



**Rwanda Environment Management Authority**

# Review of key economic sectors regarding greenhouse gas mitigation policies and actions

## Final version

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## DISCLAIMER



This publication has been produced as part of a component of the Initiative for Climate Action Transparency project (ICAT) implemented by UNEP DTU Partnership (UDP). The views expressed in this publication are those of the authors and do not necessarily reflect the views of UDP.

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Rwanda Water and Forestry Authority, METEO RWANDA, Africa Center Excellence of Energy for sustainable development /University of Rwanda, Rwanda Transport Development Agency, Rwanda Standard Board, Rwanda Utilities Regulation Agency, Rwanda Green Fund, Rwanda Resource Efficient and Cleaner Production Centre, Rwanda Housing Authority, Company for Environment protection and Development.

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## List of abbreviations

| | |
|---|---|
| AC | Air Conditioners |
| BRT | Bus Rapid Transit |
| CAPEX | Capital Expenditure |
| CCAC | Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants |
| CFL | Compact Fluorescent Light |
| CIF | Climate Investment Funds |
| CoK | City of Kigali |
| ECI | Environmental Compliance Institute |
| EDCL | Energy Development Corporation Limited |
| EIA | Environmental Impact Assessments |
| ESSP | Energy Sector Strategic plan |
| EUCL | Energy Utility Corporation Limited |
| FDI | Foreign Direct Investment |
| FONERWA | National Fund for Environment and Climate Change |
| GDP | Gross domestic product |
| GHG | Greenhouse gas |
| GoR | Government of Rwanda |
| HPS | High Pressure Sodium |
| INDC | Intended Nationally Determined Contribution |
| IPCC | Intergovernmental Panel on Climate Change |
| IPP | Independent Power Producer |
| IPPU | Industrial Processes and Product Use |
| K-CEP | Kigali Cooling Efficiency Program |
| $kWh/m^2$ | Kilowatt hour per square meter |
| LED | Light Emitting Diodes |
| MEPS | Minimum Energy Performance Standards |
| MINALOC | Ministry of Local Government |
| MINECOFIN | Ministry of Finance and Economic Planning |
| MINICOM | Ministry of Trade and Industry |
| MININFRA | Ministry of Infrastructure |
| MoE | Ministry of Environment |
| MoH | Ministry of Health |
| MSW | Municipal Solid Waste |
| NAMA | Nationally Appropriate Mitigation Actions |
| NAPA | National Adaptation Programs of Action |
| NDC | Nationally Determined Contribution |
| NECCP | National Environment and Climate Change Policy |
| NIRDA | National Industrial Research and Development Agency |
| NISR | National Institute of Statistics of Rwanda |
| NGO | Non-Governmental Organization |

| | |
|---|---|
| NSPIS | Nationally Significant Infrastructure Projects |
| NST1 | National Strategy for Transformation 1 |
| OPEX | Operational Expenditure |
| PA | Paris Agreement |
| PPA | Power Purchase Agreements |
| PPP | Private-Public Partnership |
| PSF | Private Sector Federation |
| RBD | Rwanda Development Board |
| REG | Rwanda Energy Group |
| REMA | Rwanda Environment Management Authority |
| RHA | Rwanda Housing Authority |
| RRA | Rwanda Revenue Authority |
| RSB | Rwanda Standards Board |
| RTDA | Rwanda Transport Development Agency |
| RURA | Rwanda Utilities Regulatory Authority |
| SE4All | Sustainable Energy for All |
| SGR | Standard Gauge Railway |
| SME | Small and Medium Enterprises |
| SREP | Scaling-up Renewable Energy Program |
| SWH | Solar water heaters |
| UNFCCC | United Nations Framework Convention on Climate Change |
| WASAC | Water and Sanitation Corporation Ltd. |
| Wte | Waste-to-energy |

# 1. Executive summary

Rwanda defined several strategies at national and sectoral levels to address climate change. The key document is the Nationally Determined Contribution (NDC) published in 2015 (GoR 2015) which defines the overall mitigation and adaptation goals of the country to be achieved by 2030. More recently, other strategy documents, such as the 7 Years government programme: National Strategy for Transformation (NST1) (GoR 2018b) and the National Environment and Climate Change Policy[1] (GoR 2018c) have been published and define the country strategy and vision regarding climate change. In addition, several strategy documents have been developed to define priority areas and actions at sector and sub-sector level. These strategies pave the way for the implementation of mitigation activities in the country that trigger emission reductions and can contribute to the transformational change of Rwanda towards a low-carbon economy and society. This report assesses the main documents available at national and also sectoral level, specifically in the energy, buildings, industry, transport and waste sectors. Furthermore, it also looks into specific actions and programmes that are to be implemented jointly with other entities such as the UN Environment, SE4All strategy among others. This aims at providing a more complete picture of the existing policies and activities ongoing in Rwanda. For the purpose of this report, only mitigation policies and actions are considered. The goal is to identify policies and underlying policy instruments to be further assessed under the overall methodological framework that is developed under this project as a separate component. The identification process hence provides the required information to actually utilize a methodological framework for the policy assessment. The tools that allow the assessment of the policies (i.e. checklists) will have to be tailored to the specific sector and also to the specific policy and underlying policy instruments in order to be able to capture the specific features and impacts of each policy. There is no one-size-fits-all solution that can cover all policies and sectors without ad-hoc adjustments.

The sectoral review first describes briefly the current context in each sector, in terms of current emissions and expected trends based on the Third National Communication (GoR, 2018a). It also provides a summary table with the key strategies and policies identified in each sector. The information provided describes the sector and sub-sector targeted, the status of implementation, source of information, targets of the policy or action, technology and underlying policy instruments. It should be noted that is some instances the full set of information was not available. The review highlights also existing gaps: in some cases while an overall strategy exists, actual policy instruments and ancillary measures (if any) are not yet defined. In these cases, the proposed methodology cannot be applied in full. For each sector we also identified the relevant stakeholders that will have a role in the design and implementation of the identified climate policies, with a description of their actual role. A broad variety of stakeholders is identified, ranging from line ministries, governmental authorities, entities in charge of the energy infrastructure (such as Rwanda Energy Group and its subsidiaries), private companies,

[1] Final draft version

other organizations such as the Rwanda Green Building Organization, UN environment and it also identifies potential roles for Non-Governmental Organizations (NGOs).

This exercise will inform the development of the actual methodology for the assessment of climate policies and also the development of the tools (i.e. the checklists) that will be used under the proposed methodology. This sectoral review is the initial step: an updated overview of the existing policies and details on the related policy instruments is necessary to have a full picture of the ongoing activities in Rwanda, and to continuously refine and adapt the checklist depending on the specific policies to be assessed. This will allow institutions to enhance their own capacities on policy assessment and also on policy design.

# 2. Introduction

## 2.1. Background

The Government of Rwanda (GoR) is strongly committed to fighting climate change. Despite the very low level of greenhouse gas (GHG) emissions per capita, around 0.6 t $CO_2e$ per capita (GoR, 2018a), Rwanda is actively participating in the international agreements on climate change: it ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in 2003 (GoR, 2015); it submitted its First National Communication in 2005, followed by the second one in 2012 and the third one in 2018 (GoR 2018a). Rwanda submitted its Intended Nationally Determined Contribution (INDC) in December 2015 (GoR 2015) prior to the 21st Conference of Parties to the UNFCCC held in Paris, which has been transformed into the NDC upon ratification of the Paris Agreement (PA) in 2016.

The National Strategy for Climate Change and Low Carbon Development Strategy (GoR, 2011) established the basis of the INDC: this document presents the commitments of the country towards climate change mitigation and adaptation with a time horizon that spans up to 2030. The mitigation priority sectors are: energy, transport, industry, waste and forestry. The NDC describes a number of mitigation actions that could be implemented if international support (finance, technology and capacity building) is provided (GoR, 2015).

At domestic level, Rwanda's government has put in place legislation, policies and strategies to prevent and limit the losses related to climate variability, to increase resilience to climate change effects and to contribute to climate change mitigation. At the highest legal instrument level is the National Constitution of Rwanda that constitutes the basis for the legal framework for the protection and safeguarding of environment and climate. The key documents related to climate policy in Rwanda are: the Green Growth and Climate Resilience Strategy issued in 2011, highlighting the exposure of the country to climate change and stresses the importance of sustainable and low carbon development and suggesting measures to achieve it (GoR, 2011); Rwanda's Vision 2020 (GoR, 2012), which foresees the transformation into a service-based economy reaching a middle-income level by 2020; the Economic Development and Poverty Reduction Strategy 2013-2018 (GoR, 2013), which identifies the

green economy as a priority for the country. These have been followed by the more recent NST1 based on three pillars, i.e. Economic Transformation, Social Transformation, and Transformational Governance (GoR, 2018b) and the draft National Environmental and Climate Policy (NECCP), which presents the aspiration of the country to reach middle-income country status by 2035 and high-income status by 2050 and updates the previous climate policy of the country (GoR, 2018c). In combination, these documents provide the key climate policy priorities for Rwanda and also its commitment to ensure sustainable development for the Rwandan society while contributing to mitigation goals.

The Ministry of Environment (MoE) is the key institution in charge of making policies and programs related to the environment and climate change, and is responsible for formulating, monitoring and evaluating the implementation of the NDC through stakeholder consultations. Rwanda Environment Management Authority (REMA) is the regulatory agency tasked to coordinate the implementation of those policies and programmes and it also acts as the focal point under the UNFCCC.

Sectoral policies and actions have been implemented or planned in the key economic sectors and thus line ministries, for instance the Ministry of Infrastructure (MININFRA) are playing a primary role in the definition of sectoral policies, (for instance the Energy Sector Strategic plan (ESSP) (MININFRA, 2016a) and Sustainable Energy For All initiative (SE4All) (MININFRA, 2016b) that can contribute to GHG emissions mitigation. Coordination among the different institutions and stakeholders will be necessary for the successful implementation of the mitigation policies and actions.

## 2.2. Objective and Scope

This report is part of a larger project for the definition of a methodological framework for assessing the impacts of climate policies and actions and strengthening national capacity in this field. The sectoral review aims at identifying the mitigation policies and actions in five key sectors: energy, transport, building, waste and industry. It is the basis for the preparation of the methodological framework and appropriated tools that are tailored to the Rwandan context and that can ensure an accurate and transparent assessment of the mitigation impacts of the identified policies and actions. This report will also identify key stakeholders that will have a role in the operationalization of the methodological framework at the sectoral level. In order to gain a comprehensive view on the existing policies and actions in the selected sectors, this report presents the outcome of the review of the main national and sectoral policies described above.

It also identifies the institutional arrangements needed to ensure the correct implementation of the proposed methodological framework. On the basis of this report, Rwandan institutions can communicate the status and impacts of ongoing and planned policies.

## 2.3. Outline of the report

The report presents the results of a sectoral review covering the energy, transport, building, waste and industry sectors. Each of the sections covering a specific sector is structured as follows: an introductory

paragraph provides an overview of the sector, followed by the stakeholder mapping and brief description of their main roles and responsibilities. For each sector a summary table presents the key information on the policies and actions. The summary tables provide information on the subsectors covered and specific technology focus, targets of the policies and actions, timeframe, identified policy instruments and where available also information on the implementation status.

Finally, Section 8 summarizes the key findings of the sectoral review and describes how these will inform the definition of the methodological framework to be developed under the assignment.

# 3. Energy sector – overview

## 3.1. The energy sector at a glance

The power generation capacity in Rwanda was historically dominated by hydropower and diesel (GoR, 2018a). It has expanded to non-conventional sources in the last years, including 30 MW natural gas power from Lake Kivu, 15 MW peat and 12 MW solar. Total capacity has more than doubled between 2010 and 2018, reaching 221 MW in 2018 (MININFRA 2018, REG 2019). The ESSP 2018/19-2023/24 foresees another doubling of capacity (expansion by 228.8 MW to reach 446.8 MW) until 2023/24. A long-term modelling exercise undertaken for the 3rd National Communication estimates peat and hydropower to dominate electricity generation with 43.5% and 42% shares in 2050, respectively. GHG emissions from power generation would increase to 3.3 million t $CO_2$eq. in 2050, from 0.1 million t $CO_2$eq. in 2012 in the baseline scenario (GoR, 2018a).

Regarding other renewable sources, further assessment is required for the estimation of the potential for other renewable sources such as geothermal and wind, while biomass-based generation is considered feasible for small scale applications (MININFRA, 2018).

Off-grid power generation is also important in the country: 8% of the population was relying on off-grid electricity in 2017 (MININFRA, 2018). Off-grid access to energy is provided mainly through solar home systems that can provide energy to households for basic needs, or through dedicated mini-grids. The latter can supply a village or a small number of users and it is normally based on solar power. Other combinations such as hybrid diesel/wind and diesel/solar are also possible.

Primary energy use is largely dominated by biomass, representing over 86% of the total. Biomass (i.e. fuelwood) is the main fuel for cooking, and often it is burnt in inefficient stoves. The high consumption of non-renewable biomass jeopardizes national forests and it is also a burden for low-income communities, with women and children investing significant time to collect the fuel wood. Negative effects on human health due to indoor pollution are also a direct consequence of the use of biomass for cooking. Households are the main consumer of electricity (51% of the total), mainly for lighting needs, followed by industry (42%).

Regarding energy efficiency activities in Rwanda, three main areas can be identified (GoR, 2018a):

- Streetlighting: public lighting is going to be installed in all urban streets and main roads. Efficient lamps (i.e. Light Emitting Diodes (LEDs) or Compact Fluorescent Lamps (CFLs)) will be used. A previous distribution project for CFLs disseminated 400,000 CFLs to users (see Section 6)
- Solar water heaters (SWH): an ongoing programme aims at disseminating SWH in buildings to reduce grid electricity for heating water (see Section 6)

- Transmission losses: it is planned to strengthen the electricity transmission and distribution infrastructure to reduce losses from 21% in 2013 to 10.2% in 2032 (GoR, 2018a)

In terms of private sector participation, many companies are active in the energy sector, with Independent Power Producers (IPPs) contributing to the expansion of the grid capacity and signing several Power Purchase Agreements (PPAs). As reported by MININFRA (2018), private companies are also key for the off-grid electrification and for the dissemination of alternative fuels for cooking.

### 3.2. Stakeholder mapping

The following Table 1 presents the key stakeholders in the energy sector and briefly describes their current roles and responsibilities.

