



Circular Economy in Africa-EU Cooperation

Country report for Rwanda



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Abbreviations

ACEN	African Circular Economy Network
ACP	African, Caribbean and Pacific Group of States
CAAST-NET	Sub-Saharan Africa-EU Science & Technology Cooperation Network
CDAIS	Capacity Development for Agricultural Innovation Systems
CE	Circular Economy
CoK	City of Kigali
CPCIC	Cleaner Production & Climate Innovation Centre
CSO	Civil Society Organisations
DE	Germany
DeSIRA	for Development of Smart Innovation through Research in Agriculture
DFID	Department for International Development
DFIs	Development Finance Institutions
DP	Development Partners
EAC	East African Community
EBC	European Business Chamber
ECOWAS	Economic Community of West African States
EDD	European Development Days
EDPRS	Economic Development and Poverty Reduction Strategies
EEE	Electrical and electronic equipment
EESD	Environmental Education for Sustainable Development
EIB	European Investment Bank
EIR	Institution of Engineers Rwanda
EPA	Economic Partnership Agreement
EU	European Union
FAO	Food and Agriculture Organization
FONERWA	Rwanda Green Fund
GCCA+	Global Climate Change Alliance Plus
GDP	Gross Domestic Product
GGCRS	Green Growth and Climate Resilience Strategy
GIZ	Gesellschaft für Internationale Zusammenarbeit
GoR	Government of Rwanda
HFCs	Hydro-fluorocarbons
ICRAF	International Centre for Research in Agroforestry
ICT	Information and Communication Technologies
IPRCs	Integrated Polytechnic Regional Centres
IPs	Industrial Parks
IUCN	International Union for Conservation of Nature

JSR	Joint Sector Reviews
KfW	Kreditanstalt für Wiederaufbau
LCF	the Local Competitiveness Facility
LDC	Least Developed Country
LRT	Light Rapid Transit
MENA	Middle East and North Africa
MINECOFIN	Ministry of Finance and Economic Planning
MINICOM	Ministry of Trade and Industry
MINEDUC	Ministry of Education
MININFRA	Ministry of Infrastructure
MoE	the Ministry of Environment
Mol	Rwandan Ministry of Infrastructure
MRT	Mass Rapid Transit
MSW	Municipal Solid Waste
NDC	Nationally Determined Contributions
NIP	National Indicative Programme
NIRDA	National Industrial Research and Development Agency
NL	Netherlands
NST	National Strategy for Transformation
OECD	Organisation for Economic Co-operation and Development
PoAs	Programs of Actions
PSF	Private Sector Federation
RAB	Rwanda Agriculture Board
RDB	Rwanda Development Board
RECP	resource efficiency and cleaner and greener production
REG	Rwanda Energy Group
REMA	Rwanda Environment Management Authority
RFA	Rwanda Forestry Authority
RRECPC	Rwanda Resource Efficient and Cleaner Production Centre
RSB	Rwanda Standards Board
RTDA	Rwanda Transport Development Agency
RURA	Rwanda Utilities Regulatory Authority
RwGBO	Rwanda Green Building Organisation
SE	Sweden
SEZ	Special Economic Zone
SEZAR	Special Economic Zones Authority of Rwanda
SWG	Sector Working Groups
TVET	Technical and Vocational Education and Training
UK	United Kingdom

USD	United States Dollar
WASAC	Water and Sanitation Corporation
WDA	Workforce Development Authority
WEEE	Waste from Electrical and Electronic Equipment
WVA	Watoto Vision on Africa

Executive summary

This country report for Rwanda is one of eight 'country reports' produced as part of the study 'Circular Economy in the Africa-EU Cooperation'. The report has been developed in the context of the implementation of the European Green Deal agenda, and notably of its international dimension. The objective of the report is to provide a better understanding of the potential of the circular economy in Rwanda as well as to contribute to a better understanding on the role of EU-Africa cooperation and aid mechanisms concerning the circular economy development.

The status of the circular economy in Rwanda reveals that the government is taking into consideration opportunities presented by circular principles across different strategies and policies. However, these initiatives are not necessarily coined under the term 'circular economy'. Rwanda is well placed to be the regional hub for Africa in the area of circular economy (CE). For over a decade, it has taken a proactive approach and put environment and climate change at the heart of all the country's policies, programmes and plans to integrate green growth and climate resilience strategies. It was one of the first countries to ban single-use plastic bags, has the largest Green Fund in Africa, and is widely seen to have a pioneering, innovative and nimble policy environment. Rwanda has a pioneering role in the co-founding of the African Circular Economy Alliance and has a track record for being a test location for trialling innovative approaches before launching in other parts of Africa.

