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## Analysis of MRV and Accounting Systems of Annex I and Non-Annex I Countries: Good Practices and Lessons Learned

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# Acronyms

<b>AI</b>	Annex I Countries	<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>AVR</b>	Accreditation and Verification	<b>IPPU</b>	Industrial Processes and Product Use
<b>BAU</b>	Regulation of the European Union Business as Usual	<b>ITMO</b>	International Transfer Mitigation Outcome
<b>BR</b>	Biennial Report	<b>KP</b>	Kyoto Protocol
<b>BUR</b>	Biennial Update Report	<b>LCC</b>	Low Carbon Cities Program
<b>CAA</b>	New Zealand Carbon Accounting Areas	<b>LECB</b>	Low Emission Capacity Building Program
<b>CCC</b>	Climate Change Committee	<b>LULUCF</b>	Land Use, Land Use Change and Forestry
<b>CCIS</b>	New Zealand Climate Change Information System	<b>M&amp;E</b>	Monitoring and Evaluation
<b>CDM</b>	Clean Development Mechanism	<b>MoU</b>	Memorandum of Understanding
<b>CER</b>	Australian Clean Energy Regulator	<b>MPI</b>	Ministry of Primary Industries of New Zealand
<b>COP</b>	Conferences of the Parties	<b>MRV</b>	Measurement, Reporting and Verification
<b>CRTEM/HBEFA</b>	China Road Transport Emission Model	<b>NAB</b>	National Accreditation Board
<b>DECC</b>	Department of Energy & Climate Change of the United Kingdom	<b>NAI</b>	Non-Annex I Countries
<b>DER</b>	Ghana Domestic Electronic Registration System	<b>NAMA</b>	Nationally Appropriate Mitigation Actions
<b>EA</b>	European Accreditation	<b>NC</b>	National Communications
<b>EERS</b>	Australian Emissions and Energy Reporting System	<b>NDC</b>	Nationally Determined Contribution
<b>e-GGRT</b>	EPA's electronic Greenhouse Gas Reporting Tool	<b>NGER</b>	Australia's National Greenhouse Gas and Energy Reporting Scheme
<b>ETS</b>	Emission Trading System	<b>NGGEI</b>	National Greenhouse Gas Emissions Inventory
<b>EU ETS</b>	EU Emission Trading System	<b>OCDE</b>	Organization for Economic Co-operation and Development
<b>FES-CO2*</b>	Carbon Fund for a Sustainable Economy	<b>PA</b>	Paris Agreement
<b>FLIGHT</b>	Facility Level Information on Greenhouse Gases Tool	<b>PAM</b>	Ghanaian Policy Analysis Matrix
<b>G-CARP</b>	Ghana Climate Ambitious Reporting Program	<b>PATPA</b>	Partnership on Transparency in the Paris Agreement
<b>GCF</b>	Green Climate Fund	<b>QA/QC</b>	Quality Assurance/Quality Control
<b>GHG</b>	Greenhouse gases	<b>TGO</b>	Thailand GHG Organization
<b>GHGRP</b>	U.S. Greenhouse Gas Reporting Program	<b>TMS</b>	Korean Energy and GHG Target Management System
<b>GIS</b>	Geographical Information System	<b>T-VER</b>	Thailand Voluntary Emission Reduction Program
<b>HBEFA</b>	Handbook Emission Factors for Road Transport	<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>IAR</b>	International Assessment and Review	<b>US EPA</b>	United States Environmental Protection Agency
<b>ICA</b>	International Consultation and Analysis	<b>WRI</b>	World Resources Institute
<b>INDC</b>	Intended Nationally Determined Contributions		



## Introduction

Following the two analyses published by the Partnership on Transparency in the Paris Agreement (PATPA) and the Low Emission Capacity Building Program (LECB)<sup>1</sup> on Good Practices in iNDC, LEDS, NAMA and MRV in 2016, the Accounting Rules for Achievement of Emission Mitigation Objectives in Non-Annex 1 Countries Project, implemented by GIZ in cooperation with the consulting firm Ricardo Energy & Environment, carried out a study that sought to collect and analyse international good practices and their link between GHG Accounting, Measurement, Reporting and Verification (MRV) and Monitoring and Evaluation (M&E) in both Annex I (AI) and non-Annex I (NAI) countries.

For this purpose 68 cases from different countries, regions and cities were reviewed. In the end, 15 were selected based on diverse crosscutting criteria with the aim of identifying the aspects that motivated the development of their systems, their design process and quantitative information relevant to such design, their implementation and their operation. This led to the selection of the most relevant lessons for countries in the process of developing their MRV and accounting systems. Each case was summarized and systematized into individual analysis sheets that have been published by PATPA (see the following link: <https://www.transparency-partnership.net/gpa>).

The study presented here analyzes and summarizes the lessons learned during the specific analysis carried out on Good Practices that link MRV and Accounting, relevant to those developing countries. It provides readers with easier access to detailed information on the complete case studies of good MRV and accounting practices through hyperlinks to documents prepared for each case.

Good Practice case identification is based on a set of criteria (e.g., MRV and accounting approaches that are particularly efficient, innovative, sustainable or integrated) and which combine a set of angles related to the various aspects of MRV and accounting. These angles were used to ensure a broad scope of MRV and were considered accounting approaches in the identification of Good Practices, while the analysis criteria helped to identify a practice as “good.”

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<sup>1</sup> Global Analysis of Good practices 1.0 (2014) and Analysis 2.0 of Good practices (2015)

Appendix 1 (See page 34) presents the Good Practices analyzed and related angles. As progress was made in identifying and selecting Good Practices, it became clear that while the criteria had been useful, generally for the identification of possible Good Practices, the reasons why a practice was considered good were multifaceted and complex. Therefore, the criteria were not used as justification for the selection or to structure the presentation of Good Practices. Rather, a simplified version of the angles was used to structure this report, focusing on key steps in the design and operation of the MRV processes.

Each documented good practice, derived from the consultancy, refers to a specific approach of a particular country or region. The scope of these Good Practices can be quite broad (e.g., the M&E system in South Africa) or very narrow, such as the approach to control and quality assurance of the Danish Greenhouse Gas Inventory. Even the Good Practice cases, which have limited scope, generally represent a collection of several approaches worth highlighting.

This study presents the approaches that have been considered most important for countries with the objective of developing an MRV and accounting system, as well as their various related aspects. In the selection of these methods, two very simple qualitative criteria have been applied:

1.

What are the approaches that – in principle – can be useful for a large number of countries under different conditions?

2.

What are the approaches that have a high relevance for the development and general operation of the system?

Since the study is based on a limited number of Good Practices cases, focused primarily on MRV (in comparison with the accounting component). The information presented does not cover all potential aspects of both elements. Likewise, when more examples of a specific aspect are presented, it does not mean the case is more relevant than others, but simply that a greater number of related cases were identified.

In order to keep the present study as concise as possible, and given that the relevant information on MRV and accounting is available to the public, a detailed introduction to these two topics has not been included. Below are bibliographical suggestions for consultation purposes and for those readers who wish to delve deeper into the subject:

- GIZ MRV tool, available at <https://www.transparency-partnership.net/mrv-tool-how-set-national-mrv-systems> in English, Spanish, French and Vietnamese.
- United Nations Framework Convention on Climate Change (UNFCCC) manual on Measurement, Reporting and Verification, available at [http://unfccc.int/files/national\\_reports/annex\\_i\\_natcom\\_/application/pdf/non-annex\\_i\\_mrv\\_handbook.pdf](http://unfccc.int/files/national_reports/annex_i_natcom_/application/pdf/non-annex_i_mrv_handbook.pdf).
- UNFCCC guide, which summarizes the provisions of the Paris Agreement (PA) and the transparency guidelines stipulated by UNFCCC, available at <http://bigpicture.unfccc.int/>



## 2. Lessons Learned

### 2.1 Design and Implementation

#### 2.1.1 Coverage of all MRV areas

Based on current UNFCCC reporting requirements, countries need MRV in certain areas, such as greenhouse gas emission levels (reported in the National GHG Inventory), as well as in everything related to mitigation and monitoring of support received and required (climate finance, capacity building and technology transfer). According to the Paris Agreement (PA) and depending on the Intended Nationally Determined Contributions (INDC), some countries must include adaptation in their reports. For developing countries, the identification of mitigation benefits and/or adaptation activities may be interesting at the national level. The implementation of integrated MRV systems that cover all relevant areas can ensure a more efficient and aligned system in general, allowing the combination of information that facilitates future understanding; for example, how efficiently the climate financing obtained was used for mitigation or adaptation actions and what development co-benefits did it achieve? What has been the impact of mitigation actions in a specific sector on reducing or increasing their emissions over time? Ghana and South Africa are currently establishing systems that encompass the National GHG Inventory, mitigation actions, support, adaptation and development aspects.