**Table 1: Relevant stakeholders in the energy sector**

| Stakeholder | Current role/responsibilities |
|---|---|
| **Ministry of Infrastructure (MININFRA)** | ● Policy development<br>● Budget preparation and mobilization<br>● Oversight and monitoring of existing policies<br>● Drafting laws<br>● Support of local entities<br>● Management of SE4All implementation<br>● Development of the SREP jointly with multilateral development banks |
| **Rwanda Environment Management Authority (REMA)** | ● Coordination, oversight and implementation of national environmental policies<br>● Ensuring consistency of energy projects with national environmental regulations |
| **Ministry of Environment (MoE)** | ● Ensuring environmentally sound exploitation of natural resources<br>● Managing compliance with environmental regulations |
| **Ministry of Trade and Industry (MINICOM)** | ● Promotion of international trade<br>● Involvement of private sector<br>● Representing the GoR regarding energy-related topics in international fora |
| **Ministry of Finance and Economic Planning (MINECOFIN)** | ● Oversight of financial flows from partners<br>● Ensuring the fiduciary framework for managing different financial instruments (e.g. grants, loans, etc.)<br>● Contributing to resource mobilization |
| **Ministry of Local Government (MINALOC)** | ● Overseeing local government in order to implement national policies at local level<br>● Ensuring the delivery of decentralized services |
| **Energy Utility Corporation Limited (EUCL)** | ● Day-to-day operation of generation, transmission and distribution<br>● Planning for the transmission infrastructure in areas already reached by the grid<br>● Responsible for energy efficiency and demand side management activities |
| **Energy Development** | ● Project development and facilitating investment in energy projects<br>● Definition and update of the power system master plan and least cost development plan |

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|---|---|
| **Corporation Limited (EDCL)** | ● Cooperating with MININFRA on the negotiations on the agreements on electricity imports to Rwanda |
| **Rwanda Energy Group Ltd. (REG)** | ● Supervision of EUCL and EDCL<br>● Reports to MININFRA and MINECOFIN |
| **Rwanda Utilities Regulatory Authority (RURA)** | ● Update of the electricity grid code<br>● It covers all public utilities involved with "renewable and non-renewable energy, electricity, industrial gases, pipelines and storage facilities, and conventional gas extraction and distribution"<br>● Ensures no uncompetitive practices are in place and utilities' operations are sustainable, reliable and efficient<br>● Licensing of operators involved in the generation, transmission and distribution<br>● Revision of the tariff structure |
| **Rwanda Development Board (RDB)** | ● Supports mobilization of investments<br>● Facilitates foreign direct investment (FDI) flows for energy projects<br>● Issuance of the Environmental Impact Assessments (EIA) for specific energy projects requiring one<br>● Expected to host an agency for managing Private-Public Partnership (PPP) development |
| **Rwanda Standards Board (RSB)** | ● Development of technical regulations at national level, including technology and performance standards (including biogas digesters and solar technologies) |
| **National Industrial Research and Development Agency** | ● Research on optimization of the energy mix<br>● Market research on current status of renewable and clean energy deployment |
| **Rwanda Revenue Authority (RRA)** | ● Assessing, collecting, and accounting for tax, customs and other specified revenues<br>● The Authority is also responsible for providing advice to the Government on tax policy matters relating to revenue collections |
| **IPPs** | ● Responsible for the operation of power generation assets (on-grid)<br>● Potential participation in the development of renewable mini-grids |
| **Private companies (solar and clean cooking)** | ● Technology and service providers active in the dissemination of efficient and clean cooking technologies and solar systems for off-grid energy access |
| **Non-Governmental Organizations (NGOs)** | ● Can contribute significantly in supporting policies targeting energy access, increasing awareness in rural and urban areas, potentially also directly participating in the dissemination of specific technologies (e.g. efficient cookstoves or solar technologies) |

### 3.3. Relevant mitigation policies and actions

This section provides a summary of the main policies and actions identified in the energy sector that can have a mitigation effect on GHG emissions. The table below provides also a brief description, identified policy instrument(s), goals and, where available, also information on the implementation status.

**Table 2: Mitigation policies and actions – energy sector**

| Policy or action | Sector | Subsector | Technology | Year publication | Document | Validity period | Main content, target, objectives | Policy instruments | Current status | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| **Increase transmission efficiency** | Energy | Energy efficiency | Transmission technologies | 2018 | Energy Sector Strategic plan (ESSP) (MININFRA, 2018) | Until 2024 | Reduce technical and non-technical transmission losses to 15% by 2024 through investments and capacity building Investments in new distribution network and high voltage transmission lines | Financial (Investments)<br><br>Information (capacity building) | *Ongoing* | Have clear understanding of baseline losses |
| **Standards and Labelling** | Energy | Energy efficiency | Multiple | 2018 | ESSP | Until 2024 | Standards and labelling are mentioned regarding appliances, however no information is provided on actual policies or activities implemented (or to be implemented) in this regard | Regulatory | *No information available* | Understand plan for actual introduction of new standards / labels |
| Grid Expansion | Energy | On-grid generation | Multiple | 2018 | ESSP | | Expansion of the grid capacity by around 228 MW until 2024, with a 15% reserve capacity.<br><br>Technologies to be used: large-scale peat and regional hydro projects (reported as under construction), large-scale Lake Kivu methane and hydro projects, and small-scale hydro projects. | Financial (investments) | Partially under construction | Final impact on GHG emission related to grid electricity to be assessed given the presence of large peat power projects:<br><br>Methodological approach to emissions from Lake Kivu gas power plants needs to be discussed |
| Enhancement of energy access | Energy | Energy access | Multiple | 2018 | ESSP | | Reach 100% energy access (of 52% on-grid and 48% off-grid)<br><br>100% of productive used have access to electricity. Around 2,400 productive users | Financial (To be confirmed) | *No information* | On-grid access: type of power plants to be connected to the grid to ensure the expansion to be identified (i.e. fossil |

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| | | | | | | | do not have electricity connection. The target is to reach 100% of these users by 2021. Where connection to the grid is not feasible, off-grid solutions (solar and storage) will be used | | *availabl e* | based, or renewable power)<br><br>Assessment of baseline fuels used by productive users not connected to the grid is needed |
| Rural Electrification Strategy | Energy | Energy access | Solar syste ms and mini-grid | 2016 | Rural electrifi cation strateg y (MININ FRA, 2016a) | | 70% energy access by 2018 and 100% by 2020.<br>Programmes planned:<br>- GoR to establish a program for providing households with solar systems as basic necessity;<br>- Establishment of a risk-sharing facility for the private sector, for providing affordable solar systems<br>- Installation of mini-grids | Financial (risk sharing facility). | N/A | It is assumed that all mini grids will be fully fed by solar or hydropower<br><br>Need to identify the investment type (e.g. equity from the GoR or private, loans or guarantees) for mini-grid installation |
| SE4All strategy | Energy | Energy access<br><br>Energy efficiency | Efficie nt Cookin g<br><br>Bioma ss<br><br>Charc oal produc tion | 2016 | Sustai nable Energy for All-Action Agend a-Update Draft<br><br>(MININ FRA, 2016b) | Until 2030 | Targets until 2030:<br>▪ Access to clean and sustainable cooking<br>○ Close the gap (around 20%) between demand and supply of biomass<br>○ Clean biomass for cooking: a) access to efficient cooking technologies; b) improve charcoal production and promotion of alternative fuels (e.g. biomass pellets, biogas, LPG); and c) ensure that the efficient stoves reduce indoor pollution | Multiple | *No informati on availabl e* | Needs specifications of underlying policies |

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| | | | | | | | ▪ Access to electricity<br>○ 100% electricity access (by 2020 all household have basic access to electricity; by 2030 all household have at least moderate access to electricity services<br>○ Progress to higher quality and quantity of electricity over time<br>▪ Renewables<br>○ Exceed the SE4All target (26%) of renewable energy generation (as percentage of primary energy supply)<br>▪ Energy efficiency<br>○ At least double the efficiency of biomass energy use<br>○ Extend current rates of electrical efficiency improvement | | | |
| **Halve the number of households using traditional cooking technologies and achieve a balance between demand and supply of biomass** | Energy | Clean cooking<br><br>Efficient charcoal production | | 2018 | NST1, ESSP | Until 2024 | Reduction of users of fuelwood to 42% by 2024. Proposed fuel mix is composed by: LPG, pellets, charcoal, biogas and electricity<br><br>Introduction of efficient stoves where fuel switch is not possible: distribution of around 1.8 million efficient stoves until 2024<br><br>Improved institutional context to facilitate target achieement, including clear definition of roles and responsibilities for involved entities at national and local level | Financial (de-risk investments, subsidise access for low income households, leverage private finance)<br><br>Institutional | *Ongoing* | The impact of the fuel switch from biomass to the new fuels depends on several factors, including the carbon content of the fuels, and fraction of non-renewable biomass |

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| **Efficient streetlights** | Energy | Efficient lighting | LEDs and efficient CFLs | 2018 | ESSP | Until 2024 | It is planned to install lighting in all populated areas and main roads. Initial categories: (1) existing national roads (2) Main roads in Kigali City and urban areas; (3) New main national roads and roads under construction.<br>Target: around 1,800 km of streets and roads equipped with efficient lighting technologies<br>A pilot project for the substitution of High Pressure Sodium (HPS) lamps in Kigali with more efficient LEDs that can reduce consumption by 60% (NC3) | *No information available* | *No information available* | Needs specifications of underlying policies |
| Subsidies for IPP | Energy | Energy generation | Multiple | 2018 | ESSP | *No information available* | Support to IPPs from the GoR (e.g. guarantees, access to finance) and also through long term PPAs. Initial subsidies are mentioned (p. 84) but no detail is provided. | *No information available* | *No information available* | IPPs are supported through long term PPAs<br>Subsidies could be provided also to IPP investing in fossil fuels-based generation, with a negative impacts on GHG emissions |
| Renewable Energy Fund (REF) | Energy | Off-grid renewables | Multiple | 2017 | World Bank (http://projects.worldbank.org/P160699/?lang=en&tab= | Until 2023 | Facilitate private-sector participation in renewable off-grid electrification through two components:<br>- Line of Credit and Direct Financing for Off-grid Electrification:(45.94 million USD)<br>- Technical Assistance, Capacity Building, and Project Implementation Support (3 million USD) | Financial instruments<br>Technical assistance | Up to Sept. 2018 (WB Implementation status report) only limited results | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | overview ) | | | | achieved | |
| Scaling-up Renewable Energy Program (SREP) | Energy | Rural electrification | Off-grid solar and small hydro | 2015 | SREP Investment plan (CIF 2015) | - | Support private investment to scale up Renewable energy investments in solar systems and small hydropower for rural electrification (off-grid) | Financial (equity, debt, guarantee and loans) | Ongoing | |
| **National Fund for Environment and Climate Change (FONERWA)** | Multiple | Multiple | Multiple | - | http://www.fonerwa.org | - | FONERWA is a cross sectoral financing scheme that aims at channel, disburse and monitor climate change finance, including facilitating access to international finance | Financial and non-financial | Ongoing | |

# 4. Transport sector – overview

## 4.1. The transport sector at a glance

The transport sector in Rwanda is dominated by road transport as there is no railway in the country and shipping on Lake Kivu plays a minor role. The national and district road networks as well as infrastructures for public transport have expanded in the last years. Currently the road network consists of national roads (2749 km), district roads class 1 (3906 km) district roads class 2 (9706 km, draft) and other unclassified roads (GoR, 2018a). The number of registered vehicles has doubled since 2010 and reached 198,518 in 2017, of which 101,694 were motorcycles (NISR 2018). Transport sector emissions increased from 0.3 million t $CO_2$-eq. in 2006 to 0.55 million t $CO_2$eq. in 2015. Baseline emissions are estimated to increase to 1.7 million t $CO_2$eq. in 2050 (GoR, 2018a). The preliminary engineering design for railway line from Kampala to Kigali was completed. This Kampala-Kigali section is the last section of the Mombasa-Nairobi-Naivasha-Malaba-Kampala-Kigali Standard Gauge Railway (SGR) line, of which the section Mombasa-Nairobi SGR is operational while section Nairobi-Naivasha is under construction. On the other hand the Isaka-Kigali Standard Gauge Railway project that will connect Kigali with Dar es Salaam Port is under fund mobilisation since the section Dar es Salaam-Makutupora in Tanzania is under construction.

## 4.2. Stakeholder mapping

Table 3 presents the key stakeholders in the transport sector, including their roles and responsibilities.

**Table 3: Relevant stakeholders in the transport sector**

| Stakeholder | Current role/responsibilities |
|---|---|
| **MININFRA** | ● Overall transport policy and strategic planning<br>● Overall supervision of the agencies<br>● Directly responsible for implementation of various transport projects<br>● Setting transport rules, regulations and standards |
| **Rwanda Transport Development Agency (RTDA)** | ● Assist the Ministry with the management and administration of the transport sector<br>● Maintenance and development management of transport infrastructure (excluding air transport)<br>● Planning actions and policies related to transport services |
| **RURA** | ● Regulatory authority for transport sector<br>● Issuing permits, authorizations and licenses in accordance with the relevant laws and regulations |
| **MoE** | ● Monitors and evaluates the implementation and mainstreaming of environment and climate change policies, strategies and programmes |
| **REMA** | ● Coordination, oversight and implementation of national environmental policies<br>● Ensuring consistency of transport projects with national environmental regulations |

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|---|---|
| **MINALOC** | ● Oversees planning, development and maintenance of transport infrastructure and services on the district level<br>● MINALOC and Districts cooperate with MINICOM and the Ministry of Agriculture (MINAGRI) for priority interventions in Class 2 roads |
| **City of Kigali (CoK)** | ● Preparation of a master plan and planning of the development for the City of Kigali<br>● Supervising the implementation of the national policy in the Districts of Kigali |
| **RSB** | ● Development of technical regulations at national level, including technology and performance standards |
| **RRA** | ● Assessing, collecting, and accounting of tax, customs and other specified revenues<br>● Providing advice to the Government on tax policy matters relating to revenue collections |
| **Private sector transport operators** | ● Offering of public transport services. |
| **Rwanda National Police** | ● Enforcement of Road Safety<br>● Operation of the Motor-vehicle inspection Center |
| **NGOs** | ● Contribute to awareness raising and information dissemination<br>● Support use of public transport and switch from motorized to non-motorized transport |

### 4.3. Mitigation policies and actions

The following Table presents the main policies with a mitigation effect on GHG emissions in the transport sector.

**Table 4: Mitigation policies and actions – transport sector**

| Policy or action | Sector | Subsector | Technology | Year publication | Document | Validity period | Main content, target, objectives | Policy instruments | Current status | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| **Standards for public transport vehicles and operators** | Transport | Public Transport | Standards | 2012 | Public transport policy and strategy for Rwanda (MININFRA, 2012) | *No information available* | In order to improve safety and reduce pollution, the maximum age of urban public transport buses shall be limited to 10 years. | Regulatory | *No information available* | Safety standards can increase emissions due to increasing vehicle weight |
| **Promote efficient non-motorized transport modes (e.g. walking, bicycle, etc.).** | Transport | Public Transport | Non-motorized transport | 2012, 2018 | Public transport policy and strategy for Rwanda and National Environment and Climate Change Policy Draft (NECCP) (GoR, 2018b) | *No information available* | Transportation priorities should be set based upon prioritizing the needs of people as follows:<br><br>Design transportation systems that protect and serve the pedestrian first; next, consider the needs of those who use public transportation and non-motorized transportation modes; then consider the needs of automobile users after the two groups above. | Infrastructure programmes | Construction of 140 km of non-motorized transport lanes by 2018 and 107 km of non-motorized transport lanes were built on 2017. (REMA, 2017) | Methodological approach to assess GHG impacts of non-motorized transport challenging due to difficulties to identify baseline transport mode. |
| Setting up additional four regional vehicle fitness and | Transport | Air quality | Emissions inspection | 2013 | Transport Sector Strategic Plan for EDPRS2 | Since 2016 | Emissions inspection is mandatory to all vehicles operating in Rwanda (twice a year for all commercial and public transport vehicles and once a year for other vehicles (private, public and even utilities). Non- | Regulatory (Law N° 18/2016 of 18/05/2016 governing the | One inspection center in Kigali and 4 in the provinces. (GoR, 2018a) | If inspection focuses on local air pollutants only, GHG reduction benefit may be limited. |

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| environmental rating inspection centres | | | | | (MININFRA, 2013) | | compliant vehicles not authorized to operate in Rwanda. (GoR, 2018a) | preservation of air quality and prevention of air pollution) | | Methodological challenges to assess mitigation benefit of earlier scrapping of vehicles |
| Setting emission standards for new vehicles | Transport | Vehicles | Standards | 2015, 2018 | NDC and NECCP Draft | *No information available* | Establish national standards for emissions and implement strictly air quality standards | Regulatory | Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC) technical support to GoR to develop new emission standards for motor vehicles (ECI, 2018). | If standards focus on local air pollutants only, GHG reduction benefit may be limited or even negative. Methodological challenges to assess mitigation benefit of changes in new vehicle fleet |
| Construction of 17 km Bus Rapid Transit (BRT) main corridor and 6 modern interchanges in Kigali City | Transport | Public Transport | High efficiency transport modes | 2015 | NDC and Detailed implementation plan (REMA 2017) | *No information available* | Implement BRT in two major corridors:<br>Route 1: City centre- Gisimenti-Remera-Kimironko (10.3 km).<br>- Route 2: Gisimenti- Kanombe (6.5 km) | Infrastructure programmes | Planned, the feasibility Study and Preliminary Engineering Design ongoing( Expected to be accomplished in March 2019) | Ongoing Nationally Appropriate Mitigation Actions (NAMA) for the construction of the BRT in Kigali which is currently in the design phase and results should be available in 2018. (REMA, 2017) |

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| Use of higher fuel efficiencies and low carbon technologies for new vehicles | Transport | Vehicles | High efficiency and low carbon transport modes | 2015, 2018 | NDC, Third national communication under the UNFCCC (NC3) (GoR, 2018a) and NECCP | *No information available* | Diesel fuelled cars will be partially replaced by electric cars starting from 2020. Electric cars are expected to replace 150,000 passenger cars by 2050. | Financial incentives | *No information available* | Specification of policy instruments needed. |
| **Increase taxes of imported old cars emitting toxic gases** | Transport | Vehicles | | 2018 | NC3 | *No information available* | GoR committed to reduce the number of imported old cars emitting toxic gases by increasing taxes on them and to set up a centre for generally to calculate air emissions in Rwanda. (GoR, 2018a) | Regulatory | Under implementation | If taxes focus on local air pollutants only, GHG reduction benefit may be limited or even negative. |
| **Raise awareness on green mobility transport** | Transport | Public Transport | High efficiency and low carbon transport modes | 2018 | NECCP | *No information available* | Through public events (e.g. temporary conversion of main streets to pedestrian zones, car free days, children painting streets, speed measurements near schools, car-pooling, etc.), TV, Radio as well as newspaper articles promoting sustainable transport | Information instruments | *No information available* | Outcome depends on actual annual action plans. Awareness alone may have short "half life", transformational impacts depend on persistence of approach |
| **Construction of an electric rail between Isaka and Kigali** | Transport | Public Transport | Low carbon transport modes | 2018 | Third national communication under the UNFCCC (NC3) | *No information available* | Bilateral agreement signed in March 2018. | Infrastructure | Design review completed.<br><br>Feasibility study is being updated expected to be | |

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| | | | | | | | | | completed by March 2019 | |

# 5. Waste sector – overview

## 5.1. The waste sector at a glance

Waste generation is directly linked to population increase, income and consumption growth and increasing urbanization rates. This also triggers in a shift in the waste composition from a majority of organic waste towards a broader composition (i.e. including other materials such as paper, plastics, glass, etc.)[2]. According to GoR (2018a), the most common practice is "collect and dumping": all landfills in the country fall under the category "unmanaged". Only cities have disposal sites, while in villages and rural areas uncontrolled decentralized dumping occurs. Involvement of private companies in the waste management chain has recently resulted in increased volumes of collected and disposed waste.

GHG emissions from solid waste disposal increased from 24 kt $CO_2$eq in 2006 up to 187 kt $CO_2$eq in 2015 (GoR, 2018a). According to GoR (2018a) data on waste composition are lacking. Appropriate solid waste management can generate mitigation benefits, but also important sustainable development co-benefits such as reduced water and soil pollution due to leachate, air quality, increased sanitation, improved working conditions for informal waste pickers. The two key GHG mitigation options in the waste sector (GoR, 2018a) are identified as follows:

- Landfill gas capture and utilization for power generation
- Waste-to-energy (Wte) options

In the baseline scenario (GoR, 2018a) emissions from solid waste treatment are estimated to increase to 2.3 million t $CO_2$eq in 2050. GHG mitigation potential for 2050 is estimated at 1 million t $CO_2$eq for landfill gas and 0.6 million t $CO_2$eq for Wte, respectively (GoR, 2018a).

Regarding wastewater treatment, it currently relies on decentralized systems, such as soakaways and septic tanks, or on direct discharges in wetlands (GoR, 2018a). No centralized systems are existing in urban areas, and only certain buildings have a treatment system, such as for instance hospitals, government buildings and new housing estates where a treatment system is legally required. It is planned to improve the situation with the construction of centralized treatment plants, however no clear policy is available to drive this transformation. GHG emissions from wastewater reached 289 kt $CO_2$eq in 2015 (GoR, 2018a). In the baseline scenario (GoR, 2018a) emissions from wastewater treatment are estimated to increase to 642 kt $CO_2$eq in 2050. Mitigation could reach 220 kt $CO_2$eq in the same year.

[2] For the purpose of this report, the waste sector is here considered as Municipal Solid Waste and centralized wastewater treatment.

## 5.2. Stakeholder mapping

Table 5 presents the key stakeholders and related responsibilities in the waste sector.

**Table 5: Relevant stakeholders in the waste sector**

| Stakeholder | Current role/responsibilities |
|---|---|
| **MININFRA** | ● Oversight of the policy development and implementation; coordination of ministries and entities involved<br>● Planning and development of standards and legislation<br>● Investments in collective sanitation activities and infrastructure together with Water and Sanitation Corporation Ltd. (WASAC) and Ministry of Health (MoH) |
| **Ministry of Health (MoH)** | ● Contribution to legislation and policy development<br>● contribution to CAPEX and OPEX (wastewater component)<br>● Awareness raising<br>● Monitoring and evaluation |
| **REMA** | ● Coordination, oversight and implementation of national environmental policies<br>● Ensuring consistency of waste management projects with national environmental regulations |
| **MINALOC** | ● Municipalities have a key role in the design and implementation of landfills and wastewater treatment construction projects<br>● Responsible for landfills and dumping sites; in secondary cities it signs agreement with private companies and pays the collection service through revenues from tax (i.e. hygiene tax) (GoR, 2018a)<br>● Monitoring and evaluation |
| **REG** | ● Relevant for the waste-to-energy component and also in case of landfills capturing methane for energy production |
| **RURA** | ● Sets tariff for private operators providing services to households (Tariff is set jointly with local governments and private sector)<br>● Setting standards on landfills and other waste treatment facilities<br>● Directives on liquid waste disposal and treatment |
| **Water and Sanitation Corporation Limited (WASAC Ltd)** | ● Facilities operation |
| **RSB** | ● Contribution to standards development |
| **RDB** | ● Supports mobilization of investments<br>● Facilitates foreign direct investment (FDI) flows for waste projects<br>● Expected to host an agency for managing Private-Public Partnership (PPP) development |
| **Private companies (collection and segregation, recycling, composting)** | ● Provision of services collection to customers (households) against payments; in secondary cities they provide collection services under a contract signed with local governments<br>● Investment and operation in treatment facilities (e.g. landfills, recycling)<br>● Investment in the construction of waste treatment facilities |
| **NGOs** | ● Participation in awareness campaign and dissemination of information to citizens on the importance of waste reduction, recycling and proper segregations |

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| | • Can participate in the design phase at local level of specific waste treatment facilities/wastewater |

## 5.3. Mitigation policies and actions

This section provides a summary of the main policies and actions identified in the waste sector that can have a mitigation effect on GHG emissions. The table below provides also a brief description, identified policy instrument(s), goals and, where available, also information on the implementation status.

**Table 6: Mitigation policies and actions – waste sector**

| Policy or action | Sector | Subsector | Technology | Year publication | Document | Validity period | Main content, target, objectives | Policy Instruments | Current status | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| **Construction of landfills in all cities** | Waste management | Municipal Solid Waste (MSW) | Landfill construction | 2018 | 7 Years Government Programme: National Strategy for Transformation, 2017 – 2024 NST1. (GoR 2018) | Until 2024 | Although the NST1 mentions the "Construction of landfills in cities, towns and rural areas" no actual policy or action is mentioned.<br>The NECCP (2018) mentions the promotion of waste management systems to reduce GHG emissions, however no further details on the implementation are provided.<br>Mitigation potential of landfills would be increased with the use of landfill gas for power generation, as in the scenario presented in the NC3 | *No information available* | *No information available* | Waste management is mentioned also in the NECCP (2018) however no clear information on the type of policies and actions that will be implemented is available.<br><br>No information is available on policies for the implementation of plants for the use of landfill gas for power generation |
| **Composting** | Waste management | MSW | Composting | 2017 | NDC implementation plan | *No information available* | A composting plant was planned to be commissioned by 2018, and by the same year 80% of households were expected to practice organic waste recycling.<br><br>One NAMA is targeting "WtE and improved waste management practices in Kigali", implementation status is unclear. | *No information available* | *No information available* | No information is available on concrete policies mobilizing composting |
| **Use of solid waste for electricity generation** | Waste management | MSW | Waste-to-energy (Wte) | 2017 | NC3 | *No information available* | No clear policy is identified for Wte: the NC3 mentions the scenario with one Wte plant in Kigali with a processing capacity of 800 t/day, by 2021, with two additional plants in 2030 and 2040 respectively | Not identified | *No information available* | No information is available on concrete policies mobilizing WtE. Interaction with other waste technologies needs to be assessed |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Centralized wastewater treatment plants** | Waste | Waste water treatment | - | 2016<br><br>2017 | National Sanitation Policy Implementation Strategy (MININFRA, 2016c)<br><br>NC3 | - | Implementation of centralized wastewater treatment plants is mentioned, however it seems that still no policy is in place. However there are activities planned, such as a centralized plant in Kigali and other facilities are reported as under construction (implementation status not known). The NDC implementation plan (2017) mentions that “WASAC is planning to build five faecal sludge plants, one in Kigali and 4 other ones in districts around Lake Kivu (Rubavu, Rusizi, Karongi) and in Musanze. These plants will be accompanied with new landfills within five years”. | *No information available* | *No information available* | According to the NSPIS, relevant legislation should be available in 2018, however no information is identified on status of the regulatory framework development and its enforcement |

# 6. Building sector – overview

## 6.1. The building sector at a glance

The GHG emissions related to the building sector are mainly due to the energy consumption for cooking, heating (both water and room heating), cooling (i.e. air conditioning), lighting and the use of electric appliances[3]. This sector will have a great importance in terms of volume of GHG emissions in Rwanda, given the current trends in the population growth and urbanization rate. According to GoR (2018a) the population will more than double by 2050 (reaching 23.2 million people from 10.5 in 2012) and urbanization will reach 35% in 2024 from 18.4% (2016/17). Expected increase in the income level will also result in increases in GHG emissions, due to changing behaviours and use of electrical appliances and air conditioning systems, and increasing number of buildings built in urban areas. In the same time period 2012-2050, emissions are expected to increase from 2.2 million t $CO_2$ eq. up to 6.1 million t $CO_2$eq.

During the period 2012 - 2038, the GHG emissions from residential buildings are projected to be more relevant compared to those from the commercial and public buildings, while the situation will reverse after 2038. Commercial and public buildings are expected to account for 72% of total GHG emission from buildings in 2050 (GoR, 2018a). Emissions are driven by the use of biomass for cooking, kerosene, increased use of LPG and increased demand for diesel-based electricity from the grid. GHG emission could be reduced, with the introduction of mitigation policies and actions, limiting the increase up to 3.5 million t $CO_2$ eq. in 2050.

Several mitigation options are possible in the building sector. Some of these measures can be deployed in all buildings (i.e. residential and commercial, new and existing ones) such as efficient lighting technologies and efficient appliances. These measures can significantly reduce the energy consumption and, in the case of efficiency of refrigerators and air conditioners also refrigerant gases with harmful global warming potential and ozone depleting substances can be reduced, contributing to the achievement of the Kigali Amendment. One program, SolarRwanda, is aiming at supporting the installation of solar water heaters (SWH) in residential buildings to reduce energy consumption from the national grid.

One measure that would significantly reduce the energy consumption in buildings, providing the same level of service in terms of comfort for users, is the definition and enforcement of building codes that set limits to the energy consumption (for instance kWh/$m^2$ /year also known as Energy Use Intensity or Energy Performance Index). The target level of energy consumption can be reached also through efficient design of the building making use of natural lighting, ventilation, shading and orientation can

[3] For the purpose of this report, the building sector is including residential, institutional and commercial buildings

reduce the energy demand. Such code would have to be enforced and will target new buildings to be constructed.

### 6.2. Stakeholder mapping

The following Table 7 provides a summary of the key stakeholders in the buildings sectors and their responsibilities.

**Table 7: Relevant stakeholders in the building sector**

| Stakeholder | Current role/responsibilities |
|---|---|
| **MININFRA** | ● Urbanization, housing and human settlement<br>● Policy development<br>● Building code development and update<br>● Coordination with SE4All strategy on rural electrification |
| **MINALOC** | ● Policy development on socio-economic development and sustainable community development<br>● Economic planning at sub-national level<br>● Local governments (e.g. municipalities) develop and implement policies and plans at local level (e.g. masterplan for specific urban areas) |
| **MoE** | ● National land use planning |
| **MINECOFIN** | ● Oversight of financial flows from partners<br>● Ensuring the fiduciary framework for managing different financial instruments (e.g. grants, loans, etc.)<br>● Contributing to resources mobilization |
| **REMA** | ● Coordination, oversight and implementation of national environmental policies<br>● Ensuring consistency of building projects with national environmental regulations |
| **EDCL** | ● Implementing the SolarRwanda program jointly with 4 companies |
| **Rwanda Housing Authority (RHA)** | ● Human settlement planning and development<br>● Policy development<br>● Building Regulation, inspection and Audits<br>● Contribution to the building code<br>● Public buildings construction<br>● Research on building materials and technologies |
| **RDB** | ● Supports investments in Rwanda |
| **RSB** | ● Contribution to the definition of the standards for the building code and for efficient appliances |
| **National Institute of Statistics of Rwanda (NISR)** | ● Population census<br>● Household surveys |
| **UN Environment** | ● Implementation of the “Energy-Efficient and Climate-Friendly Cooling in Rwanda” program |
| **Kigali Cooling Efficiency Program** | ● Philanthropic program to support the implementation of the Kigali Amendment of the Montreal Protocol<br>● It supports the “Energy-Efficient and Climate-Friendly Cooling in Rwanda” program |
| **Private companies (construction** | ● Buildings construction |

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| **companies, real estate agencies, technology suppliers)** | ● Supply of technologies under the SolarRwanda program and other efficient appliances<br>● Marketing of green buildings |
| **Global Green Growth Institute** | ● Providing technical advisory services to RHA to develop and implement Green Building Minimum Compliance System since November 2016<br>● Providing green building technical advisory and supporting green certification of the upcoming New Bugesera International Airport since June 2017.<br>● Supported the establishment of Rwanda Green Building Organization in November 2016 |
| **Rwanda Green Building Organization** | ● Development of voluntary high-performance green building rating systems for Rwanda<br>● Awareness and capacity building of stakeholders<br>● Green Building certification systems |
| **NGOs** | ● Awareness raising and dissemination of information on EE technologies and measures for buildings |

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### 6.3. Mitigation policies and actions

This section provides a summary of the main policies and actions identified in the building sector that can have a mitigation effect on GHG emissions. The table below provides also a brief description, identified policy instrument(s), goals and, where available, also information on the implementation status.

**Table 8: Mitigation policies and actions – building sector**

| Policy or action | Sector | Subsector | Technology | Year publication | Document | Validity period | Main content, target, objectives | Policy Instruments | Current status | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| **Dissemination of efficient lighting equipment** | Buildings | All sub-sectors | Efficient lighting | 2016 | NDC | Until 2014 | Bulk distribution of CFLs and subsidies for retrofits. Savings already achieved (800,000 CFLs distributed since 2007) are estimated at 54 GWh and 260,000 $tCO_2$<br><br>Efficient lighting is mentioned also in the ESSP (2018), however no details are available on related policies and plans. | Financial instrument | Implemented | Policies to ensure replacement with same techs/LEDs? |
| **Building codes** | Buildings | All sub-sectors | Multiple | 2017<br><br>2018 | NDC Implementation plan<br><br>NECCP | N/A | Energy and water efficiency standards to be applied to buildings from mid-2018<br><br>NECCP mentions enforcement of the code, but actual status is not known | Regulatory | It was expected to be implemented in mid 2018<br><br>Rwanda Building code under review | Information on implementation needed |
| **Energy-Efficient and Climate-Friendly Cooling in Rwanda** | Buildings | All sub-sectors | Cooling technologies (refrigerators and air conditioning) | 2017 | Energy-Efficient and Climate-Friendly Cooling in Rwanda (https:// | Active (tbc) | Supported by the Kigali Cooling Efficiency Program (K-CEP), it targets “Transition the national market for refrigerators and air conditioners (AC) toward energy efficient and climate-friendly products”. Main activities include:<br>- Market assessment on residential refrigerators, commercial refrigerators and room air conditioners, to provide a | Multiple (regulatory and capacity building/TA) | *No information available* | Information on actual MEPS implementation is needed |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | united4efficiency.org/wp-content/uploads/2017/12/UN-Environment-K-CEP-Rwanda-Cooling-Project-overview-20171108.pdf ) | | strategy for GoR to introduce a strategy for efficient equipment and road map for Minimum Energy Performance Standards (MEPS)<br>- Capacity building and awareness raising<br>- Draft MEPS for conditioners and refrigerators for adoption by GoR<br>- Technical support for data collection | | | |
| **SolarRwanda Solar Water Heaters (SWH)** | Building | Residential | SWH | 2018 | NC3 | 2012 - ongoing | Provision of grants and interest free loans for the installation of SWH in the residential sector (info: http://115.160.244.10:8081/reg/what-we-do/programs/solarwanda/ ). Around 2300 systems installed so far (according to REG, NC3 reports 800). The program is to be implemented by the EDCL in cooperation with 4 companies (partnership agreements signed) | Financial mechanisms (grants and loans) | Ongoing | |
| **Rwanda Green Building Minimum Compliance System** | Building | New large-scale public buildings (includ | Multiple | 2018 | Rwanda Green Building Minimum Complia | 2017 - Ongoing | 29 minimum compliance green building indicators targeting energy efficiency, water efficiency, environment protection, indoor environmental quality and innovation in new large-scale public buildings | Regulatory | Rwanda Building Code expected to be amended with | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | es commercial, office, institutional, hotel, educational buildings) | | | nce System | | Green building indicators align with several national and international minimum green benchmarks<br><br>Green Building Minimum Compliance Implementation Plan | | Annex – 3 Rwanda Green Building Minimum Compliance System by March 2019 | |

# 7. Industry sector – overview

## 7.1. The industry sector at a glance

The industry sector currently generates 14 % of Rwandan GDP and encompasses construction, manufacturing, quarrying and mining. GHG emissions are linked to the energy needs to transform raw materials into final products through kilns, steam boilers, drying and toasting process equipment. Processes also generate direct emissions; in Rwanda the cement manufacturing process is the first largest cause of non-energy related GHG emissions in mineral industry due to clinker production.

GHG emissions of manufacturing and construction increased from 38 kt $CO_2$eq. in 2006 to 93 kt $CO_2$eq. in 2015. Mineral production saw emissions of 39 kt $CO_2$eq. in 2006 and 69.1 kt $CO_2$eq.in 2015, while emissions from the cement industry rose from 38 kt $CO_2$eq. in 2006 to 65 kt $CO_2$eq.in 2015. Baseline estimates for the industrial sector as a whole for 2050 reach 1.2 million t $CO_2$eq. in 2050 (GoR, 2018a).

## 7.2. Stakeholder mapping

**Table 9: Relevant stakeholders in the industry sector**

| Stakeholder | Current role/responsibilities |
|---|---|
| **MINICOM** | ● Promotion of international trade<br>● Involvement of private sector |
| **RDB** | ● Implementing the majority of policies developed by MINICOM, namely the Small and Medium Enterprises (SME) and Industrial Policies |
| **National Industrial Research and Development Agency (NIRDA)** | ● Promoting the adoption of improved technology in Rwanda's private sector. |
| **REG** | ● Implements projects providing sustainable energy (renewable energy); energy supply that supports the development of green industry and services |
| MINECOFIN | ● Oversight of financial flows from partners<br>● Ensuring the fiduciary framework for managing different financial instruments (e.g. grants, loans, etc.)<br>● Contributing to resource mobilization |
| **MoE** | ● Ensuring environmentally sound exploitation of natural resources<br>● Managing compliance with environmental regulations |
| **REMA** | ● Coordination, oversight and implementation of national environmental policies<br>● Ensuring consistency of industrial projects with national environmental regulations |
| **City of Kigali (CoK)** | ● As it is estimated that close to 70% of industry in Rwanda is located in Kigali the participation of the City is crucial for the implementation of policies and programs. |
| **Private Sector Federation – Rwanda (PSF)** | ● Promotes and represents the interests of the Rwandan business community. It was established in December |

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| | 1999, replacing the former Rwanda Chamber of Commerce and Industry |

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## 7.3. Mitigation policies and actions

This section provides a summary of the main policies and actions identified in the industry sector that can have a mitigation effect on GHG emissions. The table below provides also a brief description, identified policy instrument(s), goals and, where available, also information on the implementation status.

**Table 10: Mitigation policies and actions – industry sector**

| Policy or action | Sector | Subsector | Technology | Year publication | Document | Validity period | Main content, target, objectives | Policy Instruments | Current status | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| Energy efficiency improvements in the food industry | Industry | Tea and Coffee | Less energy intensive equipment | 2015 | NDC and NC3 | *No information available* | Through the installation of less energy intensive equipment and technologies for drying, roasting packaging.<br>Increase efficiency by 5% per year up to at least 30% in 2021. | Infrastructure programme | NAMA: Energy Efficiency Improvement in the Tea and Coffee Sector in Rwanda (UNFCCC, 2019) | Assessment of underlying incentives crucial |
| Eco-Industrial Parks / Green Industries Complex | Industry | Manufacturing | | 2015 | NDC and NC3 | *No information available* | The following principles will be applied:<br>● The production of goods and services in the industrial park must, at a minimum comply with defined standards;<br>● Any $CO_2$ emissions that remains after consideration of heating, cooling, fixed lighting and ventilation must be less than or equal to a pre-defined carbon compliance limit.<br>● Any remaining $CO_2$ emissions, from regulated energy sources must be reduced to zero | Infrastructure programmes | In two locations activities have already commenced (REMA, 2017) | Assessment of enforcement crucial |
| **Climate compatible mining** | Industry | Mining | Energy source switching | 2017 | NDC implementation plan and NC3 | 2018-2050 | Phase out fossil fuel use, through electricity by 2018.<br>Considering this restriction, the mitigation scenario assumed a reduction in GHG emission of up to 80%. The remaining 20% could be | *No information available* | 25% of mines use electricity (REMA, 2017). | Additional information on the policy instruments is required to |

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| | | | | | | | generated by on-site fuel combustion activities in the thermal generators. | | | categorize the policy. |
| Increasing efficiency in manufacturing processes in different industries | Industry | Cement and Construction | Diverse | 2018 | NC3 | *No information available* | Heat recovery from clicker production through co-generation. Rice husk as replacement of peat and/oil.<br>Efficient brick kilns. The implementation of efficient brick kilns could reduce significantly the fuel consumption the construction sector. | *No information available* | *No information available* | Additional information on the policy instruments is required to categorize the policy. |
| Increased proportions of Pozzolana in cement: | Industry | Cement | Chemical additives | 2018 | NC3 | *No information available* | Increase the share of non-clinker additives in the cement production beyond current cement-to-clinker ratio of 0.7 in the country. A rational 2% substitution of clinker with pozzolana from 2025 to 2029 and 5% (i.e. 0.65 cement-to-clinker ratios) substitution from 2030 to 2050. | *No information available* | *No information available* | Additional information on the policy instruments is required to categorize the policy. |

# 8. Conclusions

For five key sectors in Rwanda's economy we have identified the main sources of GHG emissions as well as baseline and mitigation estimates until 2050 using key Rwandan policy documents. We also identify the associated policies that can mitigate GHG emissions in Rwanda.

Regarding the energy sector, it is expected that renewable energies (principally hydro and solar, possibly geothermal) will have an important role in terms of overall installed capacity: however the development of peat-based generation and increase of natural gas-based generation can offset the positive mitigation impacts of the renewable energies. Impacts of policies related to off-grid electrification are also to be assessed further, to consider potential impacts of solar-diesel mini-grids. Another element that requires careful consideration is the assessment of the impacts of the planned increase in the use of LPG for cooking needs: its net effect on GHG emission can be established after assessment of the baseline fuels, including the share of non-renewable biomass of the fuels currently used.

In most cases policies with mitigation benefits are described in the Rwandan policy documents in general terms: however there is a lack of detailed information on the underlying policy instruments and plans for achieving the targets and their implementation status. This is the case for instance of the industry sector, where incentives provided by policies are not fully defined. Similarly, in the building sector, which is expected to be the most important sector in terms of future energy consumption, there implementation status of different policies and underlying policy instruments that can effectively reduce GHG emissions remains unclear. The case of the waste sector is different, as no clear policy is in place regarding waste management for both solid waste and wastewater. While construction and operation of certain types of waste treatment facilities would be a mitigation measure, policy support for such investments is not clear. The waste sector is crucial not only when considering GHG emissions, but also for the overall wellbeing of the communities and citizens given the important of the sustainable development co-benefits that can be delivered by appropriate waste management policies and practices. Generally, a thorough assessment of sectoral policies can only be done if the concrete policy instruments are clearly defined. As shown in this report, here many gaps remain. While a robust methodological framework that can track GHG impacts of policies can be developed now, its application is only possible once these gaps have been closed and the policies fully defined.

The list of identified policies for each sector – refined through feedback from REMA - will be the background for the preparation of the methodological framework for the assessment of GHG impacts of these policies and actions. Checklists and the methodological approach will be tailored to the Rwandan context and existing and planned policies identified in this report: appropriate tools for tracking the impacts of those policies that are clearly defined will be developed and initial elements be presented at a training workshop to be held on 21-22 February 2018.

This report also gives an overview of the relevant stakeholders in each sector. This information will be used for the definition of effective institutional arrangements in order to operationalize the methodological framework, especially when different ministries or agencies have to provide data and information.

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