic at www.czechglobe.cz, PIK in Germany - https://www.pik-potsdam.de). MEWF could consider the most appropriate mechanism, such as whether enhancing the current approach (resembling a virtual national research network) leveraging the NCCC is more appropriate for Romania than, for example, a new dedicated national CC&A RDI center. Yet, such a national center could offer integrated interdisciplinary solutions for sectoral challenges and continuous input to policy making.

5.4 Education and Citizen Awareness on Climate Change Issues

This section provides an assessment of the overall awareness of Romanian citizens on CC&A topics, as well as the prevalence of CC&A topics in formal education at all levels. It also includes recommendations on how to further increase this awareness.

CC&A topics in formal education

In the Romanian society, there generally is a favorable attitude toward education at any age, as well as substantial support for advanced and multilateral education for the younger generations. In
Romania, education is highly institutionalized, structured and regulated. Formal education includes mandated education which covers the period before adulthood as well as optional continuous long-life education and training to enhance skills for career advancement and professional development. In recent decades, there have been increasing requests from citizens as well as increasing services from private institutions or NGOs offering more informal education options for those looking for complementary personal development.

Education plays a crucial role in the sustainable development of any country. The education system can be considered successful facilitating sustainable development if sustainability principles are shared by its citizens as well as its professionals in any field.

In Romania, environmental issues are addressed in the curricula from kindergarten, to secondary school to university as summarized below.

Primary and secondary school
Education regarding the natural environment already starts in primary school through regular learning activities, such as by observing different natural phenomena. The core of environmental education is incorporated into the secondary school curricula, when the progressive levels seek to ensure a gradual deepening in understanding of the environment and sustainability principles through dedicated lessons and activities.

University
At the university level, general ecology, environment or development subjects are offered, yet they are often optional. A university curricula occasionally contains CC&A topics as its own discipline either for undergraduate or graduate students. Instead, CC&A themes are captured within related disciplines. However, it is not clear which messages or at what level of detail CC&A themes are transmitted.

Doctoral and Post-doctoral level
Scientific subjects for doctoral and post-doc programmes in Romania mostly address research on the physical basis for climate change (e.g. physics) as well as addressing various risks and climate vulnerability. Yet, some specific GHG mitigation and adaptation topics, including solutions are only addressed in a limited way, if at all. Doctoral theses addressing technological innovation focus on specific technical aspects (such as for energy efficient equipment). Over time, more focus on GHG mitigation benefits and quantitative and quantitative analysis addressing CC&A issues is needed.

Overall assessment of CC&A-related education
In summary, although inconsistent across universities, current CC&A subjects include:

- Legal: international, such as from the EU and UNFCCC, processes and the necessity of understanding the legal implications and national transpositions required;
- Technology development and engineering: energy efficiency, alternative energy, renewable energy supply technologies;
- Economics: shifts in supply of and demand for resources, costs, opportunities, economic losses;
• Social sciences: behavioral change, emigration and immigration, rural versus urban development trends;

• Sustainable development and use of natural resources: sustainable agriculture, environmental risk and mitigation, emission reductions from waste recovery and reuse, impacts of energy use from different supply sources and new technologies to address environmental and atmospheric GHG balance, eco-development, agro-ecology, water availability;

• GHG methodological development: techniques of measurement of emissions.

Universities appear to focus on offering one-time, short-term, and ad-hoc or project related, training courses on climate change (especially within the framework of EU programmes). Such trainings may be effective for working professionals seeking to update their knowledge, however more structural adjustments with a coherent climate change track will further help ensuring students’ overall preparedness for this need in the workforce.

CC&A topics in informal education and citizen awareness

According to EU Eurobarometer 372\textsuperscript{70} the Romanian population generally appears to show little concern with regard to climate change risks relative to other MS. For example, less than 17% of Romanians reported having the perception that climate change is a serious global threat. The same EU Eurobarometer study indicates that Romanians are the least likely of any EU MS’ citizens to report having taken any recent personal action on climate change. It is also shown as an uneven knowledge within society: much less known in rural than in urban areas and, more known by youth than older generations.

To increase citizen awareness, authorities can hold public events focusing on climate change knowledge dissemination with clear messages and promoting significant citizen participation, as discussed below.

It appears that NGOs can usually be quite effective in delivering awareness and education to citizens on climate change mitigation issues and promoting climate actions, such as energy efficiency, afforestation, recycling and waste management (e.g. leaflet Fenomenul schimbarilor climatice- ghid introductiv of ‘Terra Mileniul III’ Foundation, at “Fenomenul schimbarilor climatice- ghid introductiv’ of ‘Terra Mileniul III’ Foundation, at www.terramileniultrei.ro; recycling actions of Viitor Plus at www.viitorplus.ro; and Coalitia pentru Mediu at www.coalitiapentrumediu.ro). They can be a good resource for public institutions to leverage in any awareness campaign.

5.5 Options and Recommendations for education and awareness

Central authorities may wish to consider methods to ensure appropriate training of teachers, professors and public clerks at all levels, and to inform the general public as well as to enrich CC&A-related topics in school curricula at all levels.

\textsuperscript{70} http://ec.europa.eu/public_opinion/archives/ebs/ebs_372_en.pdf
Recommendations on ways to improve formal and non-formal education and awareness

The following parallel steps would help to facilitate more deeply integrating climate change issues into formal education at all levels:

- **MER in cooperation with MEWF, could consider organizing and supporting systematic learning programmes for teachers and educators.** This would help ensure that teachers fully understand the topics and can effectively integrate them into curricula for their students (see below). Training programmes would be most helpful when focused on providing teachers with sufficient details regarding the relevant background information, such as addressing atmospheric changes, warming trends, extreme events frequency, and not only rely on transmitting simple messages. Public educational institutions can also encourage development of educational programmes facilitating mobility or e-learning for students and teachers.\(^1\)

- **MER may wish to initiate efforts to more deeply integrate CC&A topics into school curricula according to the level of education.** The relevant topics can be offered as separate courses or more explicitly included in regular curricula of existing courses. Coursework should be progressive in complexity, and linked with economic and societal issues, to provide more comprehensive understanding of sustainable development concepts over time. An expert assessment could be conducted to determine the most appropriate organization and staging of CC&A-related curricula, so it is tailored to the grade-level as well as individual school characteristics. Standardized content and messaging for various grade-levels could even be subject to debate coordinated by the MER or their delegate, and national standards could be also developed, leveraging international good practices regarding climate change learning.

**Training programmes can engage working professionals and other adults, as part of the continuous lifelong learning concept already present in formal and informal education.** This programme could potentially primarily target public employees from national, regional and local administrations, as they already are involved in CC&A-related decision making now, as this would facilitate more informed decision making that more deeply incorporates CC&A challenges and opportunities. Such programmes can be supported by EU funds.

**MEWF could consider developing public programmes targeted at educating the general population on what is needed to manage and adapt to the effects of climate change and accept changes in living standards or usual practices.** The most useful programmes would be culturally-relevant and tailored according to content needs as well as the anticipated education levels of the audience. Public authorities could seek the most appropriate channels for continuous communication to the citizens, this may include linking to religious activities and local leaders, and taking advantage of any opportunity to promote awareness of climate change (e.g. local fairs or public conferences with sessions on climate change organized by schools, associations and/or civil organizations).

**To improve the visibility of its existing CC&A activities amongst other central and regional authorities, research and education institutions and the general population, MEWF could further facilitate sharing more information on GHG inventories and trends, outcomes of international UNFCCC and EU**

---

\(^1\) See for example, the US National Oceanic and Atmospheric Administration’s (NOAA) literacy and professional opportunity for teachers: [http://oceanservice.noaa.gov/education/literacy.html](http://oceanservice.noaa.gov/education/literacy.html)
negotiations, as well as future projections and changes expected due to anticipated local temperature increases and shifts in precipitation patterns.

At the local level, teachers could be tapped for a more significant role in communication of information to the general population. They can help stakeholders engage with and better understand the information communicated, such as by providing additional context and examples of what other people and communities are doing to address CC&A. Local authorities may wish to conduct assessments within their jurisdiction to determine the education needs of the most vulnerable, where the most significant local impacts are anticipated as well as those in the best position to act, these groups would be expected to include the private sector and farmers, socially marginal groups. The local awareness programmes could then be tailored as necessary to address the assessments’ findings.