#### Ghana

Ghana is currently implementing a climate reporting program (G-CARP). This integrated system includes data related to GHG inventories, mitigation actions, GHG impacts and climate change support, i.e., financing, technology transfer and capacity building. It is based on the existing development monitoring and evaluation system, which means that the system as a whole integrates both climate change information and development management data. This allows, for example, evaluation of co-benefits resulting from the mitigation actions. In general, the integrated approach facilitates the evaluation of different issues (e.g, climate and its effects on the development of funding received). These additional ideas will provide useful information for integrated climate change planning and development-related actions, requests for support required in UNFCCC reports, etc. The integrated approach also contributes to the development of a clear and efficient institutional structure in the country. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## South Africa.

South Africa has developed a comprehensive MRV system, which is currently being developed. The system is integrated into the national monitoring and evaluation (M&E) processes, adjusted to the international MRV requirements. The aim of the M&E system is to monitor South Africa's progress in its transition to a low-carbon, climate-resilient economy. For its implementation, South Africa provided relevant information for political decision-making at the national level, while meeting the international MRV requirements. The system covers information on mitigation, adaptation, GHG emissions and development-related co-benefits (e.g. job creation) in an integrated manner, with the aim of estimating the level of impact of individual actions as well as their potential to collectively achieve the transition to a low carbon economy resilient to climate change. As was the case in Ghana, the integrated approach allows a more comprehensive assessment of impacts and provides useful information, allowing for better coordination in planning of mitigation, adaptation and development actions. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0)

### 2.1.2 Long-term and Phased Planning

The implementation of MRV and accounting systems is a complex task, involving a large number of areas, including technical considerations of data collection and management, institutional structures, stakeholder involvement, capacity building and budgeting. Long-term planning and phased implementation:

1. Reduce the number of design and implementation tasks required; for example, focusing first on the most relevant MRV areas.
2. Adjust the synchronization of tasks to available budgets.
3. Allow the performance of tests and adjustments for optimization of system functions.

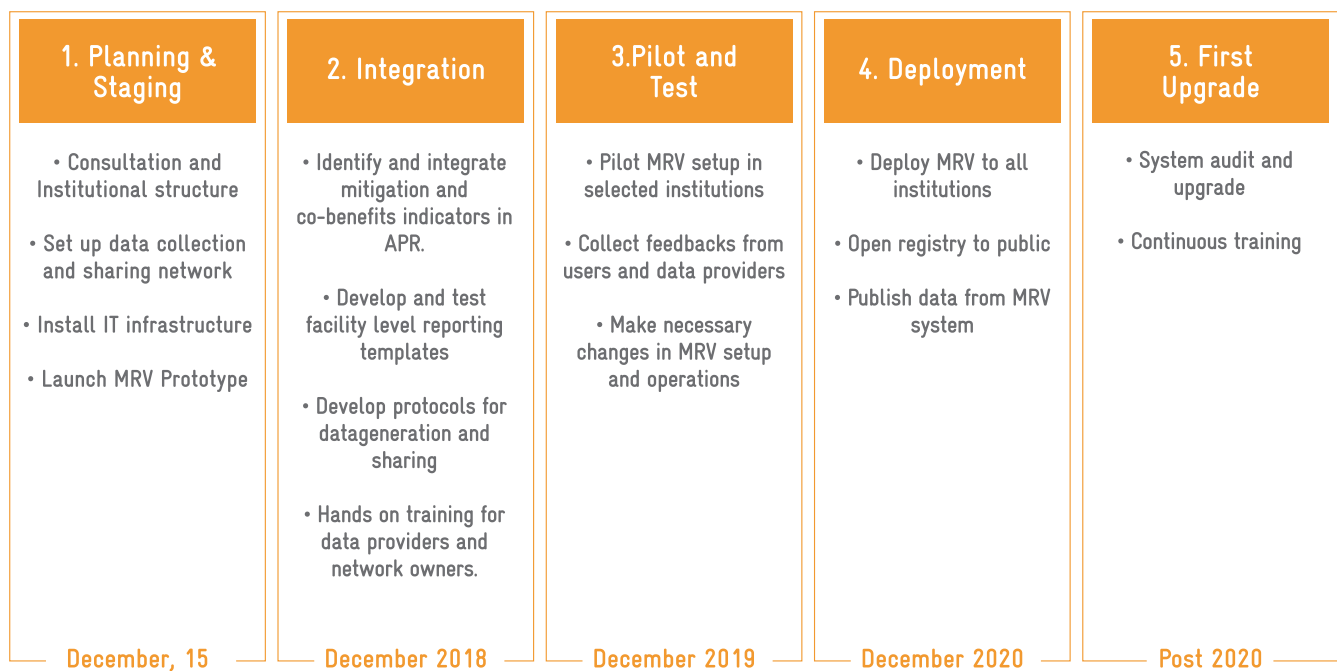
Ghana and South Africa have chosen this type of approach in the implementation of their comprehensive MRV systems.

## Ghana

The planning, development and establishment of Ghana's domestic MRV system (G-CARP) is being phased in. The roadmap for the development of Ghana's national MRV system is presented in Figure 1. The design and operation of the domestic MRV system consists of 5 stages to be carried out between 2015 and 2020. The program is divided into phases and their sequence detailed below:

- a) Planning and design
- b) Integration
- c) Pilot phase and tests
- d) Utilization
- e) Initial adjustments (Figure 1).





**Figure 1. MRV Development Roadmap in Ghana**

Staged planning, both design and implementation through detailed and phased activities, allowed detailed planning that considered the following points:

- When and what has to be done?
- Which stakeholders need to be involved in what activities?
- What resources are needed for each task?
- What capacity is required at a given time and by whom?

When a task takes longer than expected, the impact on the sequence of other tasks can be understood easily and the planning of these tasks can be adjusted accordingly. This detailed planning made it possible for the MRV prototype to be implemented in April 2016.

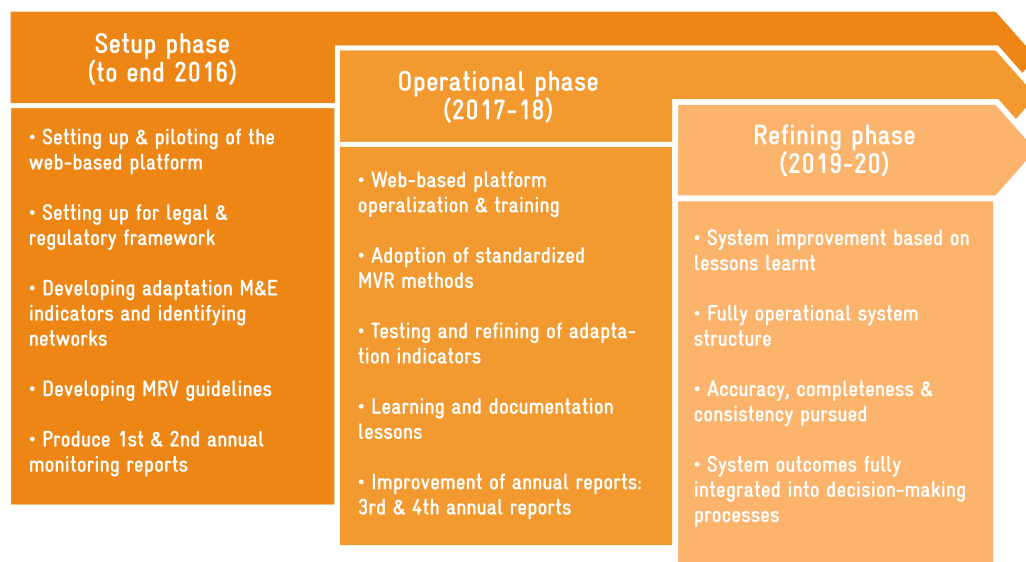
The phased grouping of activities facilitates communication of the plan at the national (e.g. with stakeholders) and international (e.g. with donors) level and creates expectations for all stakeholders of what can realistically be achieved. Long-term planning also helps strengthen donor confidence and thus facilitates support. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0)

## South Africa

South Africa has been working effectively in the development of an M&E/MRV system since 2009. The M&E system should be commissioned between 2016 and 2020 in three phases, defined as: configuration, operationalization and improvement. It is expected that each of these phases will be completed within two years.