Policy vision, framework, and priority sectors

Rwanda has been following key strategies since 2000 to provide concrete goals for transforming the country into a middle-income country by 2020. Many of these goals, although not always in name, are centred around Circular Economy principles driven by key economic directives that have significantly furthered the recent economic successes of the country. Key legislative frameworks to drive the country's vision are taken seriously and promulgated through parliament and backed by solid financial and legal instruments. Rwanda illustrates transparency and accountability in auditing its deliverables and goals in achieving economic sustainability. The country is constantly revising its structures and capacity and is looking to create international partnerships and linkages to strengthen these.

The top sectors with the greatest CE potential are Waste Management – including wastewater, solid waste, plastic and e-waste; Agriculture; Manufacturing; Construction and Transport. These are analysed in their current context with key sector recommendations for developing CE interventions, projects, policy and legislation that will support future collaboration and facilitate local economic development, collaboration with EU companies and institutions and leverage funding/investment.

There is a range of policy documents and strategies that have been implemented in the past with a focus on sustainable development and environmental protection and these have been assessed as part of the policy frameworks requiring alignment to Circular Economy. Recommendations are made to collate all projects, policy and legislation through a multi-sector strategy to align new policy and legislation along the lines of Circular Economy Principles. Financial programmes and initiatives currently in place also need strategic alignment and this would open further opportunities for trade and Rwanda/EU collaboration and a number of suggestions are made in this regard. This could further open trade and investments in the Circular Economy in Rwanda. There is existing awareness and capacities on CE in Rwanda which can also be built upon to further the transition to a Circular Economy. Impacts and benefits of CE in Rwanda are assessed in the current context and the potential of expanding these are suggested including recommendations on strengthening policy dialogue, project developments, financial instruments, trade directives, research and technical cooperation and suggestions to create a supportive environment to foster these.

Rwanda – EU cooperation

There are comprehensive political dialogues between Rwanda and the EU on various sustainable development issues. However, CE aspects have not yet become an integral part of this dialogue. With the NIP 2014-2020 as the primary basis for cooperation relations between Rwanda and the EU, EU-funded development cooperation programmes mainly focused on energy and agriculture as three priority sectors, alongside aspects of governance, civil society and human rights. Apart from a few small-scale initiatives, projects facilitating the transition towards a more circular development model in Rwanda are mostly absent. The majority of EU DFI activities in Rwanda focus on private sector support or infrastructural issues. However, first activities such as the establishment of the Rwanda Green Fund (FONERWA), supported by a financial contribution to the fund from the German KfW and UK Department for International Development (DFID), already take a central role in achieving sustainable development and supporting the implementation of CE-related activities in the country. The European Investment

Bank (EIB) has also been involved in projects in Rwanda for half a century supporting agriculture, manufacturing, tourism and wastewater and sanitation projects mainly. In an effort to develop and improve the trade relations between their countries and the EU, the East African Community (EAC), including Rwanda, has elaborated an Economic Partnership Agreement (EPA) with the EU. Although the EPA is not addressing Circular Economy as such, it does set a clear focus on promoting the sustainable development within the EAC. Currently there are no bilateral agreements on joint research initiatives or other framework documents that govern technical cooperation between the EU and Rwanda. There are dedicated platforms (or events such as Circular Economy missions) connecting EU companies to Rwandan firms on CE-related topics. However, Rwanda has already attracted a number of impactful EU companies (Heineken (NL), Sweco (SE), This Side Up Coffee (NL), Volkswagen (DE)) with diverse CE-related and sustainability objectives.

General recommendations

Education, advocacy and policy need to drive the message of Circularity to ensure a sustainable future for the country. Whilst Rwanda can benefit from similar European policies, these also need to embrace and contextualise local culture, economic realities and environmental constraints or opportunities. An initial priority emanating from the outcomes of this report could be to develop some sharing platform where the many European and local initiatives are tabled and strategically linked to create a single directive to advise and inform future project developments in the country. Projects are isolated and some level of cohesion and collaboration could lead to a greater level of additionality for these initiatives and spread the benefits more regionally.

To **strengthen policy dialogues** there is a need for a national circular policy, legal and institutional framework and strategy; CE awareness raising, capacity development, applied research, technical skills development among key stakeholders; the set-up of a well-functioning national CE related policy dialogue framework.