MEWF can coordinate with the other central authorities and institutions represented in NCCC to ensure that all reports/documentation prepared from public funding are publicly available, e.g. online, and contain a summary geared toward the general public. MEWF, through NCCC and possibly with public consultation, may wish to explore the usefulness of a separate CC&A knowledge management website open to the public.

Central and local authorities can also support their employees in taking courses on CC&A themes, and these authorities can be encouraged to take advantage of local NGOs with more advanced experience of awareness raising in the general population.

5.6 Analyzing options for improved RDI & EA inputs in the National Communications

As discussed in Section 2, Romania, as a Party to UNFCCC, has to develop, regularly update, publish and submit a National Communication (NC) to UNFCCC every four years, and as a MS of the EU has to provide a copy to European Commission (according to 525/2013/UE). The two submissions have to be fully consistent (i.e. EU reports only EU coordinated actions, strictly MS national information may not be included under EU submission). Above all, MEWF is responsible to provide transparent reporting, and ensure consistency checks of information included in such reporting is conducted with other published data (by line ministries, EU institutions) as well as the EU submission to UNFCCC.

In preparing previous submissions, the MEWF has encountered difficulties in collecting adequate and timely data and information for a complete submission of Romania’s efforts regarding research, development and innovation (RDI) as well as education and awareness (EA).

As discussed in other Section 5 subsections, collection of data on RDI and EA can be hampered by the fact that research institutes do not necessarily provide updated information online on their CC&A related projects and that CC&A is not necessarily separately delineated in national research priorities. Another structural challenge results from the fact that data collection addressing RDI and EA is not currently included in national systems supporting climate change policy (e.g. national system under Kyoto Protocol, or national system for policies and measures, and projections), thus it needs an individualized approach.

It is not clear how other Annex I Parties to UNFCCC collect RDI and EA information, i.e. if they have in place systematic approaches or act on an ad-hoc basis as well. What can be noted in other NC submissions is a harmonized format for reporting information (e.g. structured on international, national and sectorial initiatives, and on economic sectors).
Within this context, we have analyzed three options MEWF could consider for possible improvements in data collection and reporting for RDI and EA in the NC (see Table 14). The key differences between the three options are defined in terms of MEWF effort needed (e.g. lowest effort with Option 1), as well as the advantages and disadvantages for CC national processes (e.g. costs, risk of incomplete information, providing CC Fora for Romanian scientific community). The main feature of all of these options is the suggestion for more staff with higher levels of expertise within MEWF on these topics. The second feature may be that none of these options is prescriptive as such and combinations can be explored, and may even be more appropriate (e.g. for a difficult sector, Option 1 may work better, i.e. where information is more within private sector). For optimal results, the approach for RDI and EA should be adapted to existing circumstances at the moment of data collection as needed, e.g. using the best solution for available funds and institutional arrangements.

Table 14 Options of MEWF for data collection and compilation on research and systematic observations, education and awareness for preparation of the National Communication

