CACCI FIELD NOTES

An Integrated Result Framework for Tracking Progress in Climate Change Ambitions and Actions in Rwanda

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About the CACCI Field Notes

AKADEMIYA2063 CACCI Field Notes are publications by AKADEMIYA2063 scientists and collaborators based on research conducted under the Comprehensive Action for Climate Change Initiative (CACCI) project. CACCI strives to help accelerate the implementation of Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs) by meeting the needs for data and analytics and supporting institutional and coordination capacities. In Africa, CACCI works closely with the African Union Commission, AKADEMIYA2063, the African Network of Agricultural Policy Research Institutes (ANAPRI), and climate stakeholders in selected countries to inform climate planning and strengthen capacities for evidence-based policymaking to advance progress toward climate goals.

Published on the AKADEMIYA2063 website (open access), CACCI Field Notes provide broad and timely access to significant insights and evidence from our ongoing research activities in the areas of climate adaptation and mitigation. The data made available through this publication series will provide evidence-based insights to practitioners and policymakers driving climate action in countries where the CACCI project is being implemented.

AKADEMIYA2063's work under the CACCI project contributes to the provision of technical expertise to strengthen national, regional, and continental capacity for the implementation of NDCs and NAPs.

AKADEMIYA2063 is committed to supporting African countries in their efforts against climate change through provision of data and analytics using the latest available technologies. Under CACCI, for which Rwanda is a pilot study country, this Field Note aims to guide the tracking of progress in implementing Rwanda's NDC and Green Growth and Climate Resilient Strategy (GGCRS), which represents the NAP.

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AKADEMIYA2063 is a pan-African non-profit research organization with headquarters in Kigali, Rwanda and a regional office in Dakar, Senegal. Inspired by the ambitions of the African Union's Agenda 2063 and grounded in the recognition of the central importance of strong knowledge and evidence-based systems, the vision of AKADEMIYA2063 is an Africa with the expertise we need for the Africa we want. This expertise must be responsive to the continent's needs for data and analysis to ensure high-quality policy design and execution. Inclusive, evidence-informed policymaking is key to meeting the continent's development aspirations, creating wealth, and improving livelihoods.

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ACRONYMS

AFOLU	Agriculture, Forestry and Other Land Use
BTR	Biennial Transparency Report
CACCI	Comprehensive Action for Climate Change Initiative
ECC-TWG	Environmental and Climate Change Thematic Working Group
ENR-MIS	Environment and Natural Resources Management Information System
GGCRS	Green Growth and Climate Resilience Strategy
GHG	Greenhouse Gas
GIS	Geographic Information System
GDP	Gross Domestic Product
IPCC	Inter-governmental Panel on Climate Change
IPPU	Industrial Process and Product Use
IRF	Integrated Result Framework
M&E	Monitoring and Evaluation
MEL	Monitoring, Evaluation and Learning
MINAGRI	Ministry of Agriculture and Animal Resources
MINECOFIN	Ministry of Finance and Economic Planning
MINICOM	Ministry of Trade and Industry
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MRV	Measuring, Reporting and Verification
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NISR	National Institute of Statistics Rwanda
SPCR	Strategic Program for Climate Resilience
SAR	Status Assessment Report
RBME	Results Based Monitoring and Evaluation
REMA	Rwanda Environment Management Agency
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction

Climate change is a global, multidimensional challenge that requires multistakeholder and multisectoral efforts to mitigate and combat its adverse impacts. In line with this, many countries, including Rwanda, have developed various climate change initiatives, including Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs), with varying goals, objectives, and strategic actions. Rwanda's updated NDC proposes an ambitious plan for climate action by setting targets for unconditional emission reductions by 16 percent relative to business-as-usual by 2030. A further 22 percent reduction in emissions is targeted by 2030 contingent on international support and funding. The NDC has prioritized 14 strategic actions to achieve the emission targets as well as to build resilience through adaptation interventions. Implementation of the NDC is estimated to cost US$ 11 billion and Rwanda's government expects that straightforward adaptation interventions will cost US$ 5.3 billion.

The Comprehensive Action for Climate Change Initiative (CACCI) project strives to help accelerate implementation of NDCs and NAPs by meeting needs for data and analytics as well as supporting institutional and coordination capacities. In Africa, AKADEMIYA2063 works closely with the African Union Commission, the African Network of Agricultural Policy Research Institutes (ANAPRI), and climate stakeholders in selected countries to inform climate planning and strengthen capacities for evidence-based policymaking to advance progress toward climate goals. The technical support includes: 1) Clarifying the ambitions and actions stated in each country's NDC and NAP; 2) Building capacity for climate change analysis and action; 3) Facilitating the design and implementation of programs and projects; and 4) Developing progress tracking tools and systems at country and continental levels. This report focuses on the first area of technical support by clarifying the ambitions and actions of Rwanda's NDC and Green Growth and Climate Resilient Strategy (GGCRS), which represents the NAP. The report also aims to guide the tracking of progress in implementing the strategies and achieving the stated ambitions.

Concurrent to the NDC and the GGCRS initiatives, Rwanda has developed a Measuring, Reporting and Verification (MRV) framework as a monitoring and evaluation (M&E) tool to track progress and measure implementation performance of the NDC. Rwanda has also adopted a Ministerial Order for a national report on climate change, which specifies the report's contents, methods for estimating emissions, requirements for vulnerability assessments, and other relevant considerations related to adaptation (Rwanda, Ministry of Environment 2021). The Ministerial Order has prompted the adoption of a Results Based Monitoring and Evaluation (RBME) system by the Ministry of Environment, now referred to as the Environment and Natural Resources Management Information System (ENR-MIS). However, while the ENR-MIS and the MRV are comprehensive and well aligned with the proposed interventions, they have several limitations and gaps that limit their practical implementation as well as their relevance, one of which is the long list of indicators which are difficult to track comprehensively. For example, the MRV framework has proposed 99 indicators organized under different sectors. These indicators and metrics proposed for the NDC are not well-connected and linked with other national and sectoral strategic plans and policies. They are also not organized hierarchically as some indicators are high level outcomes while others are operational outputs that have to be aligned and conceptually interconnected through a results framework. More importantly, neither the ENR-MIS nor the MRV have been fully operationalized and implemented.

The purpose of this report is therefore to review ambitions and actions proposed in all the initiatives, primarily the NDC and the GGCRS, and the M&E systems related to climate change and produce recommendations for integrating and operationalizing the performance tracking systems in a harmonized and consistent manner. This will facilitate well-coordinated implementation towards trackable and measurable outcomes and impacts. More specifically, it clarifies the ambitions and actions proposed under the updated NDC and the GGCRS and the indicators proposed in the Rwanda MRV framework. It also proposes an Integrated Result Framework and key performance indicators needed to operationalize the Rwanda MRV and conduct the stocktaking analysis for the production of a Status Assessment Report (SAR), which would summarize the current status of the indicators, and could constitute the first Biennial Transparency Report (BTR) proposed in the MRV framework. In this report, we specify the logical coherence of ambitions and actions using an Integrated Result Framework (IRF), define key performance indicators that would help operationalize the MRV framework, and propose strategies to create a central database system by integrating additional indicators from the IRF and the MRV framework.

2. Review of Ambitions, Actions and M&E Systems

This section reviews Rwanda's climate change ambitions, actions, and commitments as well as M&E systems related to climate change. The two most important current climate change initiatives in Rwanda are: 1) Updated NDC, and 2) GGCRS. The two initiatives are complementary in the sense that they aim to tackle climate change and its impacts by strengthening mitigation and adaptation efforts. Both initiatives aim to tackle the climate change problem from different angles. The NDC mainly focuses on the mitigation and reduction of greenhouse gas (GHG) emissions while the GGCRS mainly focuses on building resilience and ensuring green growth. The NDC focuses on the environment while the GGCRS focuses on the economy and society. While the interventions proposed in the NDC and GGCRS are complementary, they also have areas of overlap.

The overall vision and missions of these policy initiatives are guided by the Rwanda Vision 2050 and the National Environment and Climate Change Policy (NECCP) adopted in 2019. While the former outlines the overall ambitions of the country in terms of ensuring high standards of living for all Rwandans, the latter defines the environmental sector policy that guides climate change actions as part of the country's overall environmental management efforts.

The mitigation and adaptation ambitions and actions defined in the NDC and GGCRS documents are summarized into two broader categories. The first category contains high-level ambitions and development goals related to environmental and socioeconomic outcomes. The second category includes climate change actions, which can further be categorized into programmatic and system building actions. Programmatic actions are the key intervention areas in priority sectors, while system building actions refer to those interventions that are needed to build the human, institutional and financial capacities to implement the programmatic mitigation and adaptation actions. The list of climate change ambitions and actions are described in the next section.