To ensure **successful development cooperation projects and programmes**, the EU may offer budget support to Government of Rwanda (GoR) concerned institutions in order to implement circular economy concepts that can enhance climate resilience and adaptive capacity in Rwanda. The EU may further help incentivize the private sector to optimise the use of circular economy principles across various sectors of the economy and also promote resource efficiency and cleaner and greener production (RECP) technologies, development and transfer.

For effective **cooperation with the European Investment Bank (EIB) and other European Development Finance Institutions (DFIs)**, Rwanda needs to adopt innovative financial models and instruments that would catalyse investments in CE related activities.

For advancing **investments in environmental goods and services** between the EU and Rwanda, the EU would foster investment in environmentally-friendly technologies that would accelerate the transition to a circular economy. For advancing **trade**, the EU could consider Rwanda as an up and coming trading partner with sustainable and locally processed materials that can become the cornerstone of long-term fair trade between the two.

To create a **supportive environment for EU / African companies** with CE operations in Rwandan industry, manufacturing and construction, it is critical to upgrade Industrial Parks (IPs) and Special Economic Zones (SEZs) into Eco Industrial Parks (EIPs) and Industrial Symbiosis (IS) approaches. The EU may partner with the GoR concerned institutions to initiate a program/project to operationalize EIPs CE approaches in Rwandan industry, manufacturing & construction through upgrading existing and planned IPs and SEZs.

To advance **research and technical cooperation** between the EU and Rwanda, different knowledge-sharing events and platforms are needed, as well as a web-based centre for excellence that promotes locally developed solutions to global environmental challenges. The EU could cooperate with high institutions of learning to organize University Exchange Programs specifically designed to promote CE knowledge sharing between Rwandan and EU-based Universities.

Sector-specific recommendations

Agriculture - From agricultural waste valorisation to circular urban farm systems to regenerative agriculture, there is a significant need for knowledge dissemination to inform policy making. The EU can intervene to assist in policy-making, financing as well as knowledge-sharing and the application of CE technologies and techniques. The EU may build on the existing development cooperation programs

Construction - The EU should assist in developing energy efficiency in both commercial and domestic buildings through equity or concessional debts; grants would fit in projects' feasibility studies. In addition, the EU could also support the country's plan of setting up the green parks in Kigali as well as in each secondary city. Circular approaches in the construction sector should be considered to address the rising housing demand in Rwanda's secondary cities and its potential impact on land restoration needs.

Waste - Construction of facilities for wastewater treatment, landfill, solid waste management, transforming plastics into productive uses and e-waste offer the greatest potential for future involvement of EU companies in Rwanda in the area of waste. Plastic wastes represent a unique opportunity as a prioritised waste stream where support can be leveraged to create conventional mechanical recycling options with manufacturing outputs from recycled materials.

Transport - Given that freight transportation dominates most of Kigali routes, the EU can assist and share expertise with the Rwandan Government and the different stakeholders engaged in Urban Freight Strategies in policy-design aimed at reducing freight travel distance. Next to that it is crucial for the Rwandan government to promote a sharing economy that minimizes car-ownership and alleviates the congested road networks in Rwanda.

In this study we have also done a forward-looking assessment analysing the impacts of implementing a (limited) set of circular economy actions between now and 2030. A macro-economic model was used to estimate the impact of implementing a set of circular economy measures in the identified priority sectors Agri-food, plastics, construction, Electrical and electronic equipment (EEE) products and E-waste and general waste. Overall, the circular measures assessed could lead to an increase in economic activity and create additional jobs. The key findings are the following (for more detail see section 3.2):

- Economic benefits:
 - **A 0.6% increase of GDP (+ €151 million)** compared to business as usual;
 - An improvement of the trade balance, through a reduction in imports worth €40 million while exports will only increase by €10 million;
- Social benefits:
 - **17,300 additional jobs would be created** compared to business as usual, which is equivalent to an increase of 0.2%;
 - The largest employment impacts in the CE scenario would be seen in the agricultural sector, which accounts for almost all the net employment impacts seen in the modelling results.

This illustrates that circular economy could be one of the cornerstones of Rwanda's economic diversification and green growth strategies without jeopardising its future economic growth potential.

1 Introduction

1.1 This report

Circular Economy (CE) in this report is understood as an economic system which ultimately produces neither waste nor pollution by keeping products longer in use and by circulating materials at a high quality within the production system and, if possible, feeding them back into the biosphere to restore natural capital at the end of life. As such, the circular economy covers both economic aspects (e.g. value addition, job creation, GDP growth) as well as environmental aspects (focusing on materials and resources). In addition, it takes a full lifecycle perspective, including raw material extraction and processing, design & manufacturing, use & consumption, as well as end-of-use management to look at the potential for circularity throughout the value chain. Although we acknowledge that the transition to a zero-emission energy system is related to the circular economy concept, this study addresses only material resources and not renewable energy deployment.