## Figure 2. (see below)

Shows a number of (but not all) tasks planned under these three phases. These focus not only on design, implementation and refining, but also on the division of tasks whose duration is estimated to be greater than that of a phase. As an example, the development of national and sector-specific baseline indicators of climate adaptation and financing are developed during phase 1; while the specific indicators of the individual adaptation and climate financing actions allow an estimation of the degree of catalysis financing has had in developing the action. As discussed above, long-term planning based on a detailed breakdown of activities grouped in phases facilitates more realistic and integrated planning for all actors involved, and supports the communication of overall planning to stakeholders and donors. The breakdown of longer-duration activities into sub-activities (as done for adaptation indicators) allows less time-dependent planning.



## Figure 2. Implementation Stages for the South African M&E system.

The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

### 2.1.3 Use of Existing Structures and Tools

Most countries already have some type of climate data collection system in place. In some cases, these were designed for purposes unrelated to climate change and have institutional structures and processes already implemented, as well as the capacity to make them work. The identification of such structures, processes, capabilities and their use as a basis for the operationalization of an MRV system increases the efficiency and acceptance of the parties involved. At the same time, efficiency can be potentially increased by adapting internationally available tools to national circumstances, or by adapting specific national tools from one sector to another. Examples are shown below wherein Thailand, Ghana and South Africa used existing structures, and where Chile and China adapted existing tools to national needs and circumstances.

## Thailand

In 2014, Thailand proposed the design of a domestic market mechanism to reduce energy consumption and GHG emissions through the Low Carbon Cities Program (LCC) and its LCC Fund. These programs aim to support provinces and cities in the design and implementation of actions to mitigate GHG emissions. During the preliminary discussions to decide the most appropriate platform for the LCC Program, the possibility of constructing a new system was studied, as well as using some existing institutional platform or structure. The register of the Thailand Voluntary Emission Reduction Program (T-VER) was identified as an existing structure capable of certifying and issuing carbon credits, since their functions were similar and the roles and responsibilities were already defined. T-VER was initiated by the Thai Greenhouse Organization (TGO), which is based in the Ministry of Environment and has been in operation since 2013. Thus, the T-VER registry was included in the LCC Program design, which is currently in progress.

This approach avoids having to develop the internal carbon market from scratch, taking advantage instead of established systems, methodologies and procedures. The registry facilitates harmonization between T-VER and LCC programs and uses resources and knowledge already available, such as the T-VER, T-VER Registry and T-VER Framework. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## China

An MRV system in the transport sector is being developed in Beijing, as well as a project for establishing a measuring device for the MRV system, allowing a detailed estimation of traffic emissions in the urban context in such a way that any of the mitigation actions in this area can receive follow-up and direction. The methodology used to estimate GHG emissions is based on IPCC guidelines and is similar to the Global Protocol for Greenhouse Gas Emissions protocols at the community level, which the WRI has outlined for GHG emissions in transportation.

Software has been developed to facilitate the estimation of GHG emissions (the China Transport Sector Emissions Model - CRTEM/HBEFA-China) based on a European model (HBEFA). HBEFA has been under development by European transport sector experts for the past 20 years, evincing high quality level in its origin data such as emission factors or typical traffic situations that were, of course, adapted to local conditions. Following a stakeholder consultation and with the support of transportation planners, scientists and experts in four Chinese cities, including Beijing and Shenzhen, the European HBEFA model was identified as the most appropriate tool, since European and Chinese vehicle fleets are very similar. Based on these similarities, the model was adapted to the Chinese context taking into account national traffic conditions and emission factors, as well as the inclusion of a module with local vehicle characteristics. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## Chile

Chile developed a framework that guarantees the use of common MRV approaches for appropriate mitigation actions at the national level, with the aim of increasing

comparability, transparency and data quality. This framework consists of a common MRV development process for individual NAMAs, institutional structures, reporting needs and templates. The WRI Policy and Action Standard, which is the most commonly accepted approach to MRV for individual mitigation actions, was chosen to serve as a reference for the development of MRV approaches. As the standard is a long and complex document, a guide was developed that presents the document's key steps in an easy to understand manner, referencing the original document for technical details and adjusting the process to domestic conditions, for example with respect to institutional structures, key data sources, etc. By using an existing standard as a basis, a high quality for the underlying approach could be ensured with a moderate effort. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## South Africa

During the development of its MRV system, South Africa aimed to avoid replicating existing structures and processes. An M&E Technical Working Group (IWG) was established to address issues related to design and development of the M&E system, involving representatives from different government departments, civil society, workers, private companies, local governments and research institutes. The group identified existing M&E systems, including relevant data flows, as well as their type and quality. Likewise, it identified data needed to improve the quality of monitoring and reporting systems, as well as the level of knowledge required for the future M&E system. It became apparent that a large number of relevant data collection processes were already in place (albeit scattered). As a result of this work, it was possible to design the system by using existing reporting structures, data and experiences as much as possible. This increased system design and implementation process efficiency and allowed leveraging the experience of personnel working within the existing processes. In general, this experience shows that MRV systems in most countries will not have to be built from scratch, but can be built from existing processes, and it is important to invest time in identifying such processes. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## Ghana

The development and implementation of the domestic MRV system focuses on integrating it into the existing national M&E (adaptation) superstructure rather than creating new layer structures. During the design and implementation of the G-CARP system, key stakeholders identified a number of existing national and international information mechanisms that would assist in the collection and monitoring of data (e.g. indicators) on progress in implementing mitigation actions in Ghana. A list of some 40 existing information channels for data collection and monitoring were identified, related to implementation of mitigation and support actions ranging from the national level to the project level. These included mechanisms such as national budgets, agricultural census and national communications, as well as sector-specific project reports (e.g. project design reports related to energy), which are being integrated into the domestic MRV system to the extent possible. This increases the system's overall design efficiency, both at the global level and the data collection processes level, and allows the use of existing experience. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## 2.1.4 Pilots and Transitional Approaches

A number of countries have used pilot programs to implement specific approaches and/or to use time-bound approaches, such as making voluntary systems mandatory after a certain period of use. Such approaches ensure that MRV systems can be designed to respond to specific conditions, for example at the national or sectoral level. Requirements can be introduced gradually, rather than being fully and immediately applied, thus reducing economic risk for certain parties involved, such as companies, and at the same time allowing a proper familiarization with the system. Korea used a transitional approach to prepare small issuers for the introduction of an Emissions Trading System (ETS), while China used regional and municipal pilots to test different ETS approaches as a basis for designing a national ETS system. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

### Korea

Since 2010, Korea has been operating the Greenhouse Gas Management System and Energy Targets (TMS) to manage industries that are large emitters of GHGs and energy consumers. Specifically, the TMS imposes targets for GHG reduction and energy conservation for large companies that emit between 15,000 and 25,000 tCO<sub>2</sub>eq, while the GHG Emissions Trading Scheme covers industries that emit more than 25,000 tCO<sub>2</sub>eq. The Korean TMS is a temporary system, implemented as a tool for development of capacities in industries and local governments in preparation for the introduction of the Emissions Trading Scheme (ETS). The TMS was designed in response to the doubts generated by the potential implementation of an emissions trading scheme without a preparatory phase, especially the possible impacts on those small issuers. The TMS was launched to support these companies in an easy transition to low carbon development while minimizing any negative impact on their business. TMS will phase out gradually and eventually be replaced by ETS. At present, small transmitters can voluntarily join the ETS. Tuning TMS as a temporary system allows small issuers to prepare for ETS, gain experience, and ensure that the necessary guidelines, methodologies, institutional arrangements and procedures are well developed and implemented prior to introducing the scheme. Allowing issuers to participate in the ETS on a voluntary basis also supports the transition to a long-term ETS, and can help understand the level of readiness of TMS-subject industries for participating in the ETS. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0)

### China

Emissions trading schemes (ETS) are well-known mitigation actions suitable for energy-intensive sectors. They were therefore considered an interesting option for China, since the Chinese government intends to implement a new policy, and this favors the development of prior pilot tests at the national level. Therefore, ETS pilot programs were established in five cities (Beijing, Chongqing, Shanghai, Shenzhen and Tianjin) and two provinces (Canton and Hubei). The seven pilots started their operations between June 2013 and June 2014, and to date have developed systems to (1) set emission limits for relevant sources; (2) establish emission allocations; (3) monitor, report and verify emissions; (4) offset carbon credits allocations; and (5) register and trade in such

assignments and clearances. The seven pilot programs differ in terms of economic structure and level of development, including total GHG emissions, key emission sectors and the number of sources in each. Consequently, both the scope of the systems put in place as well as the MRV requirements in turn evidence differences. For example, Shenzhen is the only pilot that considers buildings. All other pilots consider indirect CO<sub>2</sub> emissions from electricity consumption, but only Shanghai, Tianjin, Shenzhen and Canton consider indirect CO<sub>2</sub> emissions from heat consumption. The lessons learned from each of the pilots are being used in the development of a national ETS system. For example, Beijing and Shenzhen are the only two pilots to have emission legislation passed by local congresses. These two pilot programs have the most integrated sets of rules and regulations, the highest carbon prices and the most active markets.

The lesson learned from this exercise is that a robust legal framework is the basis for the development of a successful national system. This approach facilitated gaining experience in MRV systems for ETSs in very diverse conditions with respect to sectors, size of facilities, greenhouse gas emissions considered, etc. This experience provides a solid basis for the development of a national system, since such a system must incorporate regions and cities with very diverse conditions and still use a common approach for all. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## 2.2 Institutional Arrangements

### 2.2.1 Allocation of sectoral responsibilities

Institutional structures ensure the sustainability of an MRV system. Clear institutional structures and arrangements, without transposition of responsibilities and roles commensurate with the capacities of the institutions involved, will allow the system to function efficiently. Korea has adopted an approach that allows optimal use of the sectoral experience in the ministries involved.

#### Korea

The Korea Greenhouse Gas Management and Energy Objectives System (TMS) serves as a transitional approach to prepare small issuers (companies or plants) for participation in an ETS. The Ministry of the Environment is responsible for the overall framework and the creation of enabling conditions, such as the establishment of standards, development of guidelines and management of verification bodies. Since ministries often have the best insight and understanding of sectoral conditions, as well as established contacts with relevant industries, four ministries were tasked with selecting the issuers to be included in the TMS. These same ministries will be in charge of supervising these entities in the establishment of objectives, based on negotiations and evaluation of the results achieved. The Ministry of Agriculture, Food and Rural Affairs covers the agriculture, forestry and food sectors; the Ministry of Industry, Commerce and Energy comprises the public sectors of industrial electricity generation; the Ministry of Land, Infrastructure and Transport is responsible for the construction and transportation sectors; and the Ministry of the Environment is in charge of the waste sector. The Ministry of the Environment has as its main function coordinating the other three ministries and their internal tasks related to the waste sector. These inter-institutional structures allow combining centralized coordination with the sectoral experience of ministries. The selection of entities and supervision can be carried out more efficiently based on their influence and existing sectoral contacts. The sectoral vision of the relevant ministries also provides a good basis for the negotiation of effective mitigation objectives. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

### 2.2.2 Progress Assessment by an Independent Entity

In order to avoid conflicts of interest, the implementation and review of actions must be carried out by different entities. This is also true for progress towards a climate objective and the consequent evaluation of such progress. The United Kingdom established an independent entity for this purpose.

#### United Kingdom

Clear institutional structures were set up for the UK's carbon budgets approach. The project leaders are: the Department of Energy and Climate Change (DECC) and the Climate Change Committee (CCC), which have very different roles. DECC takes the lead role in Coordination of Carbon Budget Management and manages government-wide data and actions to establish and meet carbon budgets, as well as providing some of the information used to monitor progress. The Climate Change Committee (CCC), an

independent non-governmental entity established under the 2008 Climate Change Act, monitors progress in budget compliance. Development is evaluated annually and the results, as well as recommendations on the measures necessary to ensure compliance with the current carbon budget, are disseminated in a publicly available report. The DECC must respond to the CCC's recommendations, in a public report indicating the actions to be taken within a specific period. The assignment of carbon budget development and implementation tasks, the monitoring of progress towards their achievement by different government entities, and the requirement for a public response from the DECC to the CCC's recommendations creates a dynamic that facilitates progress toward established goals.

In order to provide long-term guidance on carbon budgets and the national climate change policy, in addition to providing a link to Council Committees involved in national climate change, the intergovernmental council for national emissions targets (NET) was created. It is chaired by the Permanent Secretary of the DECC, and its members include the general managers responsible for carbon management in the departments overseeing the sectors that produce the most carbon emissions. While the roles of the DECC and the CCC are more executive-oriented, the Council provides long-term strategic guidance. The council members have chosen to include interested parties so they can be consulted in the drafting of this strategic orientation. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## 2.2.3 Memorandums of Understanding

Timely delivery of relevant data is a key aspect of any successful MRV system. A number of countries have successfully used Memoranda of Understanding (MoUs) to ensure that the required data is shared and received in the format indicated and in a timely manner. Although MoUs are usually not legally binding, they express the intent of the parties involved to cooperate and allow a degree of flexibility necessary to specify the data requirements and deadlines, which can be easily updated. Ireland provides an example of using an MoU to ensure the delivery of data from its national greenhouse gas inventories.

### Ireland

In order to have a data collection system for the annual compilation of its Greenhouse Gas Emission (GHG) inventory, Ireland has established a series of memoranda of understanding with its main data providers. The Republic of Ireland produced its first GHG inventory in 1995, initially working without formal data collection processes or institutional structures. The national GHG inventory system was officially established in 2007, using the context established years before. Following the establishment of the national GHG inventory system, the data collection processes were formalized through MoUs. These stipulate the scope, timing and quality of the input data required for compilation. The adoption of MoUs is based on negotiations and discussions with the most important data providers. The quality and timely delivery of activity data has improved since the adoption of MoUs. Receiving timely data also helps the inventory planning process. Since the usefulness of MoUs in data collection processes has been recognized, new memoranda were established in 2009 between data providers and their sources (known as secondary MoUs). The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).



## 2.3 Data and Methodological Approaches related to Mitigation Actions

### 2.3.1 Methodological Harmonization between the GHG Inventory and Mitigation Measures

While greenhouse gas (GHG) inventories provide information on the temporal evolution of emissions at the national and sectoral levels, they are not particularly detailed with respect to emission reductions achieved through the application of mitigation actions. Likewise, the assessment of emission reductions obtained through the implementation of individual actions may give rise to emissions expectations on a different time scale than that observed in national GHG inventories, if the assumptions and methodologies are not well aligned. While full alignment with the GHG inventory is not always possible, (e.g., when a mitigation action is facility-level oriented, but the national GHG inventory does not use data at this scale) the alignment assessment, as well as the identification of subsequent alignments, whether possible or not, will improve the quality of the national GHG inventory data. This also permits a better understanding of how mitigation actions influence GHG emissions at the national level, and therefore facilitates estimating the potential success or the necessary adjustments to achieve it. Chile, Spain, New Zealand and Australia use data collected for other purposes in their national GHG inventory.

#### Chile

The MRV framework for NAMAs requires that, wherever possible, MRV approaches be aligned with national GHG inventory data, for example by using the same emission factors. This is necessary to ensure that impacts on NAMA are reflected in the national inventory of greenhouse gases, as far as possible. Depending on the mitigation action, full harmonization with the GHG inventory may not always be possible, for example, if the national GHG inventory uses data from the national statistics and the mitigation action uses facility-level data. While a complete alignment may not be possible, the evaluation could result in data identified by NAMAs that could be exchanged with the national GHG inventory to improve the quality of the GHG inventory. The Chilean Climate Change Office is currently planning to develop an integrated information platform on emissions and sinks reduction (National Mitigation Actions Register). Such a platform would allow easier management of reported data. An additional database containing national GHG inventory data is planned. These two databases will facilitate alignment of MRV approaches with GHG inventory data. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

#### Spain - Climate Projects

Spain's Ministry of Agriculture, Food and Environment launched the Carbon Fund for a Sustainable Economy (FES-CO<sub>2</sub>, Spanish acronym) as a tool to finance the development of greenhouse gas (GHG) reduction projects. The Climate Projects are an initiative under FES-CO<sub>2</sub> that supports Spanish companies, public administrations or individuals by financing projects that can achieve a reduction in GHG emissions. Under the Climate Projects, FES-CO<sub>2</sub> purchases the verified emissions reductions achieved by the projects during the first four years of project operation. Emission reductions must be measurable and verifiable, so that they are reflected in the National Emissions Inventory. The estimation of the GHG emission

reduction generated by these projects must follow the methodologies designed by the Spanish Office of Climate Change, together with the National Emissions Inventory team, aligned with the methodologies and assumptions of the National Emissions Inventory. In developing these methodologies, Spain's experience in Clean Development Mechanism (CDM) projects has been taken into account. The approach ensures that the automatically generated emission reductions are fully reflected in the national GHG inventory, thus facilitating monitoring progress towards Spain's mitigation targets. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## 2.3.2 Use of MRV Data to Improve the National GHG Inventory

Data compiled from specific mitigation actions for MRV can often be used for the national GHG inventory, either as input data or for review purposes. This approach increases efficiency and data quality, and often allows the reductions achieved by mitigation actions to be reflected in the national GHG inventory, on a larger scale. New Zealand and Australia are examples of this approach.

### New Zealand

This country uses ETS data for development and quality control of its national GHG inventory. ETS data from New Zealand improve the accuracy of the national GHG emissions inventory by providing more detailed and higher quality data. The advantage of such a system is that these data can also be used during quality assurance and control processes (e.g., to compare inventory data with those of the ETS). The ETS scheme is used for reviewing CO<sub>2</sub> emissions in the energy and IPPU sectors (e.g. CO<sub>2</sub> emissions from iron and steel production are compared with the information provided by these industries in the ETS), review of reported emissions data for certain ETS activities (e.g. data from the aluminium and mineral production industries), review of activity data for the collection of municipal solid waste, and to verify forest areas in the USCUS sector. In the specific case of USCUS, the Ministry of the Environment uses ETS data to update and improve the accuracy of its national land use map, which is part of the national inventory of New Zealand. This approach ensures a better quality of the data in the national GHG inventory. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

### Australia

The National Greenhouse Gas and Energy Reporting Scheme (NGER) was introduced in 2007 to provide, inter alia, corporate data on greenhouse gas emissions and energy consumption and production. The monitoring methodologies were designed to be compatible with the methodologies in the IPCC guidelines, and therefore most of the data collected can be used directly in the national emissions inventory. The use of corporate data in their inventories has resulted in an increase in the accuracy of the national GHG inventory. On the other hand, the impact of mitigation actions at the corporate level is reflected directly in the national GHG inventory. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

### 2.3.3 Common MRV Approaches for Mitigation Actions

Different mitigation actions require different indicators to monitor their impact or, if the same indicators are used (for example, the reduction of t CO<sub>2</sub>-eq), different calculation methodologies must be used depending on the measurement scope. These differences make the follow-up impacts results less comparable. Comparability can be enhanced through the use of common approaches in the selection of appropriate indicators, the selection of methodologies from the same sources, and the use of common assumptions, for example on sectoral developments. With this purpose in mind, Chile has developed an MRV framework for its NAMA.

#### Chile

Chile has developed a framework that ensures common MRV approaches to individual mitigation actions (developed using a uniform process) based on the WRI Policy and Action Standard (World Resources). MRV approaches are secured through the use of a common process to derive the relevant indicators, based on an assessment of the potential impacts of mitigation actions and the relevance of these impacts as set out in the WRI Policy and Action Standard. New support measures for common MRV approaches include the development of an MRV plan based on a template, and the approval of the MRV plan by the Office of Climate Change. Wherever possible, common national or sectoral assumptions must be used for establishing a baseline. Comparability is further supported by the use of common templates for annual reporting. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

### 2.3.4 Provision of Data for Decision-making on Mitigation Activities

One of the key functions of MRV is to provide information for the design of successful mitigation actions or their adjustment in order to increase their chances of success. Periodic evaluations leading to clear recommendations of required action are a very useful contribution to guide mitigation actions, in order to achieve long-term greenhouse gas reduction targets. The UK carbon budget approach provides an example of how this objective can be achieved.

#### United Kingdom

The overall approach to the MRV system includes an annual assessment of the progress made towards meeting the carbon budgets. This is carried out by an independent committee (the Climate Change Committee, CCC) which provides a detailed report on progress at the national and sector levels, including individual mitigation actions. As part of its annual report, published each year in June, the CCC reports on emissions trends over the past year and assesses the underlying progress in implementing carbon reduction actions and policies in the UK.

Based on these findings, the report provides detailed recommendations (e.g. at the sectoral level and at the mitigation actions level) on measures needed to meet the current carbon budget. The reports also take into account the extent to which the recommendations

in the prior year's report have been implemented. The approach adopted ensures that the recommendations are based on recent evidence, also taking into account recently implemented actions.

The government publishes a response to the annual CCC report in which it addresses each of the CCC's recommendations and describes the measures that must be taken in order to implement the same. The Government's response, which must be submitted to Parliament in October, is approved by all departments involved. Publication of the report ensures that the recommendations are developed and approved quickly, allowing the measure to be undertaken as soon as possible. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## 2.4 Use of IT Tools

Data management tools and systems have a number of beneficial functions related to MRV, such as increased efficiency in data collection, management and storage, as well as review for quality, evaluation and dissemination to the desired levels.

### 2.4.1 Integrated Data Management Systems

Several countries are developing integrated data management systems as part of their MRV system. These systems include data related to all areas of MRV. This allows use of common quality control methods, ensures the alignment of data formats, and enables easy management access to all systems in one place, which increases efficiency. Ghana is currently implementing such systems.

#### Ghana

The platform provides a centralized online climate data system, a “single window” for all data and activities related to climate change. The first version of the database platform is already under way and is currently being tested (April 2016). The centralized online climate data system has three interfaces, listed below:

1.

The GHG emissions database contains archival data used for generation of national estimates.

2.

The Domestic Electronic Record System (DER) is used as a data centralization point to monitor all past and present initiatives on climate change, including sources of support.

3.

The Climate Policy and Actions Matrix (PAM) covers all climate-related policies and actions in Ghana’s productive economic sectors. The database has a crawler designed to track implementation progress toward achieving the goals.

There are future plans to add two additional dedicated project portals for Nationally Determined Contributions (NDCs) and the Green Climate Fund (GCF). The approach adopted enables Ghana to access and distribute (to the extent desired) all relevant data in one place. When new elements are to be added in the future, they can be integrated by making as much use as possible of existing data, which will increase efficiency. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

### 2.4.2 Tools

IT tools enable automation of MRV-related activities, helping to increase task efficiency, data comparison and quality. Examples presented below include tools for locating forests and identifying changes in forest cover (New Zealand), automated data reporting and verification (Australia, USA) and data exchange (USA).