<table>
<thead>
<tr>
<th>Analysis criteria</th>
<th>Option 1: employ a consultant</th>
<th>Option 2: organize an “information collection workshop”</th>
<th>Option 3 – support an active National Commission for Climate Change (NCCC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEWF effort</td>
<td>MEWF prepares terms of reference according to requirements (including the latest guidelines, methodologies and formats agreed upon by the COP or EU) and hires a consultant; MEWF needs appropriate expertise and professionally adequate staff to check the final draft report; Activity to be organized every four years.</td>
<td>MEWF must have adequate personnel to prepare for the workshop(s), including preparing the agendas, finding appropriate moderators and the lists of participants. MEWF also secures funding for workshop. It also requires MEWF to have appropriately experienced and sufficient staff to collect relevant information and to process data collected and then develop the final report; Questionnaire developed and activity to be organized every four years.</td>
<td>MEWF ensures an active NCCC whose members are all informed of NC requirements; Technical expertise resides with NCCC members, who then need to provide direct input into a template prepared by the MEWF; MEWF still needs adequate and experienced MEWF staff to collect relevant information and to process data collected and to develop the final report; Template developed and activity to be organized every four years.</td>
</tr>
<tr>
<td>Advantages</td>
<td>Respect the deadlines for EU and UNFCCC submissions; MEWF personnel can focus on other policy or reporting matters;</td>
<td>MEWF may collect information by a precise questionnaire required of all participants; MEWF and scientific community get adequate understanding of each other needs and status; Participants may be present in either individual capacity as independent experts or</td>
<td>Debate within NCCC would help ensure a trans-sectorial background of decisions, especially if more in-depth actions is needed for data collection; NCCC could advise on more in-depth actions in order to collect needed data and information (e.g. questionnaires, set-up a web-</td>
</tr>
<tr>
<td>Analysis criteria</td>
<td>Option 1: employ a consultant</td>
<td>Option 2: organize an “information collection workshop”</td>
<td>Option 3 – support an active National Commission for Climate Change (NCCC)</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
</tbody>
</table>
|                   | institutional representative;  | Workshop would act as a forum for capacity building and awareness on CC&A issues, foster partnerships, frame signals to policy makers; Very inclusive range of stakeholders, if workshop(s) has/have adequate publicity including private sector | based tool for data collection, or hold workshops);  
Agenda of NCCC may regularly include issues related to research & systematic observation and education & awareness  
Final draft may be reviewed by NCCC;  
Due to the institutional representation in the NCCC, it may result in a better integration of RDI in overall implementation of institutions agenda and national implementation of CC policy and obligations;  
NCCC is a forum for its members to provide and increase their own knowledge and understand issues faced in other sectors;  
MEWF has very good understanding of how CC&A-related research and observation evolve;  
Option provides complete and non-biased information covering all economy sectors. |

| Disadvantages | MEWF may not have full understanding of the research and systematic observation or education and awareness issues, since the final report is prepared by the consultant;  
Potential lack of continuous assessment at national level if data collection is sporadic (between successive NCs); | Significant effort for MEWF staff for the workshop(s) preparation;  
Possibly high costs (unless participant costs are encouraged to be covered from own sources, especially for publically financed projects);  
Possible need for parallel workshops on sectoral issues whose organization may require support from NCCC or deeper advance consultations among experts;  
Need for strong moderators and specialized personnel in collecting information; | This approach may have biased output related to weak participation of institutions/institution representatives in NCCC activity or missing non-represented institutions (e.g. universities, private sector research);  
Individual effort required to NCCC members;  
MEWF personnel still has to process data collected from template and produce final report; |
<table>
<thead>
<tr>
<th>Analysis criteria</th>
<th>Option 1: employ a consultant</th>
<th>Option 2: organize an “information collection workshop”</th>
<th>Option 3 – support an active National Commission for Climate Change (NCCC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>May be difficult for MEWF to confirm information provided by the consultant; It may be difficult to keep the consultant available in the process of UNFCCC review of the submission; Time consumed by preparing and issuing tenders; MEWF puts low effort to review final report.</td>
<td>Risk of collecting qualitatively inadequate and biased information (e.g. because of missing participants from some sectors); MEWF personnel still has to process data collected and produce final report.</td>
<td></td>
</tr>
</tbody>
</table>
6. Concluding Remarks

The National Strategy on Climate Change and Low Carbon Green Growth and the CC Action Plan (LCGGP) must aim to for practical yet effective M&E and Reporting activities, building upon and improving the existing systems and current activities of the institutions involved that provides valuable and accurate data to better report on the targets established and assess policy effectiveness.

In support of the LCGGP, the World Bank has prepared this report with the aim of helping the Romanian Government to operationalize the strategic path chosen by the country for implementing its NCCS. This report focuses on MRV activities and requirements stemming from EU and UNFCCC obligations, and new maritime GHG reporting requirements. It also seeks to provide additional context on voluntary MRV activities happening at the local level and describes scientific and technological activities and organizations that may feed data into the LCGGP.
References
This section provides the references used in this report, organized by subsection.

Section 1 References

Ecologic Institute. 2014. Assessment of climate change policies in the context of the European Semester, Country Report: Germany


EU Commission, 2013. DECISION No 529/2013/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 May 2013 on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities


UNFCCC, 2013. Decision 24/CP.19 Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention.

Section 2 References


EU Commission, 2013. Regulation (EC) No 525/2013 of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC,
The following interviews and email information exchanges were also conducted as part of the background research on the new EU Maritime MRV Regulation:

- Interview and information exchange with Ms Gherghița (Geta) Nicodim, Greenhouse gas expert, Climate Change Directorate, Ministry of Environment, Waters and Forestry on the topic of transposal of relevant EU Directives into the national legislation and identifying relevant institutions, on 12 May 2015.