2.1. Goals and Ambitions of Rwanda's Climate Change Initiatives

The Rwanda National Environment and Climate Change Policy (NECCP) defines the goal of the country's climate change actions (both mitigation and adaptation) as achieving a **"Climate resilient nation with a clean and healthy environment"**. Similarly, the Green Growth and Climate Resilience Strategy (GGCRS) of Rwanda outlines the country's aspiration to become a **"Climate resilient and low carbon economy".** The GGCRS objective is more specific to climate change and includes both mitigation and adaptation ambitions, while the NECCP goal is more general and includes other environmental issues besides climate change. As in many other countries, Rwanda's NDC aspires to reduce GHG emissions. The NDC sets a target of reducing emissions by 38 percent from the business-as-usual scenario, 16 percent of which is unconditional (based on domestic funds) while the remaining 22 percent is dependent on external funding. Should Rwanda continue on the business-as-usual trajectory, annual emission levels are projected to be 12.1 million tons of CO_2 equivalent (CO_2e). The 38 percent target, which reflects the country's potential for reducing emissions and increasing carbon sequestration, represents a reduction of 4.6 million tons of CO_2e. This reduction is mainly expected to come from the agricultural and energy sectors.

There are two key concerns with the ambitions stated in the NDC and GGCRS. First, the ambitions stated in all climate change policy documents including the NECCP, GGCRS and NDC are not just about emission reductions, they are also concerned with building resilience at different levels. However, most discussions and efforts to track progress on climate change actions focus on emission reductions. Reducing emissions is indeed an important global ambition of the Paris Agreement and the NDCs of many countries, but it is not the only one. This is especially important for African countries which have low emission levels, but which experience the widespread and significant adverse impacts of climate change. Any effort to trace progress in implementing the NDC should therefore consider the following four ambitions as key areas of concern: 1) Reducing GHG emissions; 2) Creating environmental resilience; 3) Building economic resilience; and 4) Ensuring community and household resilience.

Second, the achievement of emission reduction targets is dependent on the rate of economic growth. Whether or not it is appropriate to set absolute emission reduction targets remains unclear. Many African countries including Rwanda, set their emission reduction targets in absolute terms. For example, Rwanda aspires to reduce the predicted emission level of 12.1 million tons CO_2e by 38 percent, resulting in an annual CO_2e emission level of 7.5 million tons, by 2030. These are absolute numbers. If we translate these figures into relative terms set against the 2015 gross domestic product (GDP), Rwanda emitted 0.66 tons of CO_2e per US$ one million of

GDP per annum. Assuming an annual GDP growth rate of 8 percent, by 2030, Rwanda's GDP will be close to US$ 22 billion, meaning that the annual relative emission rate by 2030 will be 0.34 tons of CO_2e per US$ one million of GDP if the 38 percent reduction target is met. This requires a reduction in the relative emission rate by 48.5 percent. Assuming an economic growth rate of 6 percent, the relative emission rate will be 0.41 tons per US$ one million of GDP, which translates into a reduction in the relative emission rate of 38.5 percent, which is close to the target for absolute emission reduction of 38 percent. This implies that the 38 percent target may only be achieved if the economic growth rate is below 6 percent. Should the country's economy expand at a growth rate above 8 percent, then achieving the targeted reductions will require more efforts than the actions proposed in the NDC. An important takeaway from this simple simulation is that it demonstrates that African countries, including Rwanda, need to determine their relative targets for emission reductions based on their GDP levels, instead of setting absolute targets for emission reduction.

2.2. Priority Actions in the Rwanda NDC

The 2011 GGCRS proposes 14 priority actions related to both mitigation and adaptation. However, the updated 2020 NDC has prioritized a greater number of actions for both mitigation and adaptation. The following section describes the mitigation and adaptation actions proposed in the updated NDC.

Mitigation actions and greenhouse gas sources

For mitigation purposes, the Rwanda NDC follows the IPCC classification of GHG sources, and prioritizes sectors within four categories: Energy; Industrial process and product use (IPPU); Agriculture, forestry and land use (AFOLU), and Waste management. The NDC aims to reduce CO_2e emissions by 4.6 million tons, primarily from the agriculture and energy sectors which have a reduction potential of 49 percent and 34 percent respectively, of total reduction. The NDC identifies a total of 26 priority sources or actions for reducing CO_2e emissions in each sector, with varying rates of contribution from each sector (Annex 1a). In agriculture, for example, the NDC aims to achieve 47 percent of the emission reductions from soil conservation actions in the form of terracing, crop rotation and multiple cropping, followed by soil fertility management (compost production and fertilizer use efficiency will contribute 30 percent of emission reductions) and livestock management (husbandry, improved species, and manure management will contribute 14 percent). In the energy sector, the NDC aims to reduce emissions mainly through the use of hydropower (32 percent), followed by introduction of solar grids and technology (25 percent). Promoting efficient cooking stoves and the use of sustainable vehicles are also critical areas that the NDC targets for reduced emissions.

Adaptation actions

The updated NDC proposes 24 adaptation actions, including 20 actions in seven priority sectors and four cross-sectoral actions. Agriculture, land and forestry, as well as water are the priority sectors for adaptation, with 15 of the 24 total actions intended for those sectors (Annex 1b). Each sector may have several actions listed in their respective sectoral development plans (e.g., the Strategic Plan for Agriculture Transformation (PSTA)). However, the actions included in the NDC for each sector are those that are strongly connected to either mitigation or adaptation, or both.

Analysis of the NDC actions

An examination of the mitigation and adaptation actions in the NDC highlights the need for several precautionary actions during implementation.

First, *integration of actions is needed.* There are significant overlaps between mitigation and adaptation actions. Although the mitigation and adaptation components differ in terms of ambitions and targeted goals, they are closely similar and highly interlinked at the action level. For instance, most of the proposed actions in agriculture, land use and forestry are equally important for mitigation as well as adaptation. In an African context, it is impossible to disentangle mitigation and adaptation actions. Therefore, an integrated framework that distinguishes mitigation and adaptation at the ambition level and links them at the action level is needed. This framework will help to bring the two separate ambitions together and track them concurrently.

Second, *further clarification and contextualization of actions is vital.* Most of the proposed actions are very generic, while some are sufficiently context-specific and offer clear guidance for implementation. For example, adaptation action #19 related to transport is rather general, which may not enable the prioritization of actions relevant to climate change. The same is true for the health interventions.

Third, *actions should be harmonized across sectors*. For instance, management of soil erosion is mentioned as an action in two or more sectors raising the issue of redundancy in institutional arrangements. Which government institution is responsible for leading soil conservation activities? In practice, the assignment may be clear, but it is difficult to trace the institution responsible for leading soil conservation activities in the NDC document.

Fourth, *the streamlining of actions across result areas is needed* as they are not systematically organized. Some actions aim to induce real technological changes in specific sectors, while others aim to build systems and capacities that are critical to implementing the technological and infrastructural actions. For instance, mobilizing finance, developing early warning systems, and building effective cross-sectoral coordination mechanisms are all related to strategic institutions and capacities that have to be in place before implementing sector-specific operational actions. Mitigation and adaptation actions therefore have to be classified into major groups for practical reasons and to ensure consistency. The first group consists of system building, cross-cutting actions related to strengthening institutions, systems and capacities that serve all sectors. The second group consists of the programmatic actions related to investments and transfers in priority sectors to reduce emissions and ensure resilience. Programmatic actions produce intermediate results that will trigger outcome results related to the NDC ambitions. System building actions aim to put in place the capacities and institutional arrangements that serve as prerequisites for successful implementation of the programmatic actions. Table 1 summarizes the objectives and results expected from the two groups of actions.

Table 1: Description of system building (cross-cutting) and programmatic actions

	System building actions	Programmatic actions
Description	Cross-cutting actions for building systems and responsive capacity	Sector-specific actions for promoting sustainable and inclusive development
Examples	Establishing coordination mechanisms, mobilizing climate finance, promoting climate knowledge management	Promotion of energy saving technologies, expanding soil and water conservation measures, promoting climate smart technologies, providing social cash transfers and building infrastructure
Expected results	Systemic outcomes in the form of effective climate change institutions that will provide inputs to implement programmatic actions	Intermediate outcomes in the form of adoption of technologies and increased productivity that will lead to impact outcomes for reducing emissions and building resilience

2.3. Review of M&E Systems Related to Climate Change

The Rwandan government in collaboration with development partners has developed several M&E systems to track and monitor progress in implementation of climate change actions and attainment of climate change commitments and development goals. These M&E systems can be broadly classified into two categories.

The first category consists of institutional M&E systems which are attached to the regular activities of a given government institution. For example, the Ministry of Environment (MoE) collects and manages information and data on environmental and natural resources through its Environment and Natural Resources Management Information System (ENR-MIS) (formerly termed the Results Based Monitoring and Evaluation (RBME) system). The Rwanda Environmental Management Authority (REMA) also conducts an annual assessment of the implementation of environment and climate change activities by reviewing sector ministry and district reports.

The second category consists of M&E frameworks which are attached to specific policies, strategies and programs designed to track and report progress on the implementation of the proposed actions and achievement of the objectives stated in programs and strategies. These frameworks are usually sector- or problem-specific as well. In terms of climate change in Rwanda, the two most important M&E frameworks are: 1) the Rwanda Measuring, Reporting and Verification (MRV) framework, which is attached to the NDC, and 2) the Rwanda Adaptation Monitoring, Evaluation and Learning (MEL) system, which is attached to the GGCRS. Whereas the adaptation MEL system is used to measure performance and outcomes of adaptation actions using country-specific indicators and approaches, the MRV framework is associated with mitigation and the measurement and reporting of greenhouse gas emissions using a common metric (tons of carbon dioxide). The MRV framework also includes verification of emission reductions to the international community to ensure that the reported data is correct and accurate. Both frameworks aim to establish a robust and inclusive climate change monitoring system which would ensure that Rwanda meets the enhanced transparency requirements

of the Paris Agreement. In this section, we review these two frameworks in terms of their ambitions, progress, and limitations.