## New Zealand

In New Zealand, the forestry sector offers a great opportunity to reduce emissions by promoting carbon sinks under the ETS system. However, the forestry sector has not been included in other ETS systems previously, since it is difficult to monitor. An online tool was developed by New Zealand to solve this problem and to enable the Ministry of Primary Industries (MPI) to monitor changes in the forest areas that participate in the ETS scheme. This innovative tool, part of the New Zealand Climate Change Information System (CCIS), was initially developed in 2009 as a web application that allows foresters and farmers to record the exact location of forest cover. The system integrates satellite data and high resolution aerial photographs, generating a set of reference data on which the limits of foresters' and farmers' properties can be recorded as part of the data presentation process, in order to obtain certifications under the New Zealand ETS scheme. The tool, similar to a Geographic Information System (GIS), allows participants to digitize and edit forest cover polygons known as Carbon Accounting Areas (CAA) over a base image, and assign those attributes specified in the MPI Cartographic Information Standard. The approach helps participants to provide forest area and forest cover information with a moderate effort and in a standardized way, while ensuring the quality of the data. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## Australia

Companies report data using the Emissions and Energy Reporting System (EERS), an online tool used for collecting and reporting data by companies. Participating firms access the portal to prepare and present their NGER reports annually. Data are entered into EERS by companies at the facility and company levels, and include data on consumption of natural gas, liquid and fuels electricity, as well as GHG emissions.

The CER (Clean Energy Regulator) has produced detailed guidelines and trained users to learn how to use EERS to create or modify their corporate structure, to report basic activity data, and to generate and present reports that are generally available on the website. A call centre is also available to assist users. The approach drives efficiency and quality, as it helps reduce the reporting effort with the online reporting tool and the guidance provided, while ensuring presentation of the data in a standardized format.

The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## United States

The US GHG Reporting Program (GHGRP) provides a number of support tools to the parties involved in the compliance system:

- An online applicability tool that supports participants potentially subject to the system, to assess whether they are required to report.
- Annual reports are submitted to the US EPA through the Electronic GHG

Reporting Tool (eGGRT), an online tool available on the agency's website. Prior to filing the report, e-GGRT performs a number of automatic checks to ensure the quality of the data (see Section 2.5.2).

- Non-confidential data will be made public on the agency's website and may be consulted using the Facility-Level Information GHG Tool (FLIGHT), which allows users to search for data by state, installation and emitted gas.
- Training materials on reporting requirements, encompassing a series of online seminars, slides and other training opportunities, including the e-GGRT tool as well as a database of frequently asked questions.

Providing these forms of support facilitates compliance with information requirements, since the requirements and their practical application are better understood and can be carried out more efficiently. Automated tools such as e-GGRT also increase the efficiency of compliance with requirements (again, see Section 2.5.2). The FLIGHT tool facilitates the exchange of data and its evaluation by other entities. The complete Good Practices documentation can be found in the webpage <https://www.transparency-partnership.net/gpa> under the title: Summary of the third round of Good Practice Cases (GPA 3.0).

## 2.5 Quality Control and Assurance and Verification

When data are used as a reference for policy-making on climate change, its quality must be sufficiently acceptable. MRV systems, therefore, must include systems that ensure quality at the desired level (QA/QC). Quality control refers to those actions carried out by the work team related to the compilation of data and the quality assurance that must be implemented by external agents.

### 2.5.1 QA/QC Manuals

QA/QC processes have to be applied consistently and at appropriate points in data management processes. Transparent and complete QA/QC manuals ensure that appropriate action is taken at the appropriate time by the person responsible, and that this is documented and reviewed. The QA/QC manual for Denmark's national GHG inventory is discussed below.

#### Denmark

For compilation of its national GHG inventory, Denmark has developed a detailed and well-structured control and quality assurance plan, as outlined in its QA/QC manual. This manual defines the concept of quality and establishes the principles that must be fulfilled to ensure quality. To establish whether these principles are met, the manual provides a series of specific quality measures to be performed at specific stages during data processing and storage (e.g. trend assessment or data comparison). For ease of reference, each measurement has been provided with an identifier number. In addition, the manual describes responsibilities for compiling the national GHG inventory, specific quality assurance processes (e.g. review of sectoral methodologies by external experts), or verification processes. The final section specifies the potential improvement of the QA/QC manual in the future.

The way in which the manual is structured and the information presented can be understood simply, by the type of measure that has to be taken at any given moment, the manner in which this measure has to be carried out, as well as assurance that such an action has been carried out completely. The manual can be easily used by Non-Annex I countries as a basis for developing their own QA/QC plans, or, with an additional effort, for the development of a QA/QC plan for some other MRV area, such as mitigation or support actions. The complete Good Practices documentation can be found at: <https://www.transparency-partnership.net/gpa>.

### 2.5.2 Report Verification

Verification may, in theory, be any type of quality assurance (e.g. a review by an external entity). External reviews provide an independent view, allowing a more critical evaluation of the data and approaches used. Although often understood to refer to the end result, such as a report, in theory verification can refer to any level of the data management process. Frequently, it refers to a review carried out by a third party, in this case an accredited auditor. This approach is used where higher quality data are required, e.g. in



carbon markets where a high level of data quality is needed to ensure market functioning and to provide a representative tariff.

## United States

The US GHG Reporting Program (GHGRP) ensures that the data presented to the US EPA is accurate, complete and consistent, and provides verification of each report. When report data is entered into the enabled software (e-GGRT), the automatic review provides real-time information about potential errors. This review ensures that all relevant data has been provided and evaluates whether the values entered are within the expected ranges. Any data related issues must be resolved before completing the reporting process. Once the report has been delivered, a new round of reviews is performed which will alert to potential errors in the data. Potential errors are identified and reviewed manually by the US EPA. Whenever an error is identified, this agency will subsequently contact the person in charge of the report. The person in charge will answer this question, either by describing the causes of said error, or by correcting it and repeating the reporting process. The approach adopted combines both manual and automated means, thus increasing process efficiency while ensuring quality through the application of expert knowledge in assessing whether an evidenced problem really constitutes an error. The complete Good Practices documentation can be found at: <https://www.transparency-partnership.net/gpa>

## European Union

The European Union Emission Trading Scheme (EU ETS) requires all facility or aviation operators to submit annual emission reports verified by an independent auditor in accordance with Accreditation and Verification (AVR) legislation. The AVR specifies a set of requirements for accreditation of auditors as well as for preparation and implementation of the verification process. The steps for the verification process are set out in detail, ensuring that the auditor develops a clear approach to the verification activities through risk analysis. The verification results are reflected in a final verification report. In order to ensure a certain level of comparability in reporting, AVR specifies minimum content, while the European Commission has compiled a reporting template, which Member States use on a voluntary basis. In order to ensure harmonization in the implementation of AVR requirements, the European Commission has developed a set of guidance documents on these requirements. The approach facilitates a high-quality verification process. As a result of this verification processes, the data are more comparable among the different verifiers and are also very reliable. Guidance documents can be updated flexibly and supplemented as necessary. The complete Good Practices documentation can be found at: <https://www.transparency-partnership.net/gpa>.

## 2.5.3 Accreditation of Verification Bodies

The previous sections have explained the importance of verification in the MRV process. When external auditors are used, the accreditation process plays a key role in ensuring the qualification and performance of comparable long-term verifiers. The EU ETS example shows how legal and advisory requirements can be combined to ensure that the accreditation process is compatible with the quality of the verification.

## European Union

An accreditation system aims to ensure that the auditors have the necessary knowledge and processes implemented to meet AVR requirements in order to ensure the quality of the verification process. According to the AVR, the accreditation process is carried out by the National Accreditation Board (NAB) and includes a detailed assessment of relevant processes, independence, ability of staff to perform verifications, etc., based on the written information provided by the candidate and a through a visit to the candidate's offices. The process also provides that the NAB accompanies the candidate's staff during the audit to assess his or her ability to carry out the verification process.

To ensure the quality of the evaluation process, the AVR also establishes the composition and competence of the team conducting the evaluations. The AVR continuously ensures the quality of the verification process through visits to the auditors' offices and annual testimonial evaluations, in addition to the periodic repetition of the accreditation process. The quality of NAB work has to be guaranteed by member states, which have to monitor the competencies and performance of their national accreditation body. In addition, the European Cooperation for Accreditation (EA) regularly organizes an independent evaluation. The AVR includes a series of requirements for information exchange among stakeholders, aimed at improving mutual understanding between institutions to increase the quality of verification and accreditation processes over time. As in the case of verification, the European Commission provides guidance on accreditation, supporting a harmonized interpretation. The combination of dedicated processes, clear roles and capacity requirements, along with ad hoc documentation, support the long-term quality of the verification process. The complete Good Practices documentation can be found at: <https://www.transparency-partnership.net/gpa>.

## 2.6 Continuous Improvement

Implementing and operating MRV systems is a continuous learning process. The commissioning of a system always has a trial and error component, which requires calibration in time and in accordance with changes in external conditions. Ad hoc improvement processes ensure that the potential for improvement is identified and documented, and that appropriate planning for the changes desired in the system is carried out.

### 2.6.1 Improvement as an Implementation Stage

During implementation of MRV and accounting systems, establishing a perfect system from the beginning is not always a realistic choice. Testing, adjustment and active evaluation of the potential for improvement are therefore necessary elements in the development of a functional system. A number of countries have purposely integrated these aspects into their implementation plans in the form of trials, feedback from experts, collection and evaluation of lessons learned and, subsequently, updating systems accordingly. Including these aspects in planning not only manages the expectations of stakeholders and the personnel implementing the systems, but also allows planning time and resources for these activities and, in short, helps to develop a system more appropriate to specific country conditions. All this results in an effective realization of the desired functions. The cases of South Africa and Ghana are discussed below.

#### South Africa

South Africa is currently implementing a comprehensive M&E system (see Section 2.1.2) and has developed a rolling implementation plan in three stages. The second phase, known as the start-up phase, includes learning and documenting lessons learned as part of its components. Although it is still in the first phase, South Africa can already collect lessons learned (e.g. experience of what worked well and what did not) based on the implementation measures adopted so far. These experiences can be evaluated during the second phase. Lessons can be used, for example, to test indicators or for adaptation, as this stage involves testing and refining such indicators. The third and final stage of the implementation phase is known as the tuning phase, and refers to the evaluation of lessons learned and the adjustment of the system as a sub-stage. South Africa views learning and continuous improvement as key elements of any M&E or MRV system, which means that adjustment and updating will likely continue after the implementation phase. In adopting this approach, South Africa ensures that improvement potentials are documented and considered in further system implementation steps, thus improving the system as a whole. The complete Good Practices documentation can be found at: <https://www.transparency-partnership.net/gpa>.

#### Ghana

As in the case in South Africa, Ghana is working on the implementation of an MRV system capable of expanding its current M&E system (see Sections 2.1.1 and 2.1.2). Improvements based on lessons learned play an essential role in its long-term implementation plan, which consists of five phases. The third phase (“pilot testing”) focuses on pilot-based learning, including projects dedicated to collecting feedback from

experts and stakeholders. Based on the lessons learned, MRV systems and their processes can be updated before they are implemented, which takes place in the fourth phase. The fifth phase (“first update”) provides for an audit of the system, providing information on improvement potentials and updates, as appropriate. Further improvement of the system will be sought through continuous training activities. As the phase five title indicates, Ghana plans to continue improving its system over time. As with South Africa, this approach ensures that potentials for improvement are actively identified, that resources for these activities are clearly established, and that sufficient time is available so that the system can continue to improve. The complete Good Practices documentation can be found at: <https://www.transparency-partnership.net/gpa>.

## 2.6.2 Integration of Continuous Improvement in MRV Systems

While temporary improvement of the system may be based on the identification and resolution of ad hoc problems, a more systematic approach to improvement can be adopted during the system’s operation, carrying out a more accurate analysis that allows understanding improvement potentials as part of MRV systems’ operation. A set of Good Practices addresses continuous improvement in a very structured way, through the execution of analyses and regular reviews aimed at identifying the potential for improvement, including processes that allow such identification in manuals and legislation. The EU and Chile examples show how improvement processes can be integrated into MRV systems.

### European Union

The European Commission has actively supported a strong improvement of MRV approaches to EU ETS. While the Good Practices documented in this project focus on verification and accreditation, the approaches described below were also applied to those requirements. All Member States, despite differences in their institutional and legal structures, should implement approaches for monitoring, reporting and verification requirements in the EU ETS regime. In order to ensure and improve compliance with requirements, the potential for improvement is frequently evaluated and appropriate measures are taken.

Since the start of the regime, it was known that there were differences in implementation. Among other things, the European Commission launched forums to facilitate the exchange of experiences and practices among stakeholders in the EU ETS, such as competent authorities, accreditation bodies, and auditors, which helped understand these differences. The evaluation of MRV requirements implemented in EU Member States was carried out by the European Commission in 2008, 2010 and 2011, including interviews with competent authorities, national accreditation bodies and auditors. These provided detailed knowledge of existing differences, but also allowed identification of Good Practices and useful tools developed by Member States. This thorough information not only allowed a detailed understanding of the potential for improvement, but also development of the most cost-effective options for improvement, for example through changes in level and legal guidance. The knowledge acquired was also used to improve, on a legal level, existing information and communication requirements, and to add new elements. This ensures that additional information relevant to the assessment

of improvement potentials is received on a regular basis. The European Commission continues to identify and implement the potential for improvement through various channels. The strategy of regularly collecting information from the various sources mentioned enables the European Commission to obtain a detailed picture of the remaining potential for improvement and to find the best way to access that potential, for example through legislative changes, advice, capacity building, etc. The complete Good Practices documentation can be found at: <https://www.transparency-partnership.net/gpa>.

## Chile

The MRV framework for NAMAs includes an annual improvement process. During regular work with the framework and according to developers' comments, the Office of Climate Change documents potential improvements throughout the year, e.g. the need to adapt the templates to include additional information, or provide clarification in the guide. These potential improvements are discussed at an annual meeting and classified according to their relevance, then used as the basis for developing a long-term improvement plan in line with available budgets. The complete Good Practices documentation can be found at: <https://www.transparency-partnership.net/gpa>.

## 2.7 Accounting

### 2.7.1 Setting a Course towards the Goal

When a long-term mitigation objective for a specific year or period has been established, planning of mitigation actions to complete the necessary processes and follow up on their progression over time can be complicated, since there is no information about the evolution of emissions between the present and the base year or period. Actions such as the disaggregation of a long-term objective into several short- and medium-term sub-objectives, or the establishment of a path towards the long-term objective, can address this problem. The UK has introduced five-year carbon budgets for this purpose.

#### United Kingdom

Progress towards the UK's target for emissions reductions by at least 80% by 2050, as set out in the 2008 Climate Change Act (CEC 2008), is monitored by an annual report provided for in the carbon budgets, which sets a limit on the amount of emissions during specific periods. The budget is a global number for the aggregate economy. To prepare the budget, sectoral models were developed with a "bottom-up" methodology, led by sector experts and following a "profitable approach". The sectors in question are: energy, construction, industry, transport, agriculture and land use, changes in land use and forestry, waste and fluorinated gases. The budgets have a five-year duration and there are always three periods budgeted in advance, so the UK's course in terms of emissions for the next 15 years is always clear.

The approach adopted provides the UK with a profitable track record towards its 2050 target, so progress is not disrupted. Long-term planning, which sets out three consecutive carbon budgets, provides a 15-year trajectory, and allows authorities and stakeholders (e.g. industry) to plan necessary actions in the long term. The complete Good Practices documentation can be found at the link: <https://www.transparency-partnership.net/gpa>.

### 2.7.2 Use of the Greenhouse Gas Inventory (GHG)

Since GHG inventories provide an overview of the development of GHG emissions over time, they are appropriate for tracking potential compliance with a target. In the past, Annex I countries have already used this approach to meet their targets under the Kyoto Protocol. New York is a good example of how to use a GHG inventory to regularly evaluate progress toward the target.

#### New York

In September 2014, New York City (NYC) committed to achieving an 80% reduction in its 2005 GHG emissions by 2050 (defined as 80 x 50), with a preliminary objective of a 35% reduction in emissions by 2025. In order to track the progress of these actions, NYC updates and publishes its urban GHG inventory annually. NYC has developed a system capable of tracking actions to achieve the 80 x 50 objective, and the city's GHG inventory (already implemented) has been identified as the most appropriate tool to carry out this monitoring.

Mitigation actions and policies are internally monitored and accounted for using GHG emission inventory data; however, these are not reported externally. The actions and policies that are being monitored and included in the accounting system are outlined in the PlaNYC and OneNYC plans. The 80 x 50 Study is currently being carried out with the aim of developing a mechanism to monitor individual policies and actions in each sector. The inventory also provides all the indicators needed to assess and optimize strategies for achieving the 80 x 50 objective. The approach adopted by New York allows tracking progress towards its objective quickly and cost-effectively, using the city's GHG inventory as an established data source. The complete Good Practices documentation can be found at the link: <https://www.transparency-partnership.net/gpa>.

## 2.7.3 Sets of Indicators

Monitoring progress, which also allows taking actions to achieve objectives, not only requires an understanding of the path towards their achievement, but also the reasons why. For example: are mitigation actions producing the required reductions? Or have emissions been reduced simply because of a slowdown in economic activity? In the event that a mitigation action does not work, it is necessary to investigate whether this is due to external factors (e.g. there is a low demand for more efficient vehicles for social or economic reasons, despite the existence of subsidies), or whether the mitigation action has not been implemented at the appropriate level. Indicator sets combine information from different sources, such as a GHG inventory or economic and statistical data to help establish an adequate level of understanding. The United Kingdom and South Africa use indicator sets.

### South Africa

Indicators developed through the South African M&E system will be used to track the country's progress toward its carbon and resilience goals reflected in its Intended Nationally Determined Contributions (INDC), while providing adequate information to direct mitigation and adaptation actions, in order to fulfill the objectives. The indicators developed include mitigation, adaptation, support received and development of collateral benefits. There are three levels of indicators:

#### 1. High-level national indicators

These indicators monitor the degree by which the country moves toward achieving its objectives and include, for example, low carbon productivity as measured by per capita GHG emissions (CO<sub>2</sub>-eq/population).

#### 2. Sectoral and sub-sectoral indicators

Those that link "bottom-up" and "top-down" indicators. Examples of these indicators are the (sub-)sector's carbon intensity, and GHG emissions of economic (sub-)sectoral activity (CO<sub>2</sub>-eq/unit of product or service).

#### 3. Action level response

These are indicators of the individual impact for each of the actions.

The indicator sets enable South Africa to direct actions towards the country as a whole, as well as to INDC objectives. Indicators make it easier to understand if the country is moving in the desired direction, who are the main drivers, if steps are needed to maintain/increase progress toward the target (e.g., adjusting mitigation actions to achieve the reduction level), and whether funding for climate change is used efficiently. The complete Good Practices documentation can be found at the link: <https://www.transparency-partnership.net/gpa>.

## United Kingdom Carbon Balances

The Climate Change Committee (CCC) has developed a framework of indicators for monitoring budgets. In this manner, evaluation of budgetary compliance must consider both emissions and progress indicators in implementing actions that drive emission reductions, to understand what is happening and above all why it happens. The sectoral indicators were determined based on the experts' knowledge for each sector, and based on policies to reduce emissions. The indicator framework is divided into main indicators and supporting indicators, as shown in Table 1.

Main Indicators	Supporting Indicators
<ul style="list-style-type: none"> <li>• National emissions and sectoral breakdown of emissions from the economy (Source: GHG Inventory)</li> <li>• Intensity of emissions and demand: High-level indicators of supply and demand factors driving emissions.</li> </ul>	<p>Each main indicator is based on a set of supporting indicators, which monitor the progress in implementing the actions necessary to achieve emissions reductions.</p> <ul style="list-style-type: none"> <li>• <b>Performance indicators:</b> monitoring progress in implementing actions</li> <li>• <b>Progress indicators:</b> trajectory of progress indicators used to assess whether the UK is on the right track to implement actions as needed.</li> <li>• <b>Milestone Policy:</b> In order for actions to be implemented successfully, the appropriate framework has to be implemented. Therefore, monitor milestones of the policy measures needed to inform future actions to reduce greenhouse gas emissions.</li> </ul>

**Table 1. Indicators for Carbon Budgets in the UK**

The combination of indicators allows the UK to understand not only the progress towards the objectives set, but also to know what factors control progress (or lack thereof). It therefore enables the UK to understand how mitigation actions have to be targeted to achieve the proposed objectives. The complete Good Practices documentation can be found at the link: <https://www.transparency-partnership.net/gpa>.



## 2.7.4 Avoiding Double Counting

When using data directly from follow-up mitigation actions to understand progress toward the target, care must be taken to avoid double counting. Double counting can occur when mitigation actions are directed at the same sources of emission and reduction related to those sources, and “claimed” by both mitigation actions. This may lead to an overestimation of the total reductions achieved. Chile has integrated an approach to identify and mitigate the risk of double counting as part of its NAMA MRV framework.

### Chile

An appendix to the MRV framework guide for NAMAs provides support to avoid double counting when mitigation actions overlap. When there is a risk of overlap and therefore double counting with another action targeting the same emission sources or sinks, this must be identified during the development of a NAMA, and the working groups involved in the development of both actions must be aligned in every way. The Climate Change Office of the Ministry of the Environment can support this process. There are specific guidelines on the type of overlap that can be found, and two key methods are provided to avoid double counting. The first option is the evaluation of NAMAs as packages to which the same MRV approach should be applied. The other suggested option is the deliberate ad hoc reduction to one of the NAMAs in the overlap area, so that the other NAMA does not cover the potential impacts in this area through its MRV. The approach adopted is intended to ensure that, where there is a significant risk of double counting, it is identified by assessing possible overlaps between NAMAs and pragmatic solutions are found to avoid repetition. With the risk of double-counting reduced to a minimum, better data can be produced to monitor progress towards the Chilean INDC objective. The complete Good Practices documentation can be found at the link: <https://www.transparency-partnership.net/gpa>.

## Appendix

### Appendix 1: Matrix of Good Practices and Angles

TITLE					
	National GHG Inventory	MRV Mitigation Actions	Supporting MRV	Accounting	S Des Imple
γ. Accreditation and Verification Approaches under the European Emissions Trading System (EU ETS)		✓			
ϕ. Evaluation of TDM policies and their impact on the Beijing GHG emissions		✓			
ϕ. MRV framework for mitigation actions in Chile		✓		✓	
ε. China's ETS Pilots, Carbon Markets		✓			
ο. Ambitious Ghana Climate Reporting Program	✓	✓	✓		
ϕ. Improving national GHG inventories with corporate data in Australia	✓	✓			
ν. Ireland's GHG inventory - efficiency development	✓				
λ. Thailand Low Carbon Cities Program (LCC)		✓			

ASPECTS						REMARKS
System Design and Implementation	Institutional Structures	Follow-up Methodologies	QA/QC	Verification	Improvements Over Time	
✓	✓			✓	✓	
		✓				Related to the transport sector
✓	✓				✓	
✓	✓					
✓	✓	✓			✓	
✓						
	✓					
✓	✓					

TITLE					
	National GHG Inventory	MRV Mitigation Actions	Supporting MRV	Accounting	S. Des Imple
9. Monitoring the reduction of GHG emissions in forest lands in the New Zealand Emission Trading System	✓	✓			
10. MRV/Compliance under the GHG System and Goal Management (TMS) in Korea		✓			
11. New York City GHG Accounting System - Assessing Progress Towards City Objectives for 2010-2020				✓	
12. Quality Assurance and Quality Control (QA/QC) in Denmark's National Greenhouse Gas Inventory	✓				
13. Comprehensive MRV system integrating M&E in South Africa	✓	✓	✓		
14. Climate Projects in Spain		✓		✓	
15. UK MRV System of UK Carbon Budgets		✓		✓	
16. Greenhouse Gas Reporting Program (GHGRP)	✓				

ASPECTS						REMARKS
System Design and Implementation	Institutional Structures	Follow-up Methodologies	QA/QC	Verification	Improvements Over Time	
	✓	✓				Related to land use, land-use change and forestry
✓	✓					
	✓				✓	Good practice at city level
			✓			
✓	✓				✓	
✓		✓		✓		
✓	✓					
✓		✓	✓	✓		



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