- Interview with Mr. Marian Popescu, National PSC Coordinator, Romanian Naval Authorities, on the topic of port State control and inspections, 19 May 2015.

- Information exchange with Ms Daniela Ionescu, Director for International Relations and Quality Management, Romanian Accreditation Association (RENAR), on the topic of accreditation of verifiers, on 10 June 2015.
• Interview with Heiko Kunst, Policy Officer for GHG emissions from maritime transport, DG Climate Action, European Commission on the status of the regulation and further steps by the European Commission, on 30 April 2015.

Section 3 References
How to develop a Sustainable Energy Action Plan (SEAP)- Guidebook, http://www.covenantofmayors.eu
Large Infrastructure Operational Programme, http://www.fonduri-ue.ro
Regional Operational Programme, http://www.mdrap.ro

Section 4 References
Annexes

Annex 1. Giurgiu Emission Inventory – Energy Use and CO₂ Tables

The following tables provide snapshots of the energy consumption for Giurgiu’s selected key sectors and CO₂ emissions; Giurgiu also separately calculates urban heating and combined heat and power energy use and CO₂ emissions.

*Table A1-1a: Giurgiu Energy consumption, 2010*

<table>
<thead>
<tr>
<th>Categorie</th>
<th>CONSUMUL FINAL DE ENERGIE [MWh]</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electricitate</td>
<td>Incălzire/</td>
<td>Combustibili fosili</td>
<td>Energie din</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>răcire</td>
<td>Gaz natural</td>
<td>Motorină</td>
<td>Benzină</td>
<td>Bio-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>combustibil</td>
</tr>
<tr>
<td>CLĂDIRI, ECHIPAMENTE/INSTALAȚII șI INDUSTRII:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clădiri, echipamente/instalații municipale</td>
<td>975</td>
<td>10401</td>
<td>0</td>
<td>1167</td>
<td>76</td>
<td>258</td>
</tr>
<tr>
<td>Clădiri, echipamente/instalații terțiere (nemunicipale)</td>
<td>1350</td>
<td>1928</td>
<td>0</td>
<td>26</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>Clădiri rezidențiale</td>
<td>63780</td>
<td>82179</td>
<td>12401</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Iluminatul public municipal</td>
<td>2850</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Industrii</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal clădiri, echipamente/instalații și industrii</td>
<td>68955</td>
<td>94509</td>
<td>12401</td>
<td>1193</td>
<td>108</td>
<td>258</td>
</tr>
<tr>
<td>TRANSPORT:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parcul municipal</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>84</td>
<td>76</td>
<td>0</td>
</tr>
<tr>
<td>Transportul public</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1083</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Transportul privat și comercial</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15250</td>
<td>293</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal transport</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>16418</td>
<td>369</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>68955</td>
<td>94509</td>
<td>12401</td>
<td>17611</td>
<td>478</td>
<td>258</td>
</tr>
</tbody>
</table>
Table A1-1b: Giurgiu CO₂ emissions, key sectors, 2010

<table>
<thead>
<tr>
<th>Categoria</th>
<th>Electricitate</th>
<th>Încălzire/ răcire</th>
<th>Combustibili fosili</th>
<th>Energie din surse regenerabile</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLĂDIRI, EQUIPAMENTE/INSTALĂȚII ȘI INDUSTRII:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Călători, echipamente/installații municipele</td>
<td>683</td>
<td>2101</td>
<td>0</td>
<td>312</td>
<td>19</td>
</tr>
<tr>
<td>Călători, echipamente/installații terțiiare (nemunicipele)</td>
<td>946</td>
<td>390</td>
<td>0</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Călători rezidențiale</td>
<td>44710</td>
<td>16600</td>
<td>2505</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Iluminatul public municipal</td>
<td>1998</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Industrii</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal clădiri, echipamente/installații și industrii</td>
<td>48337</td>
<td>19091</td>
<td>2505</td>
<td>312</td>
<td>19</td>
</tr>
<tr>
<td>TRANSPORT:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parcul municipal</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>Transportul public</td>
<td>0</td>
<td>0</td>
<td>289</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Transportul privat și comercial</td>
<td>0</td>
<td>0</td>
<td>4072</td>
<td>73</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal transport</td>
<td>0</td>
<td>0</td>
<td>4382</td>
<td>92</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>0</td>
<td>4702</td>
<td>119</td>
<td>0</td>
</tr>
<tr>
<td>Factorii corespunzători privind emisiile de CO₂ [t/MWh]</td>
<td>0,701</td>
<td>0,202</td>
<td>0,202</td>
<td>0,267</td>
<td>0,249</td>
</tr>
</tbody>
</table>

Table A1-2: Giurgiu Urban heating, CHP and CO₂ emissions

<table>
<thead>
<tr>
<th>Încălzire/răcire generată local</th>
<th>Încălzire/răcire generată local [MWh]</th>
<th>Aportul vectorului energetic [MWh]</th>
<th>Combustibili fosili</th>
<th>Energie regenerabilă</th>
<th>Emisiile de CO₂ [t/an]</th>
<th>Factorii de emisie de CO₂ [t/MWh]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrale termice</td>
<td>94509</td>
<td>185966</td>
<td></td>
<td></td>
<td>19091</td>
<td>0,202</td>
</tr>
<tr>
<td>Sobe cu lemn</td>
<td></td>
<td>258</td>
<td></td>
<td></td>
<td>104</td>
<td>0,403</td>
</tr>
<tr>
<td>Colectoare solare termale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>209</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>94509</td>
<td>185966</td>
<td>258</td>
<td>209</td>
<td>19195</td>
<td></td>
</tr>
</tbody>
</table>
**Annex 2. Institutional Contributors to Scientific Knowledge on CC&A**

Table A2-15 provides an overview of the key institutions that contribute to scientific knowledge relating to climate change and adaptation (CC&A) in Romania, such as by addressing relevant environmental factors, processes or features of society/population behaviour. The table includes elements both directly and indirectly mentioned as related to CC&A by the respective institution. Many other institutions may also conduct relevant research, such as institutions in subordinated to Romanian Academy including Institutul de Economie Naţională, Institutul de Economie Mondială “Costin Murgescu”, Institutul de Sociologie, however there was insufficient information available online to assess their contributions.

**Table A2-15 Overview of major institutional contributors to scientific knowledge on CC&A knowledge in Romania**

<table>
<thead>
<tr>
<th>Institute or organization</th>
<th>Systematic observation</th>
<th>Research activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administratia Nationala de Meteorologie (ANM) (<a href="http://www.meteoromania.ro/anm">http://www.meteoromania.ro/anm</a>)</td>
<td>Atmospheric and terrestrial climate, weather</td>
<td>Atmosphere, climate, weather, land use</td>
</tr>
<tr>
<td>Institutul National de Hidrologie si Gospodarierea Apelor (INHGA) (<a href="http://www.inhga.ro/">http://www.inhga.ro/</a>)</td>
<td>River mapping, hydrological observations, flooding</td>
<td>Above and underground hidrology/water resources</td>
</tr>
<tr>
<td>Institutul National de Cercetare-Dezvoltare pentru Pedologie, Agrochimie si Protectia Mediului (INCDPAPM-ICPA) (<a href="http://www.icpa.ro/">http://www.icpa.ro/</a>)</td>
<td>Soil resources</td>
<td>Pedology, soil (bio)chemistry, soil quality, agriculture and environmental protection</td>
</tr>
<tr>
<td>Institutul National de Cercetare-Dezvoltare Agricolă Fundulea (INCDA) (<a href="http://www.ricic.ro">www.ricic.ro</a>)</td>
<td>Agricultural crops and production</td>
<td>Conservative agriculture, agricultural crops and forages selection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Impact, vulnerability and adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigation and development of a low carbon society</td>
<td></td>
</tr>
<tr>
<td>Energy and transport, industry</td>
<td>Management of natural resources</td>
</tr>
<tr>
<td>Economy and green growth</td>
<td>Public health, social, community</td>
</tr>
<tr>
<td>Conservative agriculture, agricultural crops and forages selection</td>
<td>Nitrate management</td>
</tr>
</tbody>
</table>
### Romania Climate Change Advisory Report: D2 – Monitoring, Reporting, and Verification

<table>
<thead>
<tr>
<th>Institute or organization</th>
<th>Systematic observation</th>
<th>Research activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institutul Național de Cercetare-Dezvoltare pentru Cartofi și Sfecla de Zahar Brașov (INDCDSZ)</strong> (<a href="http://www.potato.ro">www.potato.ro</a>)</td>
<td>Crops resistance and tolerance</td>
<td>Potato selection, pests control</td>
</tr>
<tr>
<td><strong>Institutul Național de Cercetare-Dezvoltare pentru Biologie și Nutriție Animală Balotesti (INCDBNA)</strong> (<a href="http://www.ibna.ro">www.ibna.ro</a>)</td>
<td>Forest health and forest related parameters</td>
<td>Forest decline, wildlife dynamics, land conversions</td>
</tr>
<tr>
<td><strong>Institutul Național de Cercetare-Dezvoltare pentru Silvicultura “Marin Dracea”, including Inventarul National al Vegetatiei Forestiere (INCDSF,IFN)</strong> (<a href="http://roifn.ro/site/">http://roifn.ro/site/</a>)</td>
<td>State forest damages by insects, storms, others</td>
<td>Coordination of agricultural research, supports development of programmes, policy, strategies on agriculture</td>
</tr>
<tr>
<td><strong>Academia de Stiinte Agricole si Silvice (<a href="http://www.asas.ro/wcmqs/">www.asas.ro/wcmqs/</a>)</strong></td>
<td></td>
<td>Forest stand vulnerabilities, biodiversity conservation</td>
</tr>
<tr>
<td><strong>Regia Nationala a Padurilor Rom silica (<a href="http://www.rosilva.ro">www.rosilva.ro</a>)</strong></td>
<td>State forest damages by insects, storms, others</td>
<td>Forest stand vulnerabilities, biodiversity conservation</td>
</tr>
<tr>
<td><strong>Institutul Național de Cercetare-Dezvoltare pentru Im bunătățiri Funciare (ISPFF,<a href="http://ispif.ro/">http://ispif.ro/</a>)</strong></td>
<td></td>
<td>Design of irrigation systems</td>
</tr>
<tr>
<td><strong>Institutul Național de Cercetare-Dezvoltare pentru Domeniului Geologiei, Geofizicii, Geochimiei și Teledetecției București (IGR)</strong></td>
<td></td>
<td>Geothermal resources mapping, shale gas</td>
</tr>
</tbody>
</table>

### Mitigation and development of a low carbon society

<table>
<thead>
<tr>
<th>Energy and transport, industry</th>
<th>Management of natural resources</th>
<th>Economy and green growth</th>
<th>Public health, social, community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food safety</td>
<td>Reducing nitrogen emissions from livestock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Institute or organization

<table>
<thead>
<tr>
<th>Institution or Organization</th>
<th>Systematic observation</th>
<th>Research activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Understanding natural processes</strong></td>
</tr>
<tr>
<td>(<a href="http://www.igr.ro">www.igr.ro</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutul Național de Cercetare- Dezvoltare pentru Geologie și Geocologie Marină București (GEOECOMAR) (<a href="http://www.geoecomar.ro">www.geoecomar.ro</a>)</td>
<td></td>
<td>Environmental Danube and Black Sea history, coastal adaptation and mitigation, erosion management, marine geohazards</td>
</tr>
<tr>
<td>National Institute for Research-Marine Development &quot;Grigore Antipa&quot;(RMRI) (<a href="http://www.rmri.ro/">http://www.rmri.ro/</a>)</td>
<td>Physical, chemical, and biological marine environment</td>
<td>Biodiversity, genetics</td>
</tr>
<tr>
<td>Institutul National pentru Cercetare și Dezvoltare pentru Stiințe Biologice (INCDSB București) (<a href="http://www.dbi.ro.eu/">http://www.dbi.ro.eu/</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutul National pentru Cercetare și Dezvoltare pentru Fizica Materialelor (INCDFM) (<a href="http://www.infm.ro">www.infm.ro</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutul National pentru Cercetare și Dezvoltare pentru Fizica Pamantului (INCDPF) (<a href="http://www.infp.ro">http://www.infp.ro</a>)</td>
<td>Earthquakes</td>
<td></td>
</tr>
<tr>
<td>Institute or organization</td>
<td>Systematic observation</td>
<td>Research activity</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Understanding natural processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutul National pentru Cercetare si Dezvoltare pentru Tehnologii Moleculare si Izotopice (INCDTIM) (<a href="http://www.itim-cj.ro">http://www.itim-cj.ro</a>)</td>
<td></td>
<td>atmospheric particles</td>
</tr>
<tr>
<td>Institutul National pentru Cercetare si Dezvoltare pentru Masinarii si Instalatii Destinate Agriculturii si Industriei Alimentare (INMA) (<a href="http://www.inma.ro">www.inma.ro</a>)</td>
<td></td>
<td>Biomass crops, bio-combustibles</td>
</tr>
<tr>
<td>Institutul de Biologie al Academiei Romane (IBIOL) (<a href="http://www.ibiol.ro">http://www.ibiol.ro</a>)</td>
<td>Biodiversity, ecological zoning</td>
<td></td>
</tr>
<tr>
<td>Institutul de Cercetare a Calității Vietii al Academiei Romane (ICCV) (<a href="http://www.iccv.ro">http://www.iccv.ro</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutul de Economie Agrara al Academiei Romane (EADR) (<a href="http://www.eadr.ro/">http://www.eadr.ro/</a>)</td>
<td></td>
<td>Agricultural soils resources</td>
</tr>
<tr>
<td>Institutul de Geodinamică &quot;Sabba S.Ștefănescu&quot; al Academiei Romane</td>
<td>Earth geophysics and climate interaction</td>
<td></td>
</tr>
<tr>
<td>Institutul de Geografie al Academiei Romane (IGAR) (<a href="http://www.geoinst.ro/">http://www.geoinst.ro/</a>)</td>
<td>Regional projections of climate</td>
<td></td>
</tr>
<tr>
<td>Institute or organization</td>
<td>Systematic observation</td>
<td>Research activity</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Institutul Național de Cercetări Economice al Academiei Romane (INCE)</strong> (<a href="http://www.ince.ro">http://www.ince.ro</a>)</td>
<td>Understanding natural processes</td>
<td>Mitigation and development of a low carbon society</td>
</tr>
<tr>
<td><strong>Institutul de Prognoză Economică al Academiei Romane (IPE)</strong> (<a href="http://www.ipe.ro">http://www.ipe.ro</a>)</td>
<td>Impact, vulnerability and adaptation</td>
<td>Energy and transport, industry</td>
</tr>
<tr>
<td><strong>Institutul de Studii și Proiectări Energetice (ISPE)</strong> (<a href="http://www.ispe.ro">http://www.ispe.ro</a>)</td>
<td></td>
<td>Management of natural resources</td>
</tr>
<tr>
<td><strong>Universitatea de Stiinte Agricole si Medicina Veterinara Bucuresti (USAMV)</strong> (<a href="http://www.usamv.ro/">www.usamv.ro</a>)</td>
<td>Agricultural crops and production risks</td>
<td>Economy and green growth</td>
</tr>
<tr>
<td><strong>Politehnica din Bucuresti (UPB)</strong> (<a href="http://www.upb.ro/">http://www.upb.ro</a>)</td>
<td>Crops tolerance, economic risks for farms, mapping risks for crops, horticultural species &amp; livestock</td>
<td>Public health, social, community</td>
</tr>
<tr>
<td><strong>Universitatea Babes Bolyai (UBB)</strong> (<a href="http://www.ubbcluj.ro/ro/">http://www.ubbcluj.ro/ro/</a>)</td>
<td>Recover energy from waste, alternative energy sources</td>
<td>Adaptation to social and economic changes</td>
</tr>
</tbody>
</table>

- **Wind power plant, renewables and cogeneration, optimizations of supply schemes**
- **Agricultural crops and production risks**
- **Crops tolerance, economic risks for farms, mapping risks for crops, horticultural species & livestock**
- **Recover energy from waste, alternative energy sources**
- **River basin management**
- **CCS technology**
- **System for management and intelligent analysis of diseases**
<table>
<thead>
<tr>
<th>Institute or organization</th>
<th>Systematic observation</th>
<th>Research activity</th>
<th>Mitigation and development of a low carbon society</th>
</tr>
</thead>
</table>