This report is developed in the context of the implementation of the European Green Deal¹ agenda, and notably of its international dimension. Elements developed in the Circular Economy Action Plan², but also in other EU strategies such as the Farm to Fork Strategy³ or in EU Waste prevention and management policies⁴ are taken as guiding principles. For instance, priority sectors or policy instruments have been taken as inspiration while not neglecting the local contexts and dynamics of the chosen African countries. Connections between the African and European policy agendas are shown throughout the report and potential future links are included in the recommendations chapter.

1.1.1 Methodology

The report has been prepared by Trinomics B.V., Adelphi and Cambridge Econometrics in close cooperation with The African Circular Economy Network (ACEN) and two Rwandan experts namely Peter Katanisa and Ghislain Irakoze, who have contributed local knowledge to the analysis across all sections of the report. In addition, the EU delegation in Rwanda has been consulted on Energy issues.

Desk research has been the basis for Chapter 1 and Chapter 4 and has also fed into Chapter 2. In addition, several international and national datasets have been analysed to be able to understand the status of the circular economy in Rwanda (Chapter 2).

Interviews with national institutions and authorities, research institutions, international partners and private sector have been conducted to complement Chapter 2, 3 and 4. The full list of interviewees can be found in Annex A.

The modelling of impacts and benefits on Chapter 3 has been carried out using Framework for Modelling Economies and Sustainability (FRAMES)⁵. The modelling has followed three steps: 1) collecting the required data for each country; 2) build the model (i.e. developing a model solution for each country); and 3) design and implement the scenarios.

¹ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

² https://ec.europa.eu/environment/circular-economy/index_en.htm

³ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/farm-fork_en

⁴ https://ec.europa.eu/environment/green-growth/waste-prevention-and-management/index_en.htm

⁵ FRAMES is a new Input-Output (IO) tool with E3 linkages, capturing both direct and indirect (supply chain) impacts from a shift towards a more circular economy. FRAMES is particularly suitable for those countries not represented in E3ME due to data limitations, while its key features are similar to E3ME.

1.1.2 Reading guide

This report has been structured as follows:

- Chapter 2 provides an overview of the status of the circular economy in Rwanda analysing circular economy trends, the policy framework supporting circular economy activities, trade and investments in the circular economy, and existing awareness and capacity; To allow for comparison with other countries (in particular with the other seven case study countries analysed under this contract), data has been collected from centralised databases which are available for all African countries, such as the World Bank database. The limitation of this approach is that data may not be the most recent available data for the country in question;
- Chapter 3 estimates the economic, social and environmental impacts and benefits of the Circular economy in Rwanda at present and for the future;
- Chapter 4 studies cooperation between the EU and Rwanda, by mapping circular economy-related cooperation activities between the two, and by exploring opportunities for expanding such;
- Chapter 5 provides recommendations & conclusions for a more effective and integrated EU approach to promoting the circular economy transition in Rwanda, connecting all levels of the engagement including policy dialogues, development cooperation, trade and investments, innovation and research.

2 Status of the circular economy in Rwanda

Section 2.1 briefly summarises the place that the circular economy has in Rwanda. Section 2.2 provides an overview of the economic trends that impact the current circular economy transition in Rwanda in different life cycle stages. Specific sectors have been identified as priority sectors because of their important contribution to the national economy and potential role in circular economy, namely agriculture and food production, construction, waste, water, transport and plastics. Section 2.3 provides an overview on the current policy frameworks including environmental standards in Rwanda. Section 2.4 shortly addresses the trade and investments situation in Rwanda, as these can influence CE developments. Section 2.5 details the awareness and capacities of CE in Rwanda.

2.1 Rwanda and the circular economy

Rwanda is well placed to be the regional hub for Africa in the area of circular economy (CE). For over a decade, it has taken a proactive approach and put environment and climate change at the heart of all the country's policies, programmes and plans as seen by its Vision 2020⁶ initiative which aims to integrate green growth and climate resilience strategies. It was one of the first countries to ban single-use plastic bags, has the largest Green Fund (FONERWA) in Africa, and is widely seen to have a pioneering, innovative and nimble policy environment. Rwanda has a pioneering role in the co-founding of the African Circular Economy Alliance first launched at the World Economic Forum In Kigali in 2016⁷. Rwanda also has a track record for being a test location for trialling innovative approaches before launching in other parts of Africa, as demonstrated by drone and smart city initiatives. For concrete policies currