



Rwanda Thinkpiece

Appendix C

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Author Megan Cole

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University of Oxford
Smith School of Enterprise and the Environment
Hayes House
75 George Street
Oxford OX1 2BQ
United Kingdom

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Acronyms and Abbreviations



AAP	Adaptation Africa Programme	MDG	Millennium Development Goal
AGAGE	Advanced Global Atmospheric Gases Experiment	MINAGRI	Ministry of Agriculture
CC DARE	Climate Change Adaptation and Development Initiative	MINECOFIN	Ministry of Finance and Economic Planning
CDKN	Climate Development Knowledge Network	MINEDUC	Ministry of Education
CDM	Clean Development Mechanism	MINELA	Ministry of Environment and Lands
CIC	Climate Innovation Centre	MINIFOM	Ministry of Forestry and Mines
CNS-ATM	Communication, Navigation, Surveillance and Air Traffic Management	MINICOM	Ministry of Trade and Industry
COMAP	Comprehensive Mitigation Assessment Process	MIT	Massachusetts Institute of Technology
COMESA	Common Market of Eastern and Southern Africa	MOH	Ministry of Health
COP	Conference of the Parties	MRV	Monitoring, Reporting and Verification
DFID	UK Department for International Development	NAPA	National Adaptation Programmes of Action to Climate Change
DVBT	Digital Video Broadcast Terrestrial	NSCCLCD	National Strategy on Climate Change and Low Carbon Development
EAC	East Africa Community	NCC	National Climate Committee
EIA	Environmental Impact Assessment	NMHS	National Meteorological and Hydrological Services
GEF	Global Environment Facility	NUR	National University of Rwanda
GoR	Government of Rwanda	PER	Public Expenditure Review
EDPRS	Economic Development and Poverty Reduction Strategy	PRSP	Poverty Reduction Strategy Paper
INC	Initial National Communication	PSF	Private Sector Federation
JSR	Joint Sector Review	REMA	Rwanda Environment Management Authority
KIST	Kigali Institute for Science and Technology	RECP	Resource Efficient and Cleaner Production
LDC	Least Developed Country	RMS	Rwanda Meteorological Service
LDCF	Least Developed Country Fund	SADC	Southern African Development Community
LEAP	Long-range Energy Alternatives Planning System	SEI	Stockholm Environment Institute
		SEZ	Special Economic Zones
		SMEs	small and medium enterprises
		SNC	Second National Communication

SSEE	Smith School of Enterprise and the Environment	UNIDO	United Nations Industrial Development Organization
TAP	Technical Action Plans	UN-PEI	United Nations Poverty Environment Initiative
TNA	Technical Needs Assessment	V11	Vulnerable Countries Forum
UNEP	United Nations Environmental Programme		
UNFCCC	United Nations Framework Convention on Climate Change		

Introduction



Rwanda has been committed to addressing the challenge of climate change since 1995 when it ratified the United Nations Framework Convention on Climate Change (UNFCCC). The government proactively submitted its Initial National Communication to the UNFCCC in 2005, its National Adaptation Programmes of Action for Climate Change (NAPA) in 2006 and plans to submit its Second National Communication (SNC) in late 2011. The focus thus far has been on adaptation however Rwanda is moving into a new paradigm of low carbon development which addresses both adaptation and mitigation, whilst focusing on economic growth. As a least developed country (LDC) and currently a carbon sink due to forest sequestration, Rwanda is not currently required to reduce its greenhouse gas (GHG) emissions. Vision 2020 sets Rwanda on a path of economic growth, attaining middle income status by 2020. In order to mitigate future emissions and to reduce its dependence on oil imports, a low carbon development strategy is vital.

The project to develop a National Strategy on Climate Change and Low Carbon Development (NSCCLCD) was launched on 25 November 2010 by the Steering Committee in Kigali. This 9-month project is funded by the Climate and Development Knowledge Network (CDKN) and DFID- Rwanda and is being undertaken by the Smith School of

Enterprise and the Environment (SSEE) at the University of Oxford. This project comes at the request of H.E. President Kagame and the Government of Rwanda and aims to build upon work that is already being done in Rwanda on climate change. The Strategy will look to the year 2050, and recommend actions that Rwanda can take to ensure its future stability and prosperity. The purpose of the Strategy is to guide national policy and planning, to mainstream climate change into all sectors of the economy, and to position Rwanda to receive international aid to achieve climate resilience and low carbon development. The Strategy calls upon national planners to track a new course of approach to address issues that are cross-sectoral by nature and require an integrated approach to counteract. The Strategy is the first step in a continuous process, geared to set Rwanda on a course to identify, describe and monitor its current and future vulnerabilities, and take self-determined actions towards building resilience and a robust economy.

This 'thinkpiece' aims to discuss the key development challenges and opportunities for Rwanda. It covers the strategic framework, related work and discusses the next steps in the project which includes climate finance opportunities and the development of climate observations and analysis.

Rwanda's development pathway



2.1 Current resource and economic base

Rwanda is a unique country with many distinctive features which play a role in its development. Its demography, natural resources, current economic base and governance will largely determine its development in the coming decades. The most important features and their implications are discussed briefly below.

Rwanda is a **small** country, with 26,338km² of land. It is situated near the equator, above 900m AMSL and has high rainfall and is therefore a very **fertile** that can feed itself. Rwanda is therefore capable of being food secure and exporting food produce. It currently produces maize, cassava, plantane, rice and wheat for domestic consumption and produces tea, coffee and pyrethrum for export. Very little food manufacturing is done, though there is much work being done to expand the sector which would reduce the cost of basic goods for the local population.

Rwanda is a **densely populated** country with 370 people per square kilometre, the highest in Africa. Its population is growing at 2.8% per year which will result in a population doubling from 11 million today to 22 million in 2050. The majority of the population farm **small holdings** scattered across the hills and are the backbone of the current economy with agriculture contributing 36% of GDP and 80% of the national workforce. **Women** make up 53% of the population and participate in subsistence agriculture more than men. As the population grows, the plots will grow smaller and many people will need to look for jobs in towns and cities. Education is crucial for this transition to

support a growing economy. One of the flagships of EDPRS is VUP – Vision 2020 Umurenge Programme – which seeks to relocate many rural dwellers into **villages** in order to supply them with basic amenities. VUP aims to create off-farm employment, formalise the economy and to provide effective social protection.

Twenty percent of the population live in urban settlements, 44% of them in Kigali. The rate of **urbanisation** is 4.4% which will result in much larger cities and Rwanda needs to carefully plan the growth of its urban areas to ensure that they are sustainable. **Job creation** is equally important to avoid slums developing which will result in health problems and could increase the incidence of crime, making Rwanda a less attractive place to do business.

Rwanda is **landlocked** and surrounded by countries which face development challenges of their own. It has limited transport infrastructure with one airport at the capital, Kigali, and no ports or rail, though these are in the planning and design stages. There is a wide road network but it is dominated by dirt roads. These factors result in high import and export costs and limit domestic and regional trade. The average cost per tonne/km is 165 USD compared to 95 USD for the region. Rwanda joined the **East Africa Community** in 2006 however which is likely to reduce trade barriers and open up markets to Rwanda.

The majority of the population burn wood and charcoal for cooking and do it in a fairly sustainable way, using plantations rather than natural forests for sourcing the wood. Only 10.5% have access to

electricity, the majority living in Kigali, limiting development in rural areas. Rwanda has 95MW of electricity generation capacity, produced by hydropower and oil-fuelled power plants. It has large renewable resources with an estimated power generation potential of over 1,00MW from geothermal power, methane gas, peat deposits, regional hydropower plants, small scale hydro and solar PV. This large and interesting mix of energy resources means that Rwanda can support growth in domestic and industrial use and foster a low carbon development path.

Rwanda has small known **mineral resources** of gold, tin, tungsten and coltan, with potential for expanding the industry in the coming years, though the actual potential is uncertain as limited exploration drilling has been done. Even though the industry is small, it contributed 38% of Rwanda's export earnings in 2010 with USD 96.4 million. It also has known deposits of gemstones, sapphire and ruby, and of construction materials such as gravel, granite, clay and dolomite.

Industry contributes only 14% to GDP, half of which comes from the construction sector. SMEs, both formal and informal, comprise 98% of businesses in Rwanda and 41% of all private sector employment. The GoR recognises the country's vulnerabilities to low tax revenue, a narrow export base and limited infrastructure and has embarked on a programme of mobilising private investments in the service sector and industry and services. Vision 2020 seeks to transform Rwanda into a knowledge-based society where services play a large role in the economy. Services currently contribute 45% to GDP and are dominated by wholesale and retail trade, real estate, transport and communication.

Tourism is Rwanda's largest export earner at over USD 200 million, due largely to gorilla tracking in Volcanoes National Park, and visitors to Nyungwe Forest. The **ICT** sector is considered as a flagship for the country's economic prosperity and a tool for transforming the Rwandan economy into a knowledge-based economy. Fibre optic cables have

recently been laid across the country in an impressive effort to provide broadband access and make Rwanda one of the most connected countries in Africa.

Rwanda has achieved a huge amount since the genocide in 1994, largely due to the visionary leadership and **good governance** shown by the government. There are high levels of transparency, almost no corruption, and good working relations with aid agencies, regional governments, the private sector and international organisations. This means that development plans can be funded and implemented and reliable monitoring and evaluation is done.