Environment and Natural Resources Management Information System (ENR-MIS)

The Rwanda Ministry of Environment has developed an inclusive M&E system previously called the Results Based Monitoring and Evaluation System (RBME) and now termed the Environment and Natural Resources Management Information System (ENR-MIS). This data repository and information system is an interactive web-based digital system that allows data collection from different sectors and from districts. It also has data processing capabilities to enable the tracking of progress and achievements. The ENR-MIS includes 131 indicators from different sectors and covering multiple environment aspects, including some selected indicators from the Rwanda MRV (Figure 1). The ENR-MIS has been well-organized and designed as a interactive system whereby all government bodies at national and district levels can easily upload, analyze and visualize data. The Ministry has organized several capacity building and awareness activities to prepare district level and national institutions to regularly update the date as per the specified data collection frequency. However, the rate of compliance and timely updating is not yet high enough to fully operationalize the system and generate complete reports. Additional efforts are required to encourage district officers and national institutions to collect and upload the data in a comprehensive and timely manner.

Figure 1: Number of ENR-MIS indicators by sector
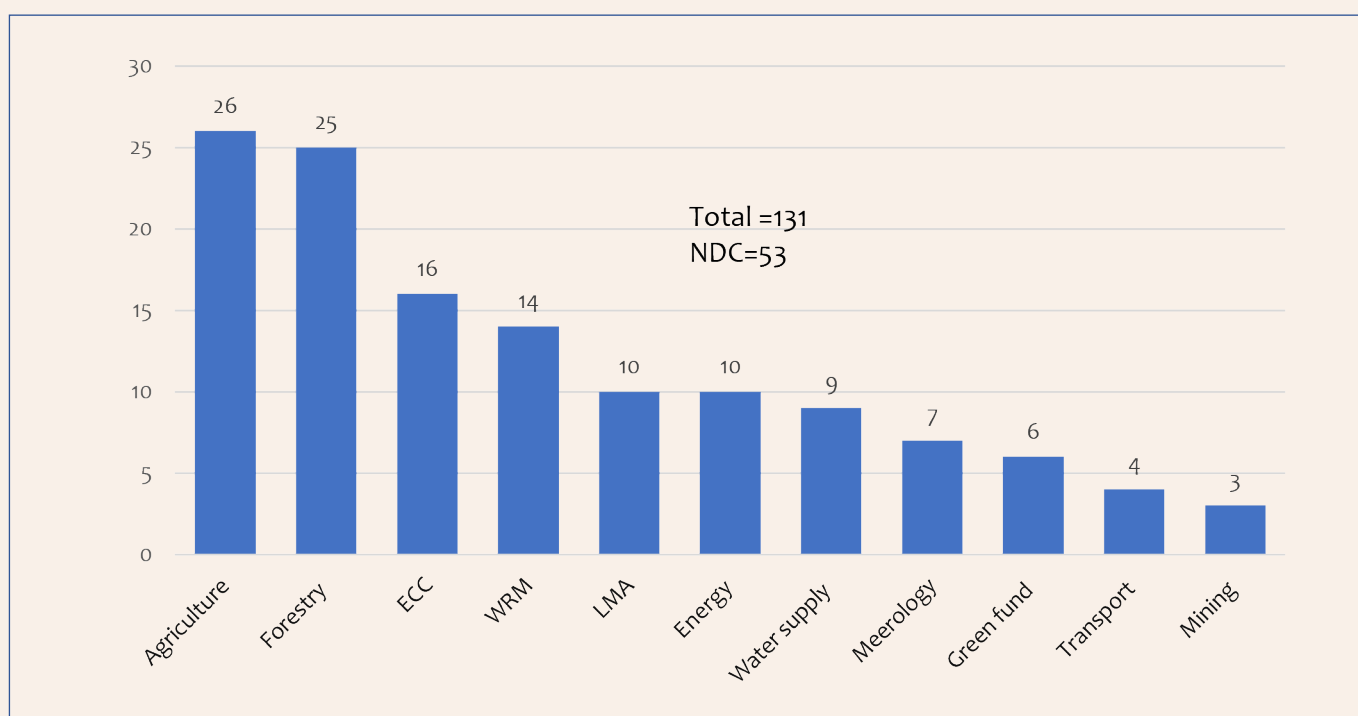
Source: Rwanda Ministry of Environment; **Note:** ECC=Environment and Climate Change, WRM=Water Resource Management, LMA=Land Management and Administration

The Rwanda MRV Framework

The Ministry of Environment (MoE), with the support of the World Bank, prepared Rwanda's MRV framework in 2021 to track and monitor progress on the implementation of the Updated Nationally Determined Contribution (NDC), which was submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in June 2021. The report provides a high-level overview of the framework's design and proposes around 100 mitigation and adaptation indicators across several sectors in the country, although it primarily focuses on mitigation indicators (Annex 2). Of the 99 total trackable indicators, 57 are mitigation indicators, while the remaining 42 are adaptation indicators. Figure 2 summarizes the number of MRV indicators by objective and sector. Agriculture, forestry, and other land use (AFOLU) including water, accounts for the largest number of indicators, followed by the energy sector.

Figure 2: Number of MRV indicators by objective and sector, Rwanda
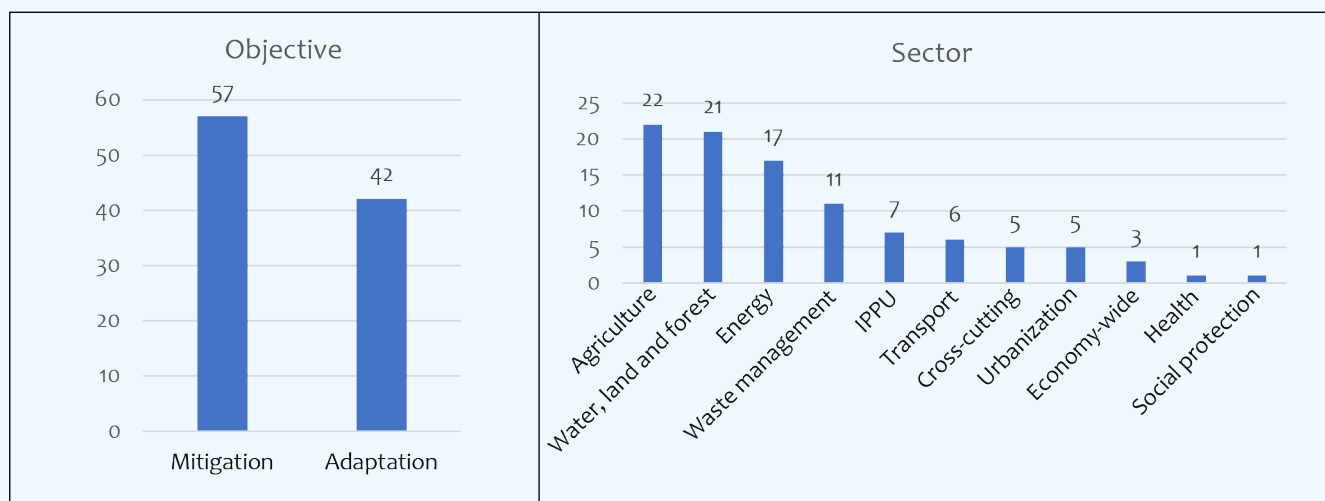
Note: IPPU = Industrial processes and product use.

The framework also sets out a roadmap to establish the MRV system and provides valuable information on the aim and purpose of the MRV system, data collection, indicators, and institutional arrangements. It also suggests that a gap analysis be conducted before operationalization of the MRV. The framework recommends a Biennial Transparency Report (BTR) that would report on the state of climate change mitigation in Rwanda and would be submitted to the UNFCCC and the public at large. The BTR will support the policy cycle by tracking progress toward the achievement of climate change targets (Gashugi et al. 2021). However, the Rwanda MRV has not yet been operationalized and the BTR has not been produced.

The Rwanda Adaptation MEL System

The adaptation MEL system is guided by the Ministerial Order No. 005/2021 of 08/04/2021 that determines the procedures for the preparation of a National Report on Climate Change which will enable Rwanda to meet reporting requirements under the UNFCCC and Paris Agreement. Based on the updated Rwanda NDC, the adaptation MEL system is supposed to:

- Report on progress made towards the targets defined in Rwanda's NDC and track the progress made in implementation of the adaptation actions by identifying relevant indicators at national and global levels.

- Measure the impacts of adaptation and mitigation actions to enable attribution of changes to the interventions.

- Enable the identification of challenges to inform policy changes that would improve the design and implementation of climate change actions.

Recently, the MoE, with the support of the NAP Global Network, has prepared a series of briefing notes for operationalization of the Rwanda adaptation MEL in the agricultural sector, as a pilot project. The first briefing note reviews the policy context and work done to date in addition to elaborating on the aims and objectives of the MEL system for the agricultural sector (Tsinda et al. 2022a). The note indicated that there is a strong need to clarify the aims and purposes of the MEL system as an important step toward its implementation. The second briefing note elaborates on the institutional arrangements for collecting, analyzing, and reporting on NDC indicators in the agricultural sector. It also underscores the importance of forming an NDC-MRV/MEL Technical Working Group as a sub-committee of the Environmental and Climate Change Thematic Working Group (ECC-TWG). The sub-committee would provide technical oversight and coordinate operationalization of the MRV and MEL systems at the national level (Tsinda et al. 2022b). The third briefing note identifies 10 indicators for tracking the progress of priority adaptation actions in the agriculture sector (Tsinda et al. 2022c). The fourth briefing note reports on the estimated values of these indicators based on Rwandan case studies (Tsinda et al. 2022d). However, this initiative is limited to the agricultural sector and considers only a few indicators that do not provide a complete overview of adaptation and mitigation actions. To date, the Rwanda adaptation MEL system has not been operationalized completely.

2.4. Recommendations

The reviews and analysis presented above indicate the need to 1) systematically clarify ambitions and actions to permit better understanding of the ambitions and guide the implementation of actions, 2) integrate the M&E systems towards a unified and consistent tracking system at sectoral level, and 3) operationalize the M&E systems, in particular the MRV. In order to achieve these objectives, we propose the following recommendations:

1. Development of an Integrated Result Framework that provides input for operationalizing the various M&E frameworks under the different initiatives in an integrated, structured, and expanded manner. The IRF helps to identify key performance indicators which are informative, inclusive, and practically manageable.
2. Focus on key performance indicators for operationalizing the MRV and other M&E systems through prioritization and revitalization of the indicators proposed in the different sytsems. This will help to effectively launch the implementation of the MRV and produce a Status Assessment Report (SAR) that would serve as the basis for the first Biennial Transparency Report.
3. Integration of the database systems related to climate change to avoid duplication of efforts and build a consistent and credible reporting system. To this effect, the ENR-MIS should serve as a data repository platform for all reporting requirements by external as well as internal users. Data collection is a costly exercise that can only be simplified through coordinated and centralized system. Therefore, the data collection for operationalizing the MRV should take place through the ENR-MIS.

In subsequent sections, we explain the details of these recommendations.

3. An Integrated Result Framework (IRF)

Based on the preceding analysis and clarifications, we strongly recommend that Rwanda's different climate change ambitions and actions should be organized into an Integrated Result Framework (IRF) that brings together priority ambitions and actions, guides their implementation, and tracks implementation and outcomes. It is important to note that the primary objective of the IRF is to operationalize an integrated M&E system that brings together the different climate change related M&E systems for the different initiatives. However, it also helps to clarify and integrate ambitions and actions that are stated in various climate change initiatives including the updated NDC and the GGCRS.

The IRF also helps to develop an inclusive and comprehensive tracking system. Most MRV and ENR-MIS indicators are activity indicators that only measure the implementation of activities instead of results and outcomes. There are no indicators that measure the ambitions of the NDC, except the emission reduction indicator. Indicators that can measure other ambitions such as development of environmental, economy-wide and household resilience are missing. An inclusive tracking system should measure not just the implementation performance of actions but also the expected outcomes from implementing system building actions. Measuring outcomes is essential to ensure that sector-specific activities are indeed contributing to economy-wide welfare improvements. Moreover, some important system level indicators are missing. These include the level of awareness and education of consumers and producers on climate change impacts and actions, as well as the governance system for climate change actions in terms of decentralization and other institutional arrangements. Operationalization of the MRV indicators would fill these gaps and generate an inclusive and complete body of evidence to guide policy decisions.

In order to develop the Integrated Result Framework for Rwanda's climate goals and ambitions, we adopt the following three steps.

First, we define priority ambitions. As stated above, the NDC ambitions include both mitigation and adaptation goals that can be summarized into four priority ambitions: 1) Reduction of GHG emissions; 2) Strengthening of ecosystem resilience; 3) Development of economy-wide resilience; and 4) Building of household resilience. The achievement of all four ambitions is expected to result in *a climate resilient and low carbon economy* as stated in the GGCRS.

Second, we summarize and prioritize sector-specific programmatic actions that lead to intermediate results in priority sectors. In line with the prioritization of sectors in the GGCRS, we summarize the objectives of the programmatic actions into four priority objectives: 1) Sustainable energy supply; 2) Resilient and productive agriculture; 3) Land, water, and forestry management; and 4) Inclusive social protection. As stated in many of the climate change policy documents, the overall objective of these specific objectives can be summarized as *promoting sustainable and inclusive development*.

Third, we redefine and summarize the system building, cross-cutting actions into key performance result areas. To implement the programmatic actions in priority sectors and achieve the stated ambitions and goals, the actions related to building capacities and institutions have to be identified and prioritized. Based on the review of Rwanda's climate change policy documents, the following three objectives are considered as key performance result areas at systemic intervention level:

1) *Establishing an effective climate change governance system*: This includes effective coordination of climate change actors at all levels and decentralization of climate change actions at district level. Rwanda's policy documents also call for the establishment of public-private partnerships on climate change actions and investments.

2) *Broadening climate finance and investment*: All the climate change policies and programs prioritize the issue of broadening and diversifying the sources of finance for climate change actions. The Rwanda NDC, for example, proposes a rapid increase of investments in climate change actions by diversifying financing from domestic and global sources. For instance, Rwanda requires US$ 11 billion if it is to achieve the targets set for mitigation and adaptation. The country has made a commitment to allocate US$ 4.1 billion from domestic sources, and the remaining US$ 6.9 billion will be sourced from global contributions. Of the US$ 11 billion, US$ 5.7 billion is designated for mitigation and US$ 5.4 billion for adaptation. Given the priority of adaptation in Africa, the target seems slightly biased towards mitigation.

3) *Building responsive knowledge capacity*: This includes building the human capacity for designing, implementing, and monitoring climate change actions. It also includes developing a new generation of knowledge and technology for mitigation and adaptation through research, education, and development.

All three cross-cutting objectives are summarized as, ***"Building institutions and responsive capacity"***, constituting an overall systemic objective for Rwanda's climate change initiatives.

Figure 3 summarizes the different result areas discussed above at the levels of outcome results (which correspond to the high-level goals and ambitions); intermediate results (corresponding to the programmatic actions); and systemic results (corresponding to the strategic objectives of building capacity and institutions). The IRF has several stylized features. It integrates both mitigation and adaptation outcomes and activities, which enables the tracking of progress in all climate change actions. It focuses on priority objectives and sectors. As all climate change actions and sectors are not equally impactful, the IRF helps in identifying those actions and sectors which are vitally important for the country. The IRF helps guide the implementation of the NDC and NAP in a way that is coordinated and harmonized. It also helps to measure attributions of the different climate change interventions by different stakeholders. It organizes ambitions and commitments hierarchically in order to clarify the steps that are needed to achieve the high-level goals and ambitions.

Figure 3: Proposed Integrated Result Framework for Rwanda NDC and NAP

	Level 1. Climate resilient and low carbon economy (development objective)			
Outcome Results	1.1. Low carbon economy	1.2. Resilient environment and ecosystem	1.3. Resilient macro-economy	1.4. Resilient communities and households
	↑	↑	↑	↑
	Level 2. Sustainable and inclusive economic and social development (intermediate objective)			
Intermediate Results	2.1. Sustainable energy supply	2.2. Resilient and productive agriculture	2.3. Land, water and forest management	2.4. Inclusive social protection and human settlement
	↑	↑	↑	↑
	Level 3. Building institutions and responsive capacity (strategic objective)			
Systemic Results	3.1. Effective climate governance system	3.2. Increased climate finance and investment		3.3. Responsive climate change knowledge capacity

Source: Authors' compilation

The framework defines 11 result areas for which several indicators and metrics can be developed. Besides clarifying ambitions and actions for guiding implementation, the framework is a guiding tool for development of indicators that are consistent across different levels of results. Defining performance indicators at different levels of the results framework is essential for many reasons. First, this helps to trace the missing links, enable learning, and identify priority areas for subsequent actions. Second, it facilitates mutual accountability by indicating areas that have caused low performance. Third, it allows for tracing of the sources of success. Most importantly, the indicators help in tracking the progress of NDC and NAP implementation and outcomes. Whereas implementation performance is measured at the lower (activity and output) levels of the IRF, outcome performance is measured at the upper levels (intermediate and final outcomes). Though attribution at the level of impact outcomes can be challenging, the changes in intermediate outcomes and outputs can reasonably be associated with NDC and NAP implementation by measuring and reporting them all together in an integrated manner.

4. Key Performance Indicators

The MRV framework proposes a total of 99 mitigation and adaptation indicators, which would be difficult to track in practice given the available resources and capabilities. One way to minimize the number of indicators is to prioritize them according to their importance and the practicality of data collection. Another way to do so is to integrate mitigation and adaptation indicators. Mitigation and adaptation actions are inseparable in an African context, as the same priority actions contribute to both mitigation and adaptation outcomes. For example, agriculture, forestry, and other land use (AFOLU) is a priority sector for both mitigation and adaptation actions. The use of separate M&E systems for mitigation and adaptation would therefore be unrealistic and unfeasible. Besides the inseparability of mitigation and adaptation actions, implementing the MRV and the MEL separately would be both costly and redundant. The MRV and MEL systems may have different points of focus, but both systems have many indicators in common.

One way to reduce the number of indicators is the use of composite indicators. Composite indicators, such as a vulnerability index, are constructed based on a combination of multiple single indicators. The proposed metrics for measurement of ambitions and goals are single indicators which are more prone to measurement bias and errors. Composite indicators are less subject to these challenges as they are generated through a combination of different indicators representing different dimensions of a given outcome. They also provide a more nuanced picture of an outcome at community or national level.

4.1. Proposed Key Performance Indicators

Table 2 lists the 30 key performance indicators for measuring progress in the 11 result areas proposed in the IRF. Ten indicators are proposed to measure high-level result areas including reducing emissions and building environmental, economic, and household-level resilience. Thirteen indicators are proposed to measure intermediate results or outcomes in the four priority sectors, which represent more than 60 percent of the MRV indicators. These indicators measure achievements made in introducing innovations and technologies as well as inducing structural changes. A total of seven indicators are proposed to capture performance in building systems and capacities in the areas of governance, climate finance, and knowledge. As some of the indicators in this category are qualitative, we propose the use of composite indices for their measurement. Of the seven indicators, four are composite indices that will be constructed based on several related sub-indicators.

For the sake of consistency and traceability, Table 2 highlights whether the specified indicators are aligned with the indicators in the MRV. Indicators taken directly from the NDC and/or MRV are therefore labeled "MRV". Most indicators at the intermediate result level are taken from the MRV and are closely linked with sector-specific interventions. The other indicators were modified or updated either by merging several indicators or by further elaborating them to form composite indicators. These indicators are labeled "MRV+". New indicators are also included to bridge the gaps stated above and are labeled "New". The newly added indicators are mainly obtained from the GGCRS and are related to the measurement of ecosystem and economic resilience, as well as the measurement of strategic results related to system capacity building.

Of the 99 MRV indicators, about half are included in one way or another in the 30 key performance indicators (KPIs) proposed in this report. Of these 30 KPIs, nine are composite indicators, each of which includes two or more indicators from the MRV. The remaining MRV indicators (mainly mitigation indicators) are not included for the following reasons. First, some indicators require extensive data and technical capabilities that are not readily available, at least for the first round of MRV implementation. Examples of such indicators are those

related to industrial products and product use, waste management and urbanization. As operationalization of the extended MRV advances, these indicators will be included in the second and third rounds of tracking progress in NDC and GGCRS implementation. Second, some MRV indicators are not indicators *per se* but are inputs for measuring other indicators. Examples include population, crop area, livestock population, cultivated land, etc. These are not strategic indicators, but rather inputs to calculate relative values and shares. Third, some of the MRV indicators are vaguely defined and represent activities and processes, and so they are not relevant for tracking results. Examples are capacity building, development of strategies and guidelines, availability of low carbon technologies, mode of transportation, etc.

For the sake of measurement and analysis, the proposed indicators are broadly grouped into four clusters based on the type of data needed to estimate their values. The first cluster includes indicators based on geophysical data which capture environmental outcomes and will be measured using GIS and remote sensing approaches. The second cluster includes aggregate outcome indicators that will be estimated based on data from secondary sources, mostly the records of national ministries and agencies. The third cluster includes indicators which will be measured using microdata from households and enterprises. Data for these indicators will be obtained from the household surveys conducted by the National Institute of Statistics of Rwanda (NISR). However, additional data may be required to supplement the NISR data. In such instances, a light-touch and targeted survey will be implemented. The fourth cluster includes indicators which will be measured using observational data obtained from key informant interviews (KIIs). The two governance indices as well as the land use and management index are representative of this type of indicator. They will be measured based on responses from subject matter experts.

Table 2: Key performance indicators for operationalizing the Rwanda MRV and the proposed IRF

Codes	Proposed KPIs by result areas	Source	Cluster
Level 1: Climate resilient and low carbon economy			
1.1.	**Low carbon economy**		
1.1.1.	GHG emissions	MRV	1
1.2.	**Ecosystem resilience**		
1.2.1	Land use and land cover	New	1
1.2.2	.Extent of land surface temperature anomaly	New	1
1.2.3	Normalized Difference Vegetation Index (NDVI)	New	1
1.2.4	Rainfall anomaly	New	1
1.3.	**Economy-wide resilience**		
1.3.1	Projected change in economic growth due to climate change	MRV+	2
1.3.2	Export diversification index	New	2
1.3.3	Price volatility	New	2
1.4	**Household and community resilience**		
1.4.1	Climate change vulnerability index	New	3
1.4.2	Resilience Capacity Index	New	3
Level 2: Sustainable and inclusive economic and social development			
2.1.	**Sustainable energy and water supply**		
2.1.1.	KWH generated from hydroelectric power	MRV	2
2.1.2	Share of households adopting energy saving cooking stoves and on-farm biogas	MRV	3
2.1.3	Share of households using solar energy for heating, lighting, irrigation and other uses	MRV	3
2.2.	**Water, land, and forestry management**		
2.2.1.	Per capita water storage	MRV	2
2.2.2	Land use and management index	MRV+	4
2.2.3	Land covered by agroforestry	MRV	2
2.2.4	Hectares of forest restored/afforested	MRV	2

2.3.	**Resilient and productive agriculture**		
2.3.1	Climate Smart Agriculture Adoption Index (CSA-AI)[1]	MEL/MRV+	3
2.3.2	Area of land under erosion control measures and used optimally	MRV and MEL	2
2.3.3	Percentage of hectares under irrigation within Integrated Water Resources Management (IWRM) framework	MRV and MEL	2
2.3.4	Share of farmers benefitting from or purchasing weather insurance	MRV and MEL	3
2.4.	**Social protection**		
2.4.1	Budget amounts allocated to social protection support activities	New	2
2.4.2	Population covered by Disaster Risk Reduction (DRR) programs	MRV	2
Level 3. Building institutions and responsive capacity			
3.1.	**Climate change governance system**		
3.1.1	Climate Change Coordination Effectiveness Index	MRV+	4
3.1.2	Climate Change Actions Decentralization Index (CCADI)	New	4
3.2.	**Climate change finance and investment**		
3.2.1	The amount of climate finance allocated by domestic institutions	MRV	2
3.2.2	The amount of international climate finance by source	MRV	2
3.3.	**Climate change knowledge and information**		
3.3.1	Percentage of extreme weather events for which advance warning was provided at least 30 minutes in advance	MRV	2
3.3.2	Climate Change Education and Awareness Index (CCEAI)	New	3
3.3.3	R&D spending on climate change mitigation and adaptation	MRV+	2

[1]**Note:** CSA practices may include, but are not limited to, use of compost, deep fertilizer application, crop rotation, conservation tillage, improved seeds, new animal breeds, new fodders, and manure management.

4.2. Metrics for the Key Performance Indicators

While the metrics for some indicators are straightforward and clear, metrics for others are not as clearly defined. For instance, the indicators and metrics related to greenhouse gas (GHG) emissions such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are well documented. However, additional sets of commitments, mainly related to the NAP, are not clearly articulated and quantified using metrics that lend themselves easily to tracking and review. Even for GHG emissions, it is not clear how they can be efficiently and accurately estimated using emerging digital technologies and remote sensing data. The metrics for qualitative indicators such as institutional arrangements, capacity building, technology development and transfer are not yet clearly defined.

The indicators proposed in Table 2 are diverse both in terms of content and composition. Some are indices that will be computed using several variables, while others are based on single variables. Annex 3 describes the 30 indicators listed above in terms of their definitions, including the variables used and the computational approach; units of measurement; frequency of estimation; data sources; and the extent of data disaggregation. Regarding frequency of estimation, most of the indicators vary across years, so the data will be collected on an annual basis. However, reports could be generated on a biennial basis as suggested by the Rwanda MRV framework.

Following the description of the indicators, an integrated data collection template or tracking tool will be prepared for data collection. The tracking tool will include all the indicators, but the respective data points will be collected from different sources. We propose the use of data from GIS-based remote sensing methods, administrative data from different ministries, and data from household surveys and international sources. In Rwanda, the National Institute of Statistics Rwanda (NISR) collects household survey data in rural and urban areas. These datasets will be used to estimate some of the indices related to vulnerability, resilience, adoption of technologies and access to social protection. Macroeconomic variables will be estimated based on national data from the Ministry of Finance.

5. An Integrated Database System

Despite overlapping actions and ambitions, Rwanda has initiated several M&E systems to track progress in the implementation of climate change initiatives and to measure overall performance in environmental protection. The two major initiatives are the MRV framework to track progress in the implementation of the Rwanda NDC and the Environment and Natural Resources Management Information System (ENR-MIS), formerly termed the Results Based Monitoring and Evaluation System (RBME), used to track overall sectoral performance. The MEL presented above is a sub-set of both the ENR-MIS and the MRV to track progress in agricultural adaptation as a pilot initiative. This study has also proposed an integrated result framework with key performance indicators to facilitate the operationalization of the MRV with additional high-level outcome and system-level indicators besides the climate actions proposed in the updated NDC. Data collection for all these initiatives may create problems related to 1) duplication of efforts and the exorbitant cost of monitoring and evaluation, and 2) conflicting and inconsistent reports. An integrated database system is required to bring the MRV, ENR-MIS and IRF systems together and reduce the cost of data collection as well as the occurrence of inconsistencies. More specifically, we recommend integrating the following additional indicators into the ENR-MIS so that it serves as an overall data repository dedicated to climate change and environmental issues related to resilience and green growth as well as reduction of greenhouse gases.

5.1. Integration of Newly Proposed IRF Indicators into the ENR-MIS

Many of the KPIs drawn from the IRF are aligned with the MRV. However, the IRF has also proposed additional indicators to capture high-level environmental and economy-wide outcomes. It has also proposed indicators to measure achievements in building institutions and capabilities as an input for implementing climate change actions. These indicators are critically important to capture the larger picture of climate actions and their sustainability as reflected by the development of systems, institutions, and capabilities. Therefore, the indicators should be integrated into the ENR-MIS so as to build a comprehensive database system that helps to track and report the different aspects of environmental protection and climate changes initiatives.

Table 3 lists the proposed additional indicators extracted from the IRF that need to be incorporated into the ENR-MIS, including geospatial indicators, indicators related to economy-wide resilience, and indicators of institution building. The geospatial indicators can easily be measured using GIS and remote sensing data and approaches. The economy-wide resilience indicators can be estimated using existing data with some adaptation to account for climate change issues. One such adaptation, for example, is the measurement of "change in growth rate due to climate change", which will be estimated through comparison of archived GDP growth rates against predicted GDP growth rates under a climate change scenario without mitigation and adaptation actions. The predictions will be available for Rwanda under the CACCI project and hence the measurement can be carried out easily. This indicator helps to gauge how mitigation and adaptation actions can help to reverse the adverse growth trajectory caused by climate change. The institutional building indicators can also be measured using qualitative assessments of changes and of the effectiveness of the institutional architecture designed for implementing climate change actions.

Table 3: List of additional IRF indicators to be incorporated into the ENR-MIS platform

Geospatial ecosystem resilience indicators	Economy-wide resilience indicators	System and institutional building indicators
• Land use and land cover	• Reduction in economic growth rate due to climate change	• R&D spending on climate change mitigation and adaptation
• Extent of land surface temperature anomaly	• Export diversification index	• Climate Change Education and Awareness Index (CCEAI)
• Normalized Difference Vegetation Index (NDVI)	• Price volatility index	• Climate Change Coordination Effectiveness Index
• Rainfall anomaly	• Climate Resilience Index	

5.2. Expansion of the MRV Indicators under the ENR-MIS

The MRV indicators must be fully integrated into the larger data repository—the Environment and Natural Resources Management Information System (ENR-MIS). The ENR-MIS includes 131 indicators from different sectors including some selected indicators from the Rwanda MRV. However, some of the important MRV indicators are not fully included and integrated. To avoid the duplication of efforts and have a consistent sector-wide M&E system, it will be necessary to merge the different M&E systems into one integrated data repository

system. This will enhance the consistency, effectiveness, and credibility of the environmental information system. Once the indicators are integrated into the ENR-MIS and data is collected, various reports can be extracted from the system in line with the different reporting requirements, including the operationalization of the Biennial Transparency Report (BTR), as required by the Rwanda MRV framework.

53 MRV indicators are included in the ENR-MIS system, mainly mitigation indicators from the two major sectors, namely energy and AFOLU. The indicators listed in Table 4 are missing from the ENR-MIS list and should be incorporated so that system becomes an inclusive and comprehensive database that can serve as a source of data for MRV reporting. These indicators represent both adaptation indicators from the agriculture and energy management sectors, and mitigation indicators from IPPU and waste management. The inclusion of these indicators would make the ENR-MIS database sufficiently comprehensive to produce a complete MRV report. The metrics corresponding to some of the indicators, e.g. progress in waste recycling, will need to be further developed in consultation with the appropriate expertise, and data collection could be challenging. However, even if it is not possible to collect data on all of the indicators in the first few rounds, it is important to include the indicators in the system, and the data collection will become progressively more complete through time as capacities are built within the different sectors.

Table 4: List of additional MRV indicators to be incorporated into the ENR-MIS platform

Agriculture	Emergency Management	Industrial Product and Product Use (IPPU)	Waste Management
Percentage of hectares under irrigation within IWRM framework	Amount of budget allocated to social protection support activities	Number of efficient brick kilns	Current organic waste disposal (t)
Number of farmers purchasing weather insurance	Number of victims supported by Disaster Risk Reaction Program	Cement (% non-fossil energy use)	Landfill gas (LFG) utilization
Number of farmers adopting climate resilient crop varieties		Number of on-farm biodigesters	Number of Waste-to-Energy (WtE) sites
		F-gas use (list the gases and amounts in kg)	Waste recycling progress

Note: IWRM=Integrated Water Resources Management.

6. Summary and Conclusion

This report has been produced to support the harmonization and operationalization of the M&E systems related to environmental management and climate change in Rwanda. To this effect, the report reviews the existing climate change ambitions and actions stated in the updated Rwanda NDC and the GGCRS as well as the M&E systems designed to track progress in the environmental sector. The review indicates that there exist several initiatives that aim to address climate change and foster green growth as well as to track the progress of climate actions, including the ENR-MIS of the Ministry of Environment, the MRV framework to track implementation progress of the NDC, and a pilot MEL to demonstrate the possibility and importance of measuring adaptation in the agricultural sector. The existence of multiple initiatives, however, complicates their implementation and raises the risk of confusion and redundancy.

In order to clarify the different initiatives, integrate the M&E systems and operationalize the MRV framework, this report recommends the following stepwise actions: 1) development of an Integrated Result Framework that helps to clarify ambitions and systematically organize ambitions and actions as well as to develop key performance indicators; 2) identifcation of key performance indicators that will help to operationalize the MRV framework and produce the first Biennial Transparency Report; and 3) integration of the multiple databases and M&E systems through the inclusion in the ENR-MIS of additional indicators from the IRF and the MRV. This will allow the ENR-MIS to serve as a comprehensive data repository platform for any required reporting related to environmental management and climate change.

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8. Annexes

Annex 1a: Proposed mitigation actions in Rwanda NDC

	Proposed actions	Target (% of contribution to total emission reductions for the sector)
Agriculture		
1	Compost production	28
2	Soil conservation/rotation	24
3	Soil conservation/terracing	20
4	Conservation tillage	9
5	Improved livestock husbandry	6
6	Improved livestock species	5
7	Manure management	3
8	Soil conservation/multi-cropping	3
9	Improved fertilizer efficiency	2
Energy		
10	Hydropower	32
11	Efficient cooking stoves	13
12	Solar mini-grid	10
13	Solar irrigation	10
14	Vehicle standards	10
15	Electric vehicle	9
16	On-farm biogas	8
17	Solar water heaters	3
18	Other solar	2
19	Industry	2
20	Efficient lighting	1
Industrial Process and Product Use (IPPU)		
21	Increased pozzolanas in cement	78
22	F-gases substitution	22
Waste management		
23	Landfill gas utilization	54
24	Waste-to-energy	34
25	Aerobic composting	9
26	Waste-water treatment	3

Annex 1b: Proposed adaptation actions in Rwanda NDC by sector

	Adaptation actions
Water	
1	Develop a National Water Security through water conservation practices, wetland restoration, water storage and efficient water use
2	Develop water resource models, water quality testing, and improved hydro-related information systems
3	Develop and implement a catchment management plan for all Level 1 catchments
Agriculture	
4	Develop climate resilient crops and promote climate resilient livestock
5	Develop climate resilient post-harvest and value-addition facilities and technologies
6	Strengthen crop management practices (disease prevention, diagnostics, surveillance and control)
7	Develop sustainable land management practices (soil erosion control, landscape management)
8	Expand irrigation and improve water management
9	Expand crop and livestock insurance
Land and Forest	
10	Development of Agroforestry and Sustainable Agriculture (control soil erosion and improve soil fertility)
11	Promote afforestation/reforestation of designated areas
12	Improve Forest Management for degraded forest resources
13	Integrated approach to planning and monitoring for sustainable land management
14	Develop a harmonized and integrated spatial data management system for sustainable land use management
15	Inclusive land administration that regulates and provides guidance for land tenure security
Human Settlement	
16	High density buildings and upgrading of informal settlements
17	Storm water management
Health	
18	Strengthen preventive measures and create capacity to adapt to disease outbreaks
Transport	
19	Improved transport infrastructure and services
Mining	
20	Enforce climate compatible mining
Cross-cutting	
21	Disaster risk monitoring
22	Establish an integrated early warning system, and disaster response plans
23	Institutional capacity building and development for coordinating NDC implementation
24	Access to finance

Annex 2 Rwanda MRV Indicators

	Indicators	Included in IRF or not (1=Yes, 2=No)	Sector*
	Mitigation indicators		
1	GHG emissions: change from business-as-usual prediction	1	1
2	GDP	1	1
3	Population	2	1
4	Domestic climate finance	1	2
5	International climate finance	1	2
6	Electricity demand (GWH)	2	3
7	Emission intensity of grid supply	2	3
8	Share of renewables in total electricity supply	2	3
9	Hydropower supply	1	3
10	Off-grid electrification	2	3
11	Solar street lighting	2	3
12	Development and strengthening of grid infrastructure, including grid losses	2	3
13	Lake Kivu methane gas utilization and emissions monitoring programme	2	5
14	Rural Electrification Strategy development	2	3
15	Fossil fuel use	2	3
16	Average fuel economy for newly registered vehicles (liters of fuel consumed per 100 km)	2	3
17	Rooftop solar (MWp)	1	3
18	Number of compact fluorescent lighting replacements	2	3
19	Efficient stoves (number of households)	1	3
20	Number of solar water heater installations	2	3
21	Number of efficient brick kilns	2	6
22	Cement (% non-fossil fuel energy use)	2	6
23	Number of on-farm biodigesters	2	3
24	Solar irrigation (Ha)	2	3
25	E-mobility, modal shifts and other forms of progress in public transport	2	9
26	Availability and cost of new and low carbon energy technologies	2	9
27	Pozzolana use for cement production (t)	2	3
28	Clinker/cement ratio (%)	2	6
29	Imported HFC (Kg)	2	6
30	F-gas use (list the gases and amounts in kg)	2	6
31	F-gas substitution (%)	2	6
32	Crop production (total tons of crop biomass)	2	6
33	Livestock production (# population)	2	4
34	Compost application (Ha and tons/Ha)	1	4
35	Deep fertilizer and biomass use in rice production (kg/tons of rice)	1	4
36	Terraced land (Ha)	1	4
37	Crop rotation (Ha)	1	4
38	Banana and coffee multi-crop production (Ha)	1	4
39	Conservation tillage (Ha)	1	4
40	New fodder species production (Ha)	1	4
41	New fodder use (# cows)	1	4
42	New species (# cows replaced with crossbreeds)	1	4
43	Number of new kraals	1	4

	Indicators	Included in IRF or not (1=Yes, 2=No)	Sector*
44	Manure yield (t/cow)	1	4
45	Government fertilizer production and distribution policy	2	4
46	Amount of crop production for domestic demand and export	2	4
47	Current organic waste disposal (t)	2	7
48	Landfill gas (LFG) utilization	2	7
49	Number of sites with LFG capture	2	7
50	Number of Waste-to Energy (WtE) sites	2	7
51	WtE generation (MW)	2	7
52	Quantity of aerobic compost produced (t)	2	7
53	Composting rate (% organic waste composted)	2	7
54	Number of wastewater treatment plants (WWTP)	2	7
55	Number of households connected to WWTP	2	7
56	Development of national and regional waste regulations and enforcement	2	7
57	Waste recycling progress (e.g., policies and practices; plastic, metals and paper recycling rates)	2	7
	Adaptation indicators		
58	Water storage per capita	1	5
59	Renewable water resource availability per capita per annum (m³/capita/year)	1	5
60	Percentage of catchment areas with water balance and allocation models	2	5
61	Number of operational hydrological stations	2	5
62	Percentage of water bodies with good ambient water quality	2	5
63	Number of climate resilient crop varieties developed	1	5
64	Percentage of farmers adopting resilient crop/varieties	1	4
65	Percentage of crossbreed livestock in national herd species	1	4
66	Capacity of post-harvest storage constructed in metric tons (MT)	2	4
67	Number of farmers using surveillance tools (Fall Armyworm , BXW apps, etc.)	1	4
68	Land area under erosion control measures and used optimally	1	4
69	Percentage of agricultural land (to the land area)	2	4
70	Number of hectares under irrigation within IWRM framework	1	4
71	Land area for crops under insurance (Ha)	1	4
72	Change in land area covered by agroforestry	1	5
73	Hectares of forest restored in program area	1	5
74	Hectares of forest afforested in project/program areas	1	5
75	Percentage of forest area (to the land area)	1	5
76	Number of Ha of private and cooperative forest restored	1	5
77	Ha of forest plantation transferred to private operators	2	5
78	Change in forest area that is degraded/rehabilitated	1	5
79	National land use development master plan (NLUDMP) developed	1	5
80	Detailed spatial plans for all districts	1	5
81	Percentage of land use development plans (LUDP) complying to the NLUD-MP	1	5
82	Accurate data on exposure to climate vulnerability by households (HHs) and infrastructures in high-risk areas reported	1	5
83	Percentage of operational integrated geospatial information framework integrated with environmental and socio-economic statistics	1	5
84	Percentage of registered state land optimally used	1	5
85	Model linking land use/administration in place	1	5

Indicators		Included in IRF or not (1=Yes, 2=No)	Sector*
86	Percentage of urban population living in informal settlements	2	8
87	Percentage of rural population living in clustered settlements	2	8
88	Average share of the built-up area of cities that is open and green space for public use for all (SDG)	2	8
89	Access to water and sanitation services	1	8
90	Percentage of urban population in areas covered by masterplans with storm water considerations	2	8
91	Malaria proportional mortality rate (N=total malaria deaths; D=Total deaths for all diseases causes)	2	10
92	Environmental and engineering guidelines developed (for climate resilient road infrastructure)	2	9
93	Reduction of length of roads vulnerable to floods and landslides	2	9
94	Percentage of passengers using public transport each year	2	9
95	Percentage of companies deploying climate compatible mining	2	9
96	Population covered by disaster risk reduction (DRR) programs	1	11
97	Percentage of extreme weather events for which advance warning was provided at least 30 minutes in advance	1	2
98	Number of staff who acquired technical skills to effectively coordinate and report on NDC implementation	1	2
99	Cumulative volume of finance [US$ millions] mobilized for climate and environmental purposes	1	2

*1= economy-wide, 2=cross-cutting, 3= energy, 4=agriculture, 5=water, land and forestry, 6=industrial product and product use, 7=waste management, 8=urbanization, 9=transport, 10=health, 11=social protection

Annex 3: Metrics and data sources for the KPIs

Indicator 1.1.1	GHG emissions
Unit	Metric tons
Description/metrics	The net amount of CO_2-equivalent emissions released into the atmosphere after deducting the amount of carbon sequestered, compared to the projected emissions under business-as-usual.
Frequency	Annual
Data type	Geophysical
Data source	GIS-based remote sensing data from satellite data providers
Responsibility of data collection	REMA
Disaggregated by:	Type of gas: CO_2, CH_4, N_2O Source: Energy, IPPU, AFOLU, Waste/land use
Indicator 1.2.1	Share of land use and land cover options
Unit	Percentage
Description/metrics	Size of area under different land use and land cover options, including cultivated lands, water bodies, areas under different types of forests
Frequency	Annual
Data type	Geophysical
Data source	GIS-based remote sensing data from Rwanda Space Agency (RSA)
Disaggregated by:	Type of land use and land cover Geographic regions
Indicator 1.2.2	.Extent of land surface temperature anomaly
Unit	Percentage

Description/metrics	The percentage of area covered by a certain range of warming anomalies (increase in temperature from the long-term average)
Frequency	Annual
Data type	Geophysical
Data source	GIS-based remote sensing data from Rwanda Space Agency (RSA)
Disaggregated by:	Months or seasons
Indicator 1.2.3	**Normalized Difference Vegetation Index (NDVI)**
Unit	N/A
Description/metrics	A dimensionless index that describes the difference between visible and near-infrared reflectance of vegetation cover and can be used to estimate the density of greenness on a land area
Frequency	Annual
Data type	Geophysical
Data source	GIS-based remote sensing data from Rwanda Space Agency (RSA)
Disaggregated by:	Months and geographic regions
Indicator 1.2.4	**Rainfall anomaly**
Unit	Millimeters (mm)
Description/metrics	Monthly rainfall difference in mm from the long-term average
Frequency	Monthly (selected)
Data type	Geophysical
Data source	GIS-based remote sensing data from Rwanda Space Agency (RSA)
Disaggregated by:	Geographic regions
Indicator 1.3.1	**Projected change in economic growth due to climate change**
Unit	Percentage
Description/metrics	Changes in economic growth measured by the annual change in GDP per capita from projections under business-as-usual and climate change scenarios
Frequency	Annual
Data type	Aggregate data
Data source	Ministry of Finance and Economic Planning (MINECOFIN) and AKADEMIYA2063 projections
Disaggregated by:	Sectors
Indicator 1.3.2	**Export diversification index**
Unit	Percentage
Description/metrics	The degree of concentration of goods exported. It tells us if a large share of a country's exports is accounted for by a small number of commodities or if its exports are distributed across a range of products. It is measured by the share of export value of major export commodities
Frequency	Annual
Data type	Aggregate data
Data source	Ministry of Trade and Industry (MINICOM)
Disaggregated by:	Sectors (agriculture vs non-agriculture; food vs non-food; processed vs non-processed)
Indicator 1.3.3	**Price volatility index**
Unit	Percentage
Description/metrics	The coefficient of variation of the consumer price index with trend and without trend
Frequency	Annual
Data type	Aggregate
Data source	MINICOM

Disaggregated by:	Product groups: 1) Food, 2) Non-food
Indicator 1.4.1	**Climate change vulnerability index**
Unit	Percentage
Description/metrics	ND-GAIN vulnerability index for climate change. It measures exposure, sensitivity, and capacity to adapt to climate change at the national level across six sectors: food, water, health, ecosystem services, human habitat, and infrastructure
Frequency	Annual
Data type	Micro-data
Data source	NISR household surveys
Disaggregated by:	Geographic region
Indicator 1.4.2	**Resilience Capacity Index (RCI)**
Unit	N/A
Description/metrics	Measures the ability of a household to adapt to new scenarios. The index value depends on the options available to that household to make a living, such as access to assets, income-generating activities, public services, formal and informal social safety nets, institutional environments, and resistance capacity. A modified RCI will be developed based on the relative regional values of the indicators considered for constructing the index
Frequency	Annual
Data type	Micro-data
Data source	NISR household surveys
Disaggregated by:	Geographic regions
Indicator 2.1.1	**Hydroelectric power generation**
Unit	Kilowatt-hours (KWH)
Description/metrics	The change in KWH energy generated from hydropower sources over years
Frequency	Annual
Data type	Aggregate
Data source	Ministry of Infrastructure
Disaggregated by:	Urban and rural
Indicator 2.1.2	**Share of households adopting energy saving cooking stoves and on-farm biogas**
Unit	Percent
Description/metrics	A scale of adoption intensity that will be constructed based on whether a household has adopted: 1) Energy saving traditional cooking stoves, and 2) Solar technologies for cooking, light, and other domestic uses. It measures how households are shifting to clean energy options
Frequency	Annual
Data type	Micro-data at household level
Data source	NISR demographic and household surveys
Disaggregated by:	Urban and rural; intensity of adoption
Indicator 2.1.2	**Share of households using solar energy for heating, lighting, irrigation and others**
Unit	Percentage of total households
Description/metrics	A household that uses solar energy for one or more uses including heating, lighting, irrigation, and other uses.
Frequency	Annual
Data type	Micro-data at household level
Data source	NISR demographic and household surveys / Afrobarometer

Disaggregated by:	Urban and rural; geographic regions; type of uses
Indicator 2.2.1	**Per capita water storage**
Unit	Cubic meters (m³) per person
Description/metrics	The total amount of water storage divided by the population size
Frequency	Annual
Data type	Aggregate at provincial level
Data source	Rwanda Water Board
Disaggregated by:	Urban and rural
Indicator 2.2.2.	**Land Use and Management Index**
Unit	Index
Description/metrics	An index that will be developed based on: 1) Availability of National Land Use Development Master Plan (NLUDMP) , 2) Number of detailed spatial plans for districts, 3) Percentage of land use development plans (LUDP) in compliance with the NLUDMP, 4) Percentage of operational integrated geospatial information framework integrated with environmental and socio-economic statistics, 5) Percentage of registered state land optimally used, 6) Model linking land use/administration in place
Frequency	Annual
Data type	Observational
Data source	Key Informant Interviews (KII)
Indicator 2.2.3.	**Land covered by agroforestry**
Unit	Percentage of total cultivated land
Description/metrics	The share of land area under intentional agroforestry practices such as hedge growth, shrubs into crops, trees for fodder
Frequency	Annual
Data type	Aggregate at provincial level
Data source	Rwanda Forestry Agency (RFA)
Responsibility of data collection	RFA
Disaggregated by:	Geographic regions or agro-ecologies
Indicator 2.2.4	**Hectares of forest restored/afforested**
Unit	Hectare
Description/metrics	The area of land restored or afforested through various public and private programs
Frequency	Annual
Data type	Aggregate at district level
Data source	Rwanda Forestry Agency
Disaggregated by;	Districts
Indicator 2.3.1	**Climate Smart Agriculture Adoption Index (CSA-AI)**
Unit	N/A
Description/metrics	Whether a farmer has practiced one or more CSA technologies such as precision fertilizer application, crop rotation, conservation tillage, improved seeds, new animal breeds, new fodders, manure management, immunization of farm animals, composting, irrigation (off-season), breed improvement, feed improvement, de-worming, tree planting, benches (contour earth bunds), feed treatment and conservation, etc. Measured as , where is the adoption index of farmer , is the adoption of technology by farmer which takes the value 1 if the farmer practiced technology and 0 otherwise, and is a weighting factor of the technology/ practice.
Frequency	Annual
Data type	Micro-data at farm household level
Data source	NISR agricultural household surveys

Disaggregated by:	Agro-ecologies
Indicator 2.3.2	**Area under erosion control and soil conservation measures**
Unit	Percentage or hectares
Description/metrics	Measures the extent of land that is protected from soil erosion and landslides using physical (terraces, gabions, etc.) and biological (tree planting, hedges, grasses, etc.) measures. It will be expressed in terms of hectares of land or as a percentage of land areas vulnerable/susceptible to erosion/landslides
Frequency	Annual
Data type	Aggregate at district level
Data source	Ministry of Agriculture and Animal Resources (MINAGRI)
Disaggregated by:	Districts
Indicator 2.3.3	**Share/extent of irrigated land**
Unit	Percentage or hectares
Description/metrics	The area of cultivated land which is equipped and operational with irrigation infrastructure either for communal or private uses and being used for the production of food and fodder crops, measured in hectares or as a percentage of total cultivated land area. It includes both river diversions, underground water pumping and surface water harvesting
Frequency	Annual
Data type	Aggregate at district level
Data source	MINAGRI
Disaggregated by:	Agro-ecologies and scale of irrigation (small vs. large-scale irrigation)
Indicator 2.3.4	**Share of farmers with weather insurance**
Unit	Percentage
Description/metrics	The number of farmers benefitting from or purchasing weather insurance for crops and livestock as a percentage of the total number of farmers in the country
Frequency	Annual
Data type	Micro-data at farm household level
Data source	NISR agricultural household surveys
Disaggregated by:	Geographic regions/provinces
Indicator 2.4.1	**Total amount of budget allocated to social protection**
Unit	Rwandan Franc
Description/metrics	This includes: 1) Budget allocation to cash transfers for food and cash reserves; 2) Budget allocation to emergency food supplies; 3) Budget allocation to school feeding; 4) Budget allocation to other protective services including public works
Frequency	Annual
Data type	Aggregate
Data source	MINECOFIN or Biennial Review data
Disaggregated by:	Social protection programs
Indicator 2.4.2	**Population covered by Disaster Risk Reduction (DRR) programs**
Unit	Percentage
Description/metrics	This indicator measures the percentage of people who have been affected by climate change-related disasters within the past year and received adequate disaster support services and products.
Frequency	Annual
Data type	Aggregate at district level
Data source	Ministry of Emergency Management (MINEMA)

Disaggregated by:	District
Indicator 3.1.1	**Climate Change Coordination Effectiveness Index**
Unit	N/A
Description/metrics	An index based on: 1) Presence of climate change stakeholder coordination platforms in the form of sub-sector working groups; 2) Number of meetings held by the working groups; 2) Number of policies, regulations, programs, and reports reviewed by the working groups. Further details will be specified in the tracking tool.
Frequency	Annual
Data type	Observational
Data source	Key Informant Interviews (KII)
Disaggregated by:	N/A
Indicator 3.1.2	**Climate Change Actions Decentralization Index (CCADI)**
Unit	N/A
Description/metrics	An index based on: 1) Number of districts with a climate change steering committee; 2) Number of districts with a climate budget line; 3) Number of programs or budget amounts allocated to climate change actions at district level
Frequency	Annual
Data type	Observational
Data source	Key Informant Interviews (KII)
Disaggregated by:	Provinces
Indicator 3.2.1.	**Domestic climate finance**
Unit	Rwandan Franc
Description/metrics	The amount of climate finance allocated by domestic institutions for climate change actions, both public and private sectors
Data type	Aggregate
Data source	MINECOFIN
Frequency	Annual
Disaggregated by:	Sources of fund and sectors/functions
Indicator3.2.2	**International climate finance**
Unit	Rwandan Franc
Description/metrics	The amount of climate finance generated by government, non-governmental and private organizations from international sources in the form of grants, donation, carbon sales, etc.
Frequency	Annual
Data type	Aggregate
Data source	MINECOFIN
Disaggregated by:	Source of funds
Indicator 3.3.1	**Percentage of extreme weather events for which advance warning was provided at least 30 minutes in advance**
Unit	Percentage
Description/metrics	The number of early warning alerts published as a percentage of the total number of climate related risks/disasters occurring in a year.
Frequency	Annual
Data type	Aggregate
Data source	Ministry of Emergency Management (MINEMA)

Disaggregated by:	N/A
Indicator 3.3.2	**Climate Change Education and Awareness Index (CCEAI)**
Unit	N/A
Description/metrics	An index based on: 1) Number of producers, consumers and mid-stream value chain actors who are aware of climate change impacts and mitigation and adaptation actions; 2) Number of climate change study programs in universities and colleges; 3) Number of experts trained in or graduating from climate change programs
Frequency	Annual
Data type	Micro-data at household level
Data source	NISR household surveys, special request to include questions; key informant interviews with university representatives
Disaggregated by:	Urban and rural
Indicator 3.3.3	**R&D spending on climate change**
Unit	Percentage
Description/metrics	Total R&D spending (excluding private, for-profit sector) on climate change mitigation and adaptation, including salaries, operating and program costs, as well as capital investments for all government, non-profit, and higher education agencies involved in agricultural research in the country, as a percentage of total GDP
Frequency	Annual
Data type	Aggregate at institution level
Data source	Universities and research institutes
Disaggregated by:	Type of research

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