2.2 Future economic development

Rwanda has seen impressive economic growth of 8.5% GDP per year for the past 5 years, which is mostly attributed to the crop intensification programme. The GoR is committed to facilitating the emergence of a strong and modern private sector, which will drive growth, competitiveness, economic diversification and export promotion. Recent reforms in doing business have gained Rwanda international recognition and increased foreign investment. But despite Rwanda's impressive growth rate and committed leadership, 56% of the population lives below the poverty line and the country is still dependant on foreign aid. Rwanda has a current account deficit of 8% of GDP and receives 13% of its GDP from ODA. Imports are four times larger than exports with oil accounting for 16% of imports.

Growth in Rwanda's economy can come in a number of ways – agricultural exports, manufacturing, mining, quarrying, tourism and services. It is constrained by land availability and natural resources and should therefore focus on what it already has and what areas will provide the most return on investment, whilst preserving ecosystem services to ensure a sustainable economy. With its natural beauty, tourism, and particularly ecotourism, is an obvious win-win option. With its fertile soil and high rainfall, there is

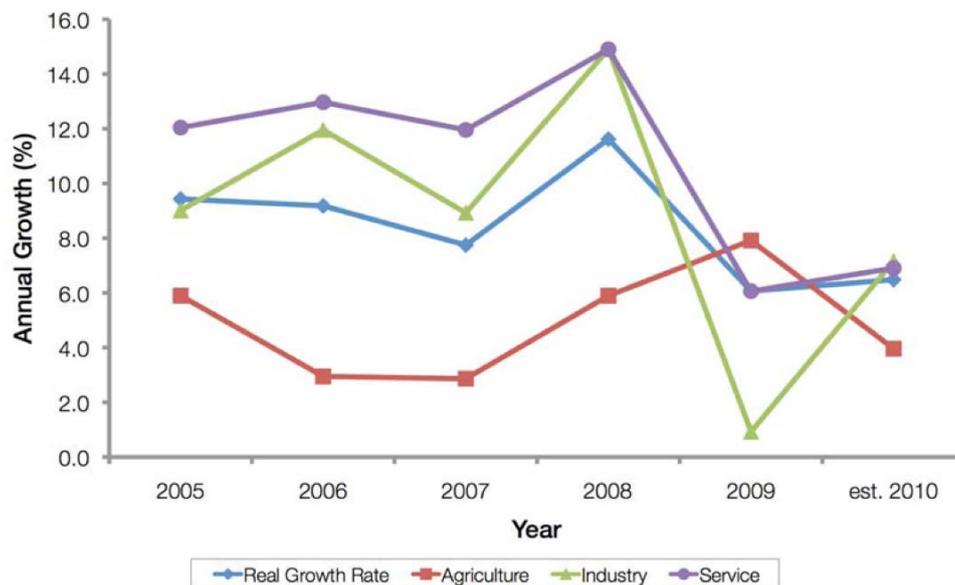


Figure 1: Growth trends in Rwanda 2005-2010
Source: National Institute of Statistics^[1]

much scope to expand crop varieties both for domestic consumption and export. Rwanda has mineral resources and quarrying materials, though the potential is unknown. Although mining degrades the natural environment, particularly on the steep slopes common in Rwanda, it is a high value export and even a small mining sector has a significant impact on economic development. Quarrying of construction materials is currently done on a small scale and there is much potential to expand operations and supply the domestic housing and road construction industry. This would reduce the cost of the materials and boost the local economy. Construction materials are particularly good for import substitution as they are very heavy, resulting in high import costs. The fibre optic network provides broadband across Rwanda and means that there is huge potential for IT-related services.

Industry should focus on import substitution – providing products that are needed by the local population, rather than for foreign export, particularly for heavy goods due to high transport costs. There is scope not only for building materials and processed food stuffs but for a whole range of products. The constraints are reliable electricity and water supply and finance, but this will be addressed through industrial parks and special economic

zones that guarantee basic services and tax exemptions. Rwanda has a large cheap labour force to support new industries though training is required to develop the knowledge and skills. The government is focusing on increasing export quantity and quality through value addition, transfer of adapted technology, decentralisation of industry, promoting competitiveness and promoting SMEs.

2.3 Threats to development: climate change, oil price and population growth

Climate change poses the greatest global challenge of our day. It requires us to reduce our dependence on fossil fuels and to learn to adapt to new climate-related risks. For developing countries, poverty alleviation and human development have become an even greater challenge. Climate change is a long term phenomenon. Since 1850, global average temperatures have risen by almost 1°C (figure 2) and climate projections indicate that temperature may increase by up to 4°C from pre-industrial levels by 2100^[2], and as a result we can expect significant changes to climate.

Population pressure will also be higher with the global population predicted to exceed 9 billion by 2050^[2]. The growth is expected to come predominantly from Asia and Africa while developed nations' populations remain fairly flat (figure 3).

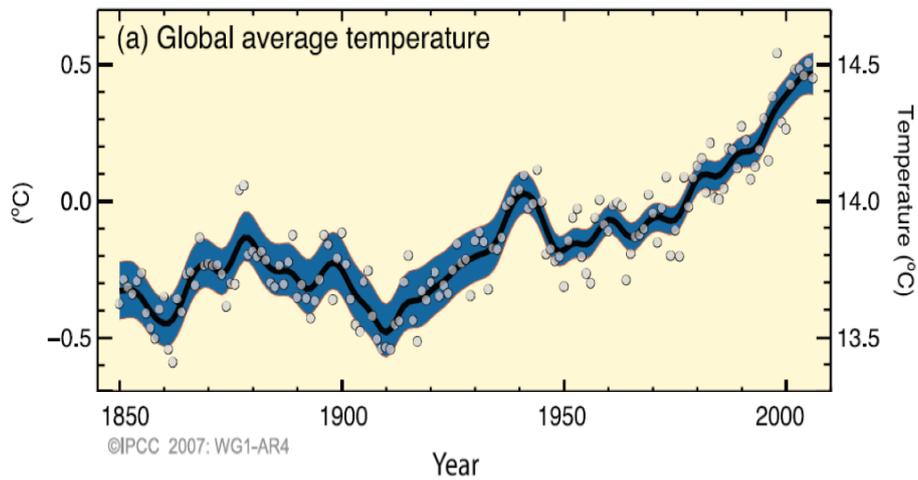


Figure 2: Global temperature increase since 1850
 Source: IPCC, 2007^[2]

Africa’s population is expected to reach 2 billion by 2050. Providing food, water and energy in a changing climate for such a large population is a huge challenge – what Sir John Beddington called the ‘perfect storm’. By 2030, global food production and water supply both need to increase by 30% to meet demands and global energy demand will be 30% higher^[3]. Urbanisation is also increasing and the global urban population exceeded the rural population for the first time last year^[4].

In our fossil-fuel dependant world, oil price has a major impact on economics and oil price spikes directly affect GDP, though to different degrees based on a country’s dependence on imported oil. Every 10 % increase in the oil price results in a drop in global GDP of about 0.2%^[5]. Oil price spikes also contribute to food price spikes as a large cost of food is transport, which hits the poorest the hardest. Oil prices are predicted to stay above the USD 80 per barrel mark for the foreseeable future^[6], as shown in figure 4, putting considerable strain on oil-dependent economies.

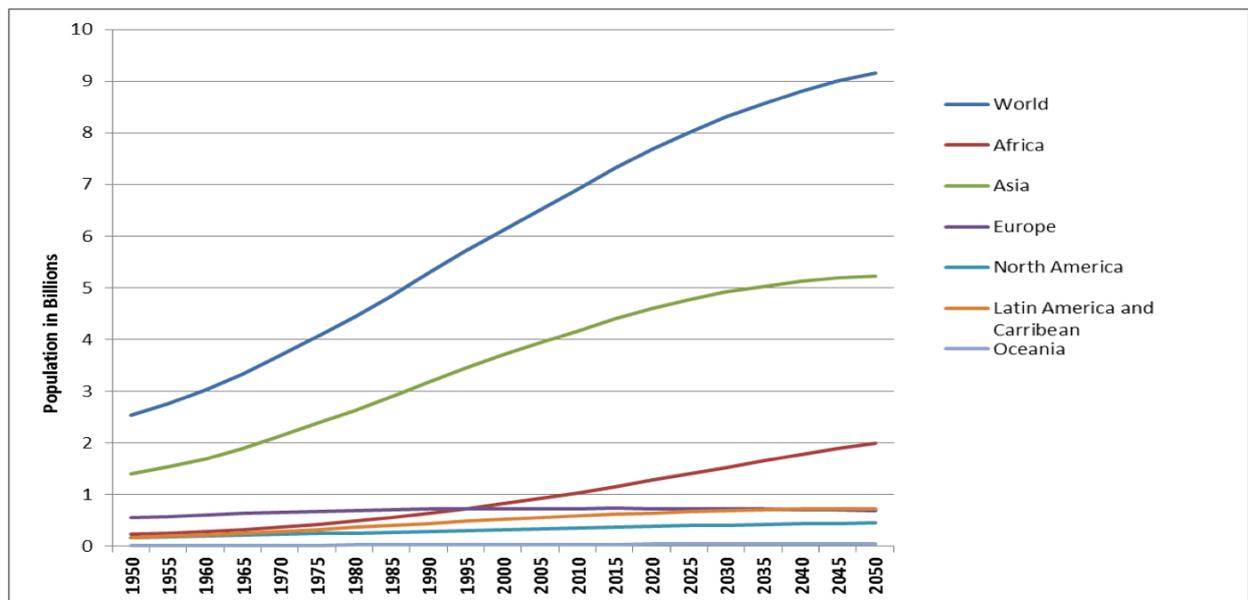


Figure 3: World population 1950 to 2050
 Source: UNPP^[4]

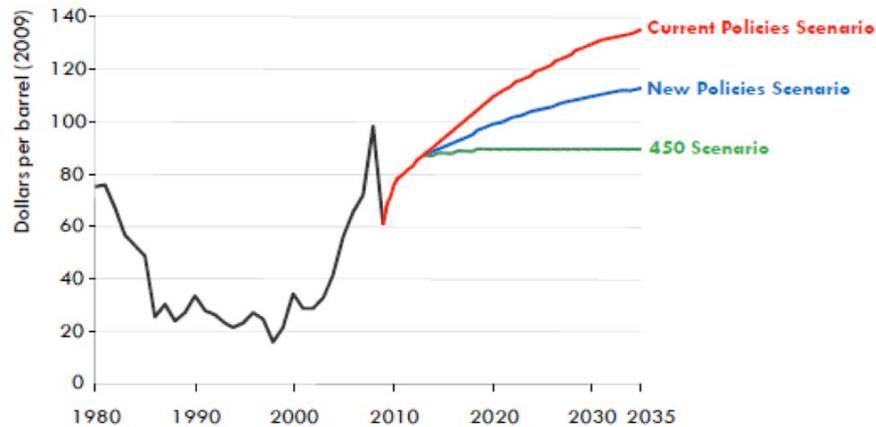


Figure 4: Oil price projections based on different climate change policies
Source: IEA^[6]

Rwanda sits astride two key climate regions, East Africa and Central Africa, with contrasting controls and drivers on climate. As a result the region is difficult to simulate in climate models. There is also a lack of sufficient data in the region which can be rectified in the coming years. Data from the airport, dating back to 1970, show an increase in temperature and decrease in rainfall (figure 5). Rwanda is highly vulnerable to the impacts of climate change because its economy is based on rain-fed agriculture. Any changes to rainfall patterns have a big impact on the economy. Rwanda's energy supply is also vulnerable as hydropower contributes 50% of its electricity, making it vulnerable to changes in rainfall and

flooding. Regional planning of hydropower plants of 500MW on the Rusizi River has based maximum capacity on current river flows, which are likely to change. Tourism is Rwanda's largest earner of foreign exchange but it is based on the survival of gorillas in the Volcanoes National Park, and the preservation of the pristine Nyungwe forest. These two areas of natural beauty are both vulnerable to change in temperature and rainfall. The health of the population is also at risk, particularly amongst those living below the poverty line, and as temperatures rise, diseases could spread. Flooding and storms are likely to become more common, which could damage roads, bridges, dams, houses, factories and mines.

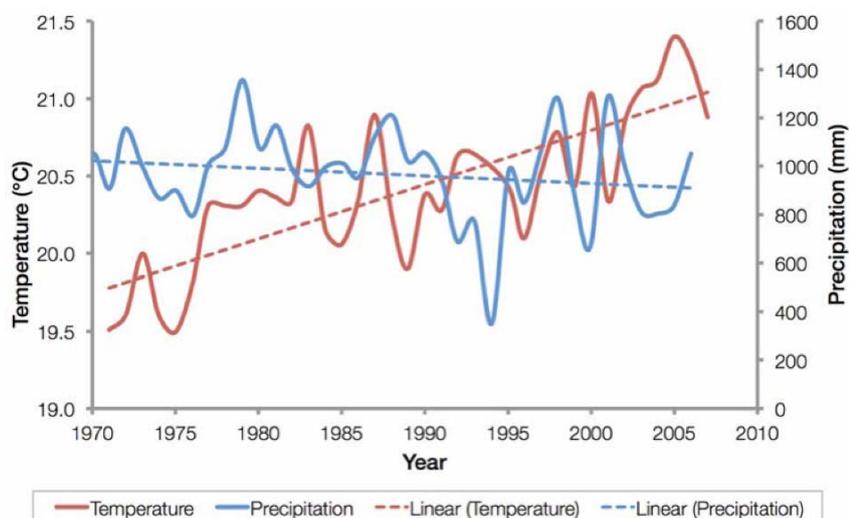


Figure 5: Variation of annual average temperature and rainfall at Kigali Airport Station

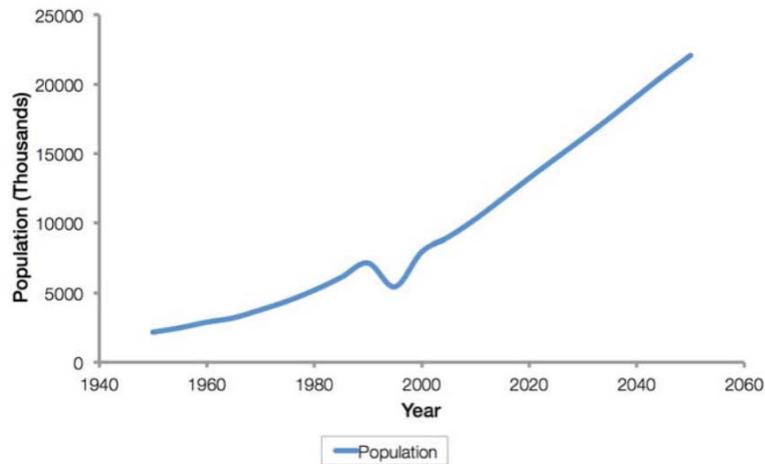


Figure 3: Population growth in Rwanda
Source: UNPP^[4]

Rwanda has the highest population density in Africa and is experiencing population growth of 2.8% per year. It is expected to have about 23 million residents in 2050^[4] shown in figure 6. As mentioned before, Africa's population is growing rapidly and this will affect Rwanda as it may increase immigration if Rwanda is seen as a successful economy. It will also increase pressure on food and water resources in the region, particularly in the already sensitive Nile Basin. Rwanda was the world's 10th fastest growing economy in the last decade^[7] which, along with population growth, has increased demand for energy, water and food domestically.

Rwanda is currently dependent on oil imports for transport and 45% of electricity generation. Rwanda's heavy reliance on imported oil puts it at risk from oil price spikes, which directly impact GDP. An example of this was the inflation spike from 5% to 20% in 2008 (figure 7). This was directly attributed to the increasing global oil price, with inflation reducing to 2007 levels once the oil price crashed. Further development reliant on fossil fuels will only make Rwanda's economy more susceptible to such price shocks. For a robust development strategy, Rwanda's economy must be decoupled from oil.

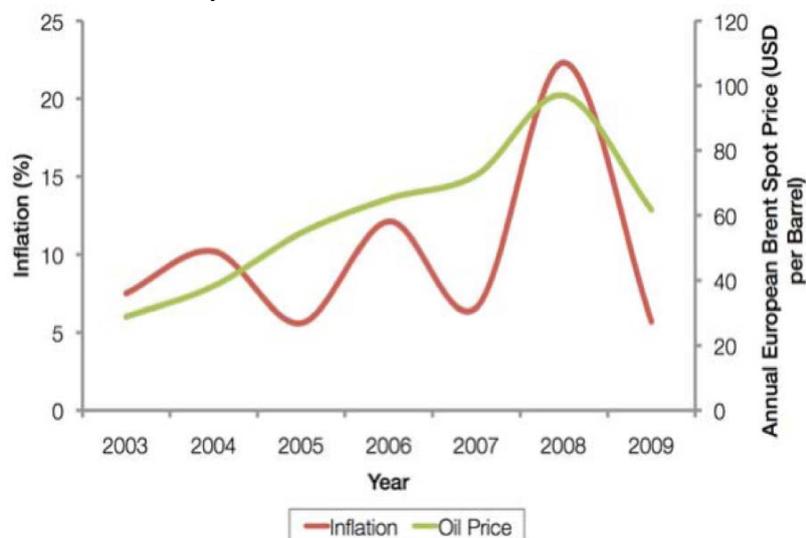


Figure 3: Inflation in Rwanda and global oil price from 2003 to 2009
Source: Owen & King^[8]

2.4 A low carbon and climate resilient development pathway

Rwanda has one of the lowest emissions per capita in the world, estimated at 0.65 tonnes CO₂/person (including land use change), compared to a global average of 4.63 tonnes CO₂/person. But recent economic growth has led to doubling of GHG emissions from 2003 to 2006 and this trend is set to continue. If Rwanda wants to reduce its emissions intensity, it needs to decouple its economy from fossil fuels. This necessity is more about energy security than mitigation of climate change. Rwanda's contribution to GHG emissions is and will remain insignificant compared to the large developed nations and emerging economies. But as shown earlier, Rwanda is highly vulnerable to oil price spikes, and needs to reduce oil import to protect its economy. As oil reserves decline and additional costs are added to the emissions from oil, oil prices are likely to increase in the future.

Rwanda is in the fortunate position of having a renewable low carbon energy resource mix which is the foundation for a low carbon economy. Although diesel is currently used for nearly half of electricity production, this can be phased out and replaced with geothermal, hydro and solar which are all clean energy sources. There are also methane and peat

deposits which are medium to high carbon, but are an improvement on oil and diesel. This energy mix will enable all consumers of energy – industry, services and the public – to lower emissions. More importantly, it will enable Rwanda to provide enough electricity for its growing economy and may even be able to export electricity generated domestically. The remaining challenge is for transport – oil will still need to be imported to supply the transport sector. Although some work is being done on growing jatropha for biofuels, the limited land and growing population in Rwanda brings the use of land for biofuels crops into serious question. Moving to a low carbon economy would reduce vulnerability to oil price spikes and improve energy security. Energy produced in-country saves foreign exchange reserves and energy efficiency gains are a win-win both for government, consumers and industry.

The Second National Communication includes an Evaluation of GHG Mitigation Options, where the 2005 baseline scenario is compared to a mitigation scenario (figure 8). A range of activities energy, agriculture, transport and industry are proposed to reduce GHG emissions. Although there is uncertainty in the data and future economic growth, this graph acts as an illustration of what a low carbon development path would look like for

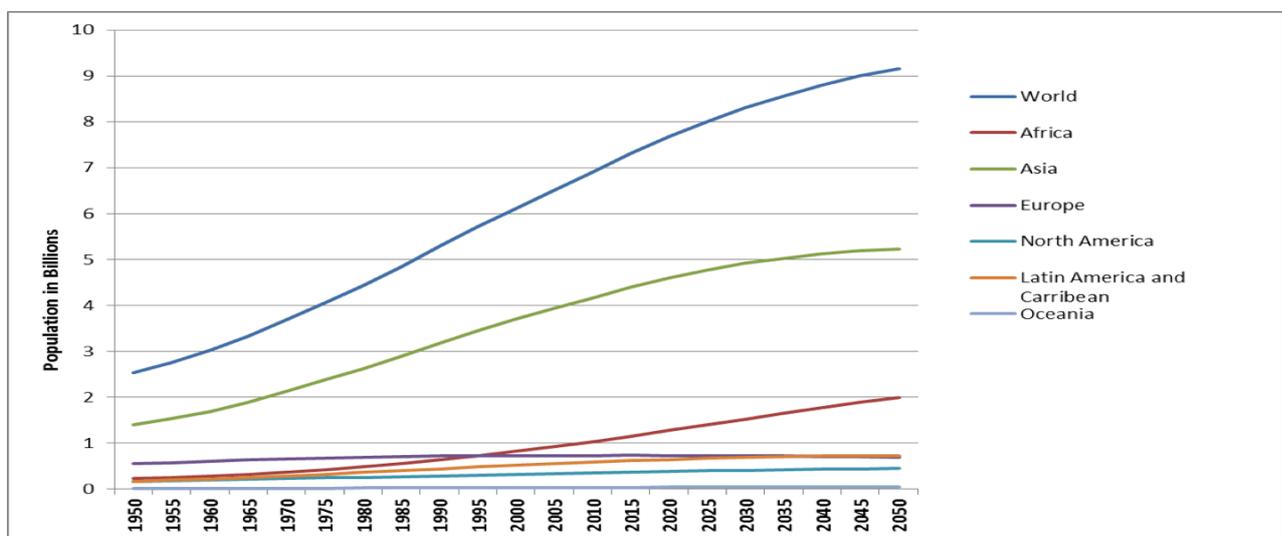


Figure 8: GHG emissions for the baseline and mitigation scenarios using LEAP software
Source: REMA^[9]

Rwanda. Forests can also play a role in low carbon development by acting as a carbon sink. By preserving current forests and planting trees, Rwanda's growing emissions can be reduced.

As discussed, Rwanda is vulnerable to climate change and needs to take steps to become climate resilient. Economic development, taking people out of poverty and into jobs that are less vulnerable to climate change, is a robust approach to adaptation. Vision 2020 aims to reduce the percentage of the population working in agriculture. But Rwanda needs to produce food to feed its growing population, and many people will continue in agricultural activities. Agricultural intensification and resource recovery and reuse will be required for improving food security, reducing vulnerability and maintaining sustainable livelihoods for the rural poor. The production per hectare can be increased

through more sustainable means and organic waste can be recycled and reused to improve soil fertility. Infrastructure also needs to become climate resilient. Roads, dams and bridges need to be designed with future climate change taken into account and buildings for housing, industry and mining need to be located in less vulnerable sites and with protection of ecosystems in mind. Rwanda also needs to gain greater understanding of the actual climate changes that will take place. This is covered in chapter 6. Population growth is a major factor in all aspects of the economy and female education and family planning is crucial to achieving robust economic development.

The development challenges and opportunities discussed in this chapter are summarised in Table 1 below and will be taken further in the Strategy, which is presented in the next chapter.

Table 1: Rwanda's resources and development pathway

Characteristics	Implications	Development path
Limited land but very fertile	Able to achieve food security	Expand crop varieties, local sales and manufactured products and exports
High population density with most people farming on small holdings	High vulnerability and potential to create rural poor	Sustainable intensification of small scale farming; Resource recovery and reuse; Female education
Majority of population live in scattered villages, while urban areas are expanding rapidly	High vulnerability Difficult to provide basic services High carbon cities and slums	Climate proofed and low carbon villagisation; Passive housing; Resource recovery and reuse
Landlocked and limited transport network, but part of EAC	High cost of imports Potential for access to markets	Integrated robust low carbon transport system; Import substitution through domestic low carbon industrial growth
High rainfall, though limited water resource management	Currently vulnerable to weather variations Able to achieve water security	Integrated Water Resource Management Irrigation and Storage
Natural beauty: forests, lakes and parks	Able to be a tourist destination	Ecotourism with community involvement
Renewable energy resources (geothermal, methane, hydro, solar) though many are shared regionally	Able to achieve energy security and low carbon development of industry and services	National grid based on renewables thus feeding industry with clean energy Installation of small-scale renewable energy in rural areas
Mineral resources and construction materials – though potential is unknown	Potential for foreign exchange earnings Potential for import substitution	Support sustainable development of the mining and quarrying industry
Small but growing manufacturing/ industry sector	Potential for import substitution of basic goods, considering weight to value ratio	Support sustainable development of industry that supplies domestic needs
Good governance though limited capacity	Access to finance Support services industry	Implement institutional and financial frameworks and capacity building

Strategic Framework



The Strategy is a document to guide National Planning and does not constitute direct policy, although policies may be readily derived. Importantly, the Strategy calls upon national planners to track a new course of approach to address issues that are cross-sectoral by nature and require an integrated approach to counteract. It lays out a vision statement for 2050 and three strategic objectives, guided by principles taken from Vision 2020 and EDPRS. These 3 core components of the strategic framework are shown in figure 9 below. The other 3 core components are enabling pillars, programmes of action and a roadmap for implementation.

Enabling Pillars establish an enabling environment to guide both development and climate finance mechanisms in order to mobilise the Strategy. They include cross-cutting issues for all sectors – institutional framework, financial structures, capacity building, research and development and information and communication.

3.1 Institutional Framework

In order for this Strategy to be effective, the institutional framework needs to be put in place. A National Climate Committee (NCC) was set up for the development of the Initial National Communication and a similar Steering Committee was convened for this project. This committee is made up of 10 cabinet ministers representing the sectors that are related to climate change and chaired by the Minister of Natural Resources. This committee should continue to convene on a regular basis to ensure that the Strategy evolves and is relevant. The members of the committee should be

reviewed at the end of this project and a new committee of technical experts be assembled for the implementation phase. This could include DGs and PSs from all the relevant ministries. The committee should maintain a strategic long term view in step with climate change and a wide range of stakeholders should be involved in the review process. A stakeholder board could be put in place to ensure that engagement occurs in all sectors. The private sector is particularly important as it is seen as a driver for growth in Rwanda, as well as academia who needs to develop the human and technical capacity for the future.

3.2 Financial Structures

A financial framework is just as important as an institutional framework and needs to be implemented as soon as possible to allow climate finance to flow into the country. The GoR is in the process of finalising a Bill to operationalise a basket fund, currently called FONERWA, for adaptation and mitigation projects. FONERWA should be housed in the Ministry of Finance and Economic Planning (MINECOFIN) and should be flexible enough to allow grants, loans, equity and other financial investments. FONERWA should be accountable and have self-investigative powers. It should be cognisant of existing initiatives and be objective to competing sector interests. It is covered in more detail in the finance section below. One of the outputs of the UN Poverty and Environment Initiative (PEI) is budget environmental mainstreaming. PEI has been doing work on integration of environment in policy, planning and implementation. In this regard, significant work has

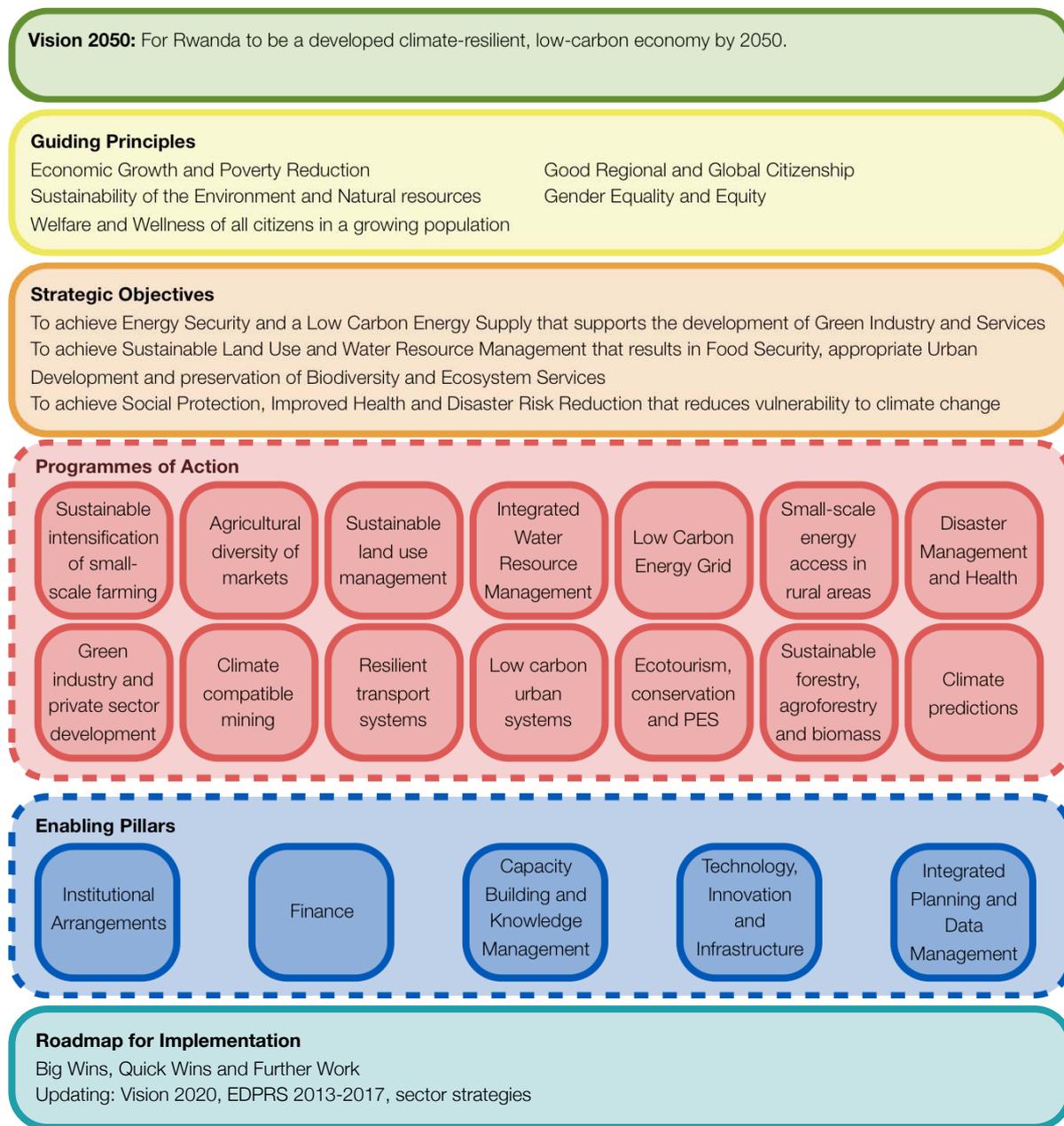


Figure 9: Strategic Framework for Rwanda’s National Strategy on Climate Change and Low Carbon Development

been done in sustainable financing for environment and climate change including working on a proposal to operationalize FONERWA as an important input towards sustainable financing of environmental sustainability and climate change related interventions.

3.3 Capacity Building

Capacity building is a fundamental element of Rwanda’s development. Each sector has highlighted capacity as a constraint and has plans to address it. As Rwanda moves towards a low carbon development pathway it will require greater

government capacity to analyse challenges, identify opportunities, prioritise interventions, mobilise resources, implement policies and evaluate progress (UNEP, 2011b). This needs to happen within government at both national and district levels, and within the private and the public sectors. Capacity building is a long term process and will require short term, medium term and long term interventions. Vulnerable groups will require particular attention to cope with the immediate challenges that climate change poses.

Immediate interventions include enrolling in free online courses while in the short term, Rwandans can study climate change related courses and gain practical experience in other countries. Foreign experts can visit Rwanda to give training courses and provide expert advice. This is common policy across ministries in Rwanda aimed at meeting development targets laid out in EDPRS. Those officials in GoR who are already involved in climate change work can take on interns to build capacity in their departments and to share local knowledge. Knowledge sharing can also take place through regular climate change meetings where representatives from different ministries meet to discuss the challenges they face and actions they are taking to respond.

In the medium term, education curricula need to incorporate climate change at primary, secondary and tertiary levels and technical training is required for the new technology that will be implemented. The curricula should be tailored for Rwanda and implementation should be done across the country. Figure 10 below shows a pyramid of climate change training that should be undertaken. At the base, the whole Rwandan population would attend school and be taught the basics of climate change. This would enable them to become catalysts for change in their families and communities. This could be done with simple practical exercises appropriate for urban or rural settings. Some of those school pupils would enter technical training colleges to develop the skills required for a low carbon developed economy, as shown in the middle of the pyramid. At the top of the pyramid, a smaller number of students would enter tertiary institutions and become professionals in the areas of climate science, water resource management, agroecology, green engineering, urban planning, renewable energy etc. To support the economy, capacity would also have to be built in the areas of management, entrepreneurship, administration, monitoring and evaluation and IT.

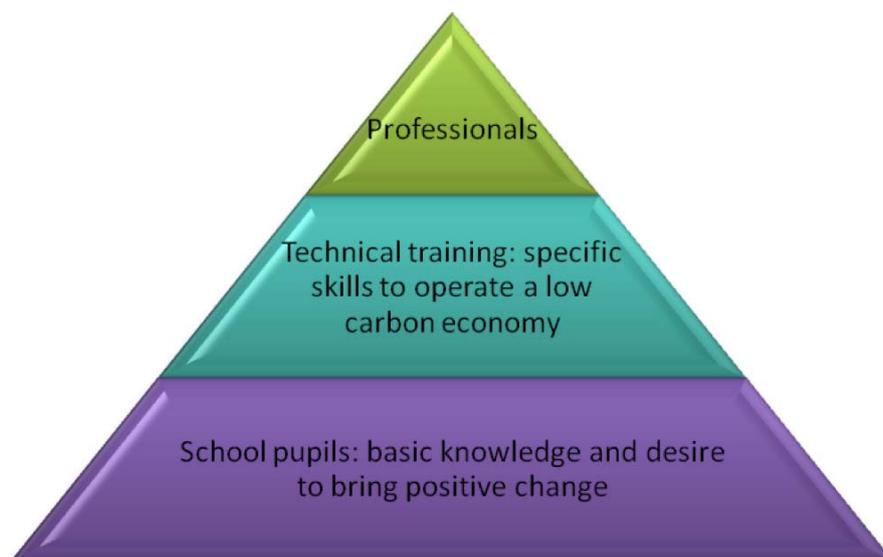


Figure 10: Pyramid of climate change training

Rwanda’s development vision is to become a knowledge economy and to provide services to the region and beyond. There is an opportunity for Rwanda to become a leader across the spectrum of climate related services. Climatologists trained in Rwanda could develop climate models and predictions for the East Africa region. Engineers could consult to developing countries on how to transform energy and transport systems for a low carbon economy. Lecturers could speak at international conferences on climate compatible development and the lessons Rwanda learned and the actions the country took to respond to the climate change. There are many opportunities before Rwanda today and capacity development is vital for taking hold of them.

3.4 Information and Communication

The responsibility for addressing climate change in Rwanda does not fall on the government alone. The private sector, academia, civil society and the public all have a part to play. Information and communication is vital for these sectors to engage with the government and to take up their

responsibility. This can start with this Strategy being made widely available in both English and Kinyarwanda and both in hardcopy and online. As a signatory to the UNFCCC, Rwanda has committed to providing information on emissions, adaptation and mitigation strategies. The Copenhagen Accord called for Monitoring, Reporting and Verification (MRV) from all countries but there is no legally binding agreement for this. This information should be made accessible and understandable to the Rwandan people. South Korea has a dedicated ‘Green Growth’ website (figure 11) while India operates a Climate Portal (figure 12) and Rwanda would benefit from setting up something similar. The proposed National Climate Centre (discussed below) would play a key role in this work as it would be the hub for all climate data. The Rwanda Meteorological Service (RMS) is working to expand weather broadcasts from television only to radio and newspaper. They are also working on the website to improve information given to the public. Public awareness has a large role in mitigation as household energy use and transport contribute a large proportion of national carbon emissions.

Figure 11: South Korea’s Green Growth website

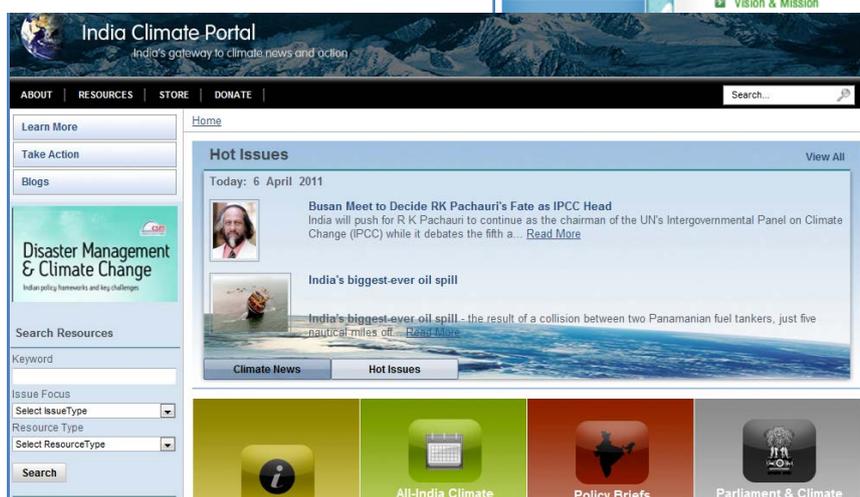
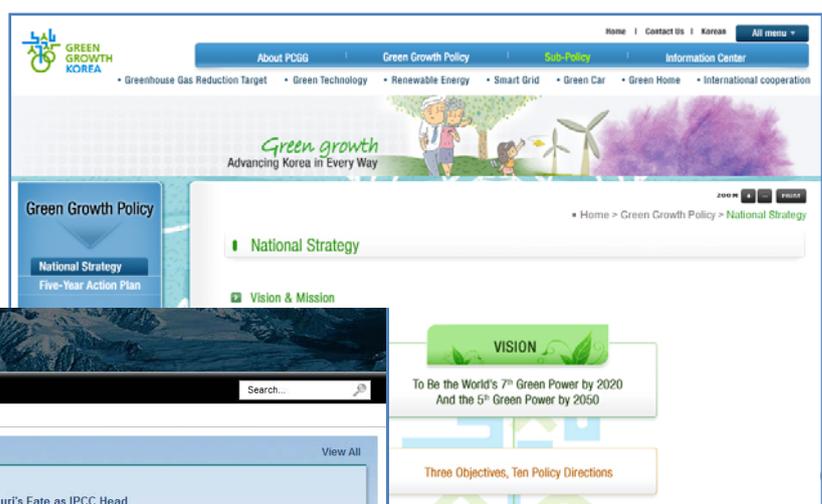


Figure 12: India’s online Climate Portal

3.5 Research and Development

Each sector will need to determine what research and development is required for their transformation into a low carbon economy. The research should be prioritised to enable appropriate funding and a technology roadmap developed. Technology transfer is crucial for Rwanda to move to a low carbon economy and the UNEP Technical Needs Assessment (TNA) and the infoDev Climate Innovation Centre (CIC) will contribute to that aspect of implementation. Rwanda's academic institutions

need to play their part by setting up the right courses for the future. This will include climatology, meteorology, agroecology, green engineering etc.

The Programmes of Action are under development as feedback on Sector Working Papers continues to be received. The programmes contain information on the Responsible Ministry, Timing, Indicators and Sources of Finance and quick wins have been identified for immediate attention.

National Guidance



The goal of the National Strategy is to provide overall multi-sector national guidance to all aspects of climate change and low carbon growth. In view of this, the strategy must necessarily review and appropriately take on all previous work that has been done in these areas of interest and work towards harmonising it to inform a coherent and forward looking framework. Previous and ongoing work is listed in a timeline below and briefly reviewed in relationship to this Strategy.

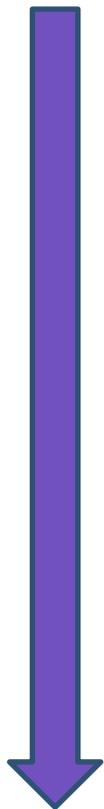
Vision 2020 aims to transform Rwanda from a subsistence agriculture economy to a knowledge-based society, with high levels of savings and private investment, thereby reducing the country's dependence on external aid. The **Economic Development and Poverty Reduction Strategy (EDPRS)** is the framework for achieving Vision 2020 and the Millennium Development Goals (MDGs). The recommendations from the NCLLCD Strategy must be incorporated into EDPRS II (2013-2017) and Vision 2020.

The GoR showed its forward thinking approach to climate change with its Initial National Communication (INC) submitted to the UNFCCC in September 2005. The **Second National Communication (SNC)** was drafted in 2010 and Rwanda plans to submit it in June 2011, when preparations for the Third National Communication will begin. This Strategy document will inform the Third National Communication in the areas of mitigation, adaptation and climate data, as well as plans for capacity building, awareness raising, research, and institutional and financial frameworks.

The SNC includes a separate report on the evaluation of **GHG Mitigation Options** for Rwanda which evaluates options for energy, agriculture, land use and forestry. Two scenarios were analysed – a baseline scenario and a mitigation scenario. This work shows that without intervention, Rwanda's GHG emissions will more than double by 2030, whereas with mitigation actions, emissions could be reduced. The assumptions and projections made in the mitigation scenarios will need to be reviewed once the National Strategy on Climate Change and Low Carbon Development (NSCCLCD) is adopted. The evaluation should then be updated and incorporated into the Third National Communication.

The Rwanda **National Adaptation Programmes of Action (NAPA)** evaluated the present vulnerabilities to climate change, considering socio-economics and land use. It identified the most vulnerable population groups, regions and sectors in Rwanda and determined 6 priority options and 7 priority projects for implementation (GoR, 2006) which are referenced in the Sector Working Papers. A number of adaptation projects are underway in Rwanda as a result of the NAPA and the recommendations have been integrated into EDPRS I. The NAPA submission enabled Rwanda to apply for funds from the Least Developed Country Fund (LCDF) managed by GEF, for project implementation. This comprehensive study on vulnerability and adaptation is still valid and forms a foundation for the Strategy development.

The overall objective of the **East Africa Community Climate Change Policy (EAC CCP)**



- Jul 2000** - Vision 2020
- Jun 2002** - Poverty Reduction Strategy Paper (PRSP)
- Sep 2005** - Initial National Communication to UNFCCC
- Dec 2006** - National Adaptation Programmes of Action for Climate Change (NAPA)
- Sep 2007** - Economic Development and Poverty Reduction Strategy (EDPRS)
- Oct 2008** – UNIDO-UNEP Resource Efficiency and Cleaner Production (RECP)
- Dec 2009** - Economics of Climate Change report
- Dec 2009** – UN-PEI Environmental Mainstreaming
- Jan 2010** – Copenhagen Accord association
- Aug 2010** - Draft Second National Communication and Mitigation Options
- Feb 2010** – Draft National Carbon Policy
- May 2010** – East Africa Climate Change Policy
- Mar 2011** – UNEP Technical Needs Assessment (TNA)
- Apr 2011** – East Africa Climate Change Strategy
- Sep 2011** – InfoDev Climate Innovation Centre
- 2011** – Preparations for Third National Communication

is to guide Partner States and other stakeholders on the preparation and implementation of collective measures to address climate change in the region while assuring sustainable social and economic development. The EAC Secretariat has recently produced an EAC Climate Change Strategy and plans to review the EAC CCP every three years. It is important for Rwanda to maintain good relations with the EAC and work with other countries to address climate change. It has the opportunity however to play a leading role and contribute greatly to the discussions and direction that the EAC takes. The NSCCLCD could be used to inform other country strategies in the region.

The **UNIDO-UNEP Resource Efficient and Cleaner Production (RECP) programme** provides an integrated framework to align climate objectives with and contribute to business success measured against traditional indicators for productivity, competitiveness and innovation (UNEP, 2010). This project complements the development of this Strategy and a recent final draft report

'Mainstreaming Resource Efficient and Cleaner Production in Rwanda's Policies and Strategies' will be used to inform the recommendations for Industry in the Strategy.

A report on the **Economics of Climate Change** was undertaken by the Stockholm Environment Institute (SEI) in 2009 and included a Rapid Assessment of a National Energy and Low Carbon Path for Rwanda report. It covers three broad areas: the impacts and economics costs of climate change, the costs of adaptation and the potential for low carbon growth. The study recommended that further work be done to improve the initial estimates, both for adaptation and low carbon development.

In March 2011, the GoR signed an MOU with **UNEP** to undertake a **Technical Needs Assessment** under the UNFCCC technology transfer process (UNEP, 2011a). The objectives of the project are to identify and prioritise technologies that can contribute to mitigation and adaptation goals, to identify barriers hindering the acquisition,

deployment and diffusion of prioritised technologies and to develop Technology Action Plans specifying activities and enabling frameworks to overcome the barriers and facilitate the transfer, adoption, and diffusion of selected technologies in Rwanda. The Sector Working Papers of the NSCCLCD will provide important inputs into the TNA project and should guide the focus of the work. The TNA work would form part of the implementation of the Strategy as it is focused on short term integration of clean technology.

infoDev is developing a business plan for a **Climate Innovation Centre** (CIC) in Rwanda and plans to host a stakeholder workshop in late 2011 in Kigali to initiate. CICs are aimed at helping developing countries accelerate the deployment of climate technologies, companies and industries. Current thinking is that it should form part of the Special Economic Zones (SEZ) which infoDev is discussing with personnel from the World Bank involved in setting up the SEZ. The CIC would support many of the recommendations in the Strategy.

Since the NAPA was produced in 2006, a number of **adaptation projects** have been initiated, funded by various donors. 'Supporting integrated and comprehensive approaches to climate change adaptation in Africa - Building a

National Approach in Rwanda' forms part of the Africa Adaptation Programme (AAP) and is funded by the Government of Japan. The work aims to strengthen institutional, individual and systemic capacity to address climate change risks and opportunities through a national approach to adaptation in Rwanda. The second major project is 'Reducing vulnerability to climate change by establishing Early Warning and Disaster Preparedness Systems and Support for Integrated Watershed Management in flood-prone areas' which is funded by UNDP and UNEP through the LDCF. The project aims to reduce the vulnerability of the Gishwati ecosystems and its associated Nile-Congo crest watersheds, and the people that derive their livelihoods from it, to increased floods and droughts due to climate change. The third project is 'Building capacity and raising awareness for a sensitive community on climate change adaptation in Rwanda' which is a CC DARE project funded by UNEP/UNDP. It was implemented by the Nile Basin Discourse Forum (NBDF) in 2009/2010. The main objective of the CC DARE Programme is to remove barriers and create opportunities for integrating climate change adaptation into national development agendas of partner countries. These projects are a good start but more needs to be done to implement the NAPA. This is dependent on funding which will be addressed in the Strategy.

Climate Centre



The Baseline Report provides a study of key sectors within Rwanda and their relationships and vulnerabilities to climate. Emerging from this study was an appreciation of key requirements for meteorological and climatological information which have an actual bearing on the economy and livelihoods in Rwanda. There is a great need for improved understanding of future climate change in order to design and plan to be climate resilient. This affects agriculture, water resource management and hydropower generation significantly.

The current resource base in Rwanda is critically limited if the country is to build its own capacity for incorporating climate issues into development. A Climate Observatory has been proposed sited on Mount Karisimbi and the Rwanda Meteorological Service (RMS) is currently undergoing a programme of expansion of its stations network and improvement of its data collection techniques.

There are numerous extant programmes, all of which are addressing Rwanda's needs only indirectly, which might offer collaborative support while Rwanda's own resources are being built. There is significant scope for the development of climate services within the region in support of national and regional development.

It is proposed that a climate centres be established, with formal links to the Rwanda Meteorological Service (RMS) and the proposed

Observatory. All meteorological and observational climate data would be collected and managed by RMS, including any data from the proposed Observatory on Mount Karisimbi. The RMS would hold all responsibility for research and operations related to time scales up to 10 days, while the climate centres would hold all responsibilities, other than for climate data collection and management, for longer time scales. The centre should be multi-disciplinary, including expertise in climate, in adaptation in all pertinent sectors, and in policy and any other pertinent disciplines and should develop links with relevant national and regional climate, social and policy programmes, both to kick-start activities and to assist in capacity building. Capacity building should be given the highest immediate priority alongside rebuilding of the observations network and training programmes and links with pertinent departments in KIST and NUR and at institutes external to Rwanda should be established. The climate centres could also explore options for becoming linked officially under either or both of COMESA and ECA. The following diagram illustrates the intended outcomes of the climate centre and the building blocks necessary to achieve those outcomes (note: arrows are for illustration only; they do not show direct links). The intended benefits of a climate centre are supportive of the development objectives identified in Rwanda's Vision 2020.

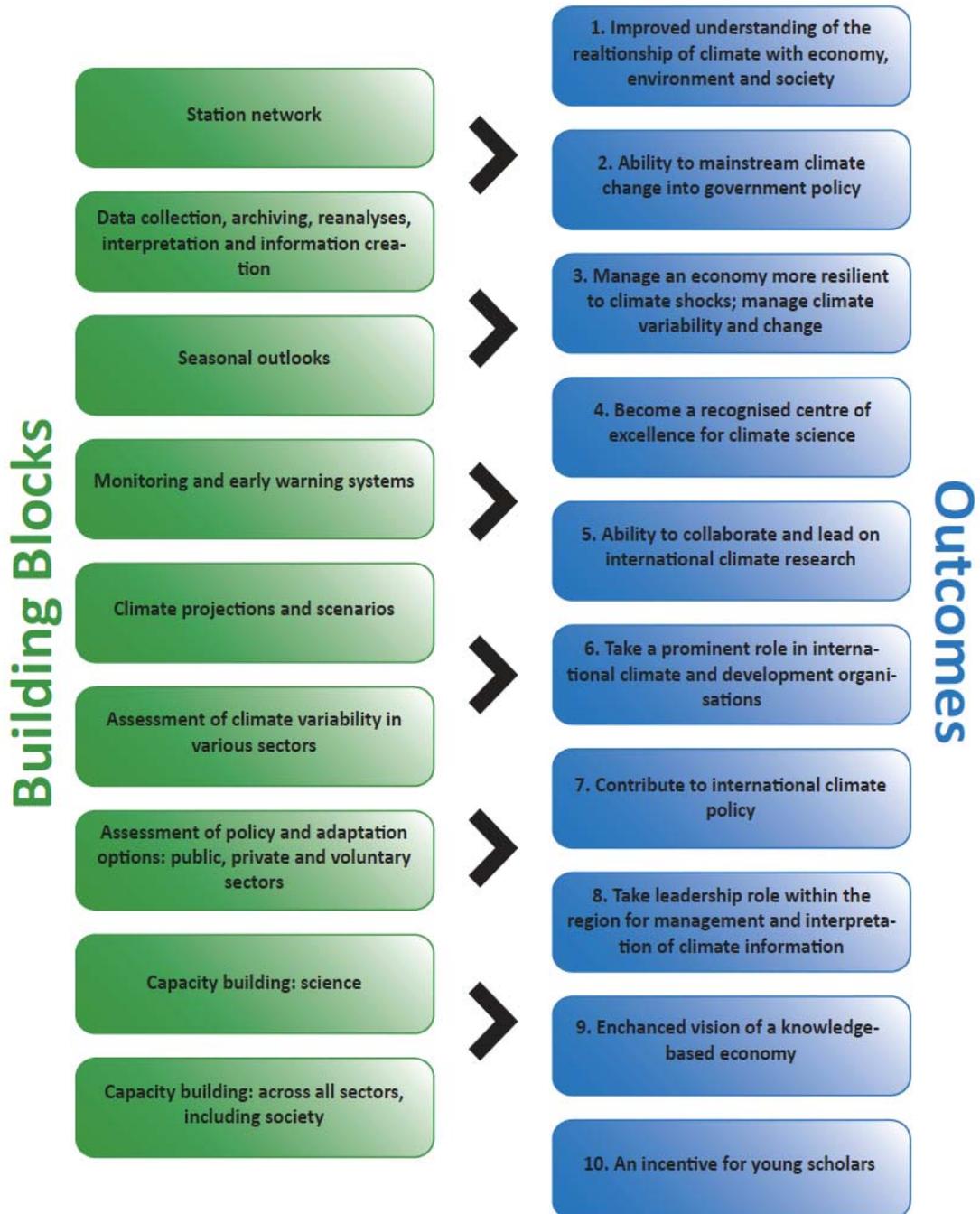


Figure 13: Building blocks and outcomes for a national climate centre

Climate Finance



Rwanda has yet to fully exploit climate finance opportunities that exist, and these opportunities will increase substantially over the next decade. The Copenhagen Accord established that developed countries will collectively commit USD 30 billion per year in new and additional ‘fast start funding’ (FSF) from 2010-2012 for adaptation and mitigation in LDCs, and will secure USD 100 billion per year by 2020 in long-term funding from a mix of public and private sources. Furthermore, the UNFCCC agreed to establish a new Green Climate Fund, which will rationalize the currently fragmented framework of climate finance, and will be central in mobilizing and channelling the committed funds. The Fund’s 40-strong transitional committee, made up of 15 members from developed countries and 25 from developing countries, held its first meeting in April 2011 in Mexico City, and aims to propose an

effective design for the fund in time for approval at the next Conference Of the Parties in Durban, December 2011.

6.1 Carbon Trading

As illustrated in figure 14, Rwanda’s carbon trading potential is limited by its “long-tail emissions profile”: it has few large-scale sources of GHG emissions that can be abated through a single carbon project, and numerous small-scale sources such as automobiles, animal and human waste, dirty cooking techniques, and fragmented deforestation that require multiple interventions and must be appropriately aggregated to access the market. Though potentially high in volume, such small-scale emission reduction opportunities have proven difficult to implement under traditional Clean Development Mechanism methodologies.

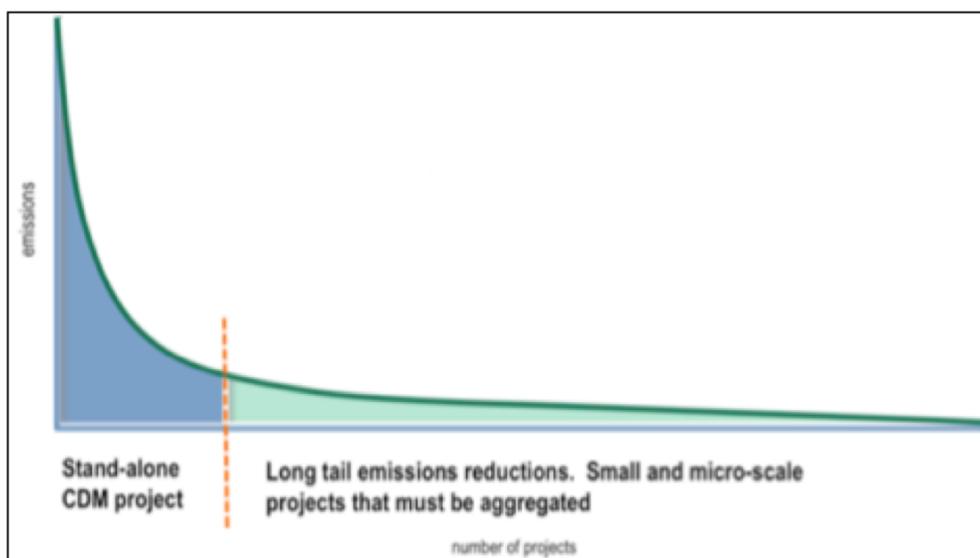


Figure 14: Long-Tail Emissions Profile of Rwanda

Energy	Built Environment	Forestry	Transport	Water	Agriculture
Hydro power	Solar water heaters	Reforestation	Biodiesel buses	Energy Efficient Water Purification	Composting
Biogas digesters	Waste-to-energy	Afforestation	Cash for clunkers		Biomass/ Biogas
Geothermal	Energy efficient building design	Reduced Emissions from Deforestation & Degradation	Bus Rapid Transit		
Solar home systems		Improved cook stoves			
Solar LED lanterns					
Lake Kivu methane					

Most CDM projects constitute large-scale installations, located primarily in China and India. Less than 2 percent of traded CDM credits have originated from Africa. This trend may change. It is becoming increasingly likely that the UNFCCC will fail to come to a post-Kyoto agreement with binding emissions reductions. Failure will reduce demand for CDM credits. If an agreement is not reached, the EU has declared that it will meet its voluntary reduction commitments for 2020, but will only purchase CDM credits from projects hosted in least developed countries. If this scenario materializes, Rwanda, as a stable least developed country, will be well placed to capitalize on the resulting shift in carbon investment away from large developing countries.

Furthermore, long-tail emission reductions are becoming increasingly implementable due to the new programmatic approach to the CDM, which allows Rwanda to aggregate emission offsets from numerous small-scale sources that are widely diffused and negated over time. Programmatic CDM could be instrumental in promoting the diffusion of small-scale technologies such as organic composting stations, solar lanterns, solar home systems, improved cook stoves, and biogas digesters.

Where the CDM remains too expensive, voluntary carbon markets may offer an alternative. Voluntary carbon markets may also be instrumental in obtaining carbon credits from Reducing Emissions from Deforestation and Degradation (REDD) projects, which are not yet eligible for CDM certification, and afforestation/reforestation projects, which are not tradable in Europe.

Currently, Rwanda has just one registered CDM project, to distribute efficient compact fluorescent lamps throughout the residential sector, and series of other proposed carbon projects at various stages in the pipeline. Table 2 lists a sample of potential carbon projects in Rwanda.

6.2 Multilateral and Bilateral Grants

Dozens of multilateral climate funds have been established in recent years. Those most applicable to Rwanda are listed in table 3. Thus far, Rwanda has received approximately USD 13.34 million from these funds and is due to receive a further USD 3 million, as outlined in table 4. Each of the multilateral climate change funds has their own unique mandate, institutional requirements and application and monitoring procedures. The overt complexity of the process has led the executive chair of CDKN, Simon Maxwell to remark: "The institutional architecture seems to me like a herd of runaway

Table 3: Multilateral climate funds available to each sector

	Agriculture	Built Environment	Disaster Risk Reduction	Climate Risk Reduction	Energy	Forestry	Industry	Land	Mining	Transport	Water
Adaptation Fund											
AfDB Congo Basin Forest Fund											
AfDB Sustainable Energy Fund for Africa											
Africa Enterprise Challenge Fund											
Clean Technology Fund											
Climate Finance Innovation Facility											
ClimDev-Africa Special Fund											
DEG - Deutsche Investitions											
EIB Post-2012 Carbon Credit Fund											
EIB-KfW Carbon Programme II											
Global Climate Change Alliance											
Global Energy Efficiency and Renewable Energy Fund											
Global Environment Facility											
Global Facility for Disaster Risk Reduction and Recovery											
Hatoyama Initiative (Japan)											
International Climate Initiative (Germany)											
International Climate Fund (UK)											
International Development Association											
KfW Development & Climate Finance											
Least Developed Country Fund											
Nordic Climate Facility											
Private Infrastructure Development Group											
Public-Private Infrastructure Advisory Facility											
Seed Capital Assistance Facility											
Special Climate Change Fund											
UNDP Green Commodities Facility											
UNDP/MDG Carbon Facility											
UNEP Renewable Energy Enterprise Development											
World Bank Carbon Facility											
World Bank Catastrophe Risk Management Facility											
World Bank Forest Carbon Partnership Facility											

horses without a rider. You need someone to simplify, simplify, simplify."

Beyond multilateral funds, a large portion the pledged USD 30 billion per year in "new and additional" Fast Start Funding (FSF) is flowing through traditional aid frameworks. Rwanda has one forthcoming FSF programme, sponsored by the

Belgian government, Wallonie 2010, which is worth EUR 250,000. Other development partners, including Japan, United Kingdom, United States, Germany, Sweden, Norway, and the Netherlands, have made significant FSF pledges. Some of these donors may be willing to channel a portion of their FSF into a national climate change basket fund, giving the Government of Rwanda greater control

Project	Fund	Year	Approved (USD)	Received (USD)
Budget Support for Environment and Natural Resources in Rwanda: Ensuring food security through a land tenure reform	Global Climate Change Alliance	2010	\$6.05 mn	\$3.06 mn
Preparation of a National Adaptation Plan of Action (NAPA)	Least Developed Country Fund	2010	\$0.20 mn	\$0.20 mn
Preserving Biodiversity in the Nyungwe Forest	International Climate Initiative	2009	\$2.42 mn	\$2.42 mn
Establishing Early Warning and Disaster Preparedness Systems and Support for Integrated Watershed Management in Flood Prone Areas	Least Developed Country Fund	2009	\$3.16 mn	\$3.16 mn
Sustainable Energy Development Project	GEF Trust Fund	2009	\$4.50 mn	\$4.50 mn
Total			\$16.33 mn	\$13.34 mn

6.3 National Climate Change Basket Fund

The international community is increasingly recognizing that a more coordinated approach to climate financing would best be achieved through ‘devolution’ of management to developing country governments. In this context, many developing country governments have created ‘national climate change basket funds,’ and have successfully attracted significant direct budgetary support. Some of these are listed in table 5.

Rwanda already has a draft law providing for a National Fund for the Environment (FONERWA). Such a fund could be the centrepiece of Rwanda’s climate financing plan, and serve to streamline climate finance along the Strategy. The forthcoming

bill will initially place FONERWA within REMA while it is being capitalized. During this incubational phase, FONERWA will be limited to providing adaptation and low carbon projects with grant financing. However, as illustrated in figure 12, FONERWA could eventually become instrumental in leveraging private investment for low carbon initiatives by employing other public financing mechanisms. By extending lines of credit, loan guarantees, and public equity capital, FONERWA would enable green businesses and consumers to overcome initial investment costs of low carbon technologies, and would attract private finance by buying down the risk of low carbon investments. To facilitate the use of these more complex financial products,

Country	Name of Fund
Indonesia	Climate Change Trust Fund, and Green Investment Fund
Brazil	Amazon Fund, and National Fund on Climate Change
Bangladesh	Climate Change Trust Fund, and Climate Change Resilience Fund
China	Fund for the Environment, and CDM Fund
Ecuador	Yasuni National Trust Fund
Maldives	Climate Change Trust Fund
Thailand	Energy Efficiency Revolving Fund
India	Clean Energy Fund
Philippines	National Survival Fund

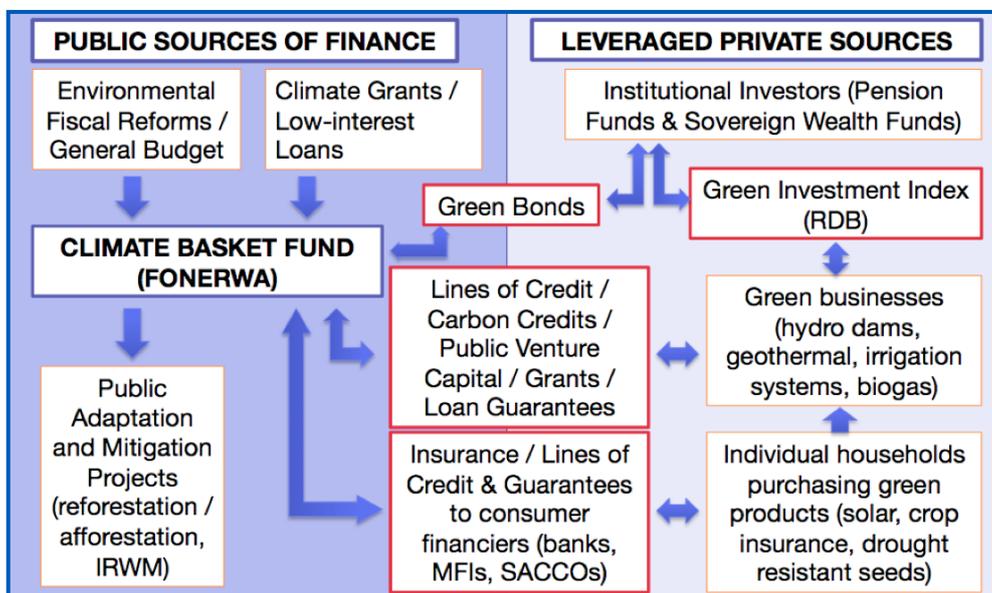


Figure 15: Using Public Funds to Leverage Private Investment

FONERWA should either be transferred to MINECOFIN once of a certain size, or a portion should be managed by a financial asset manager as a public private partnership (PPP) vehicle.

Most likely, FONERWA will initially be capitalized through bilateral grants. However, in the medium-term, the GoR may wish to access debt financing to scale-up financially viable low carbon activities. It would begin with highly concessional loans from development partners, but could eventually issue “green bonds” to attract private institutional investors. FONERWA will also be capitalized

through environmental fiscal reforms, which aim to shape private behaviour by making environmentally damaging activities more expensive. The revenues from environmental taxes could then recycled to invest in environmentally beneficial activities such as payments for ecosystem services (PES) to promote forest and wetland conservation, and feed-in tariffs to promote private production of renewable electricity. In this manner, Rwanda can guide its economic growth along a climate resilient and low carbon trajectory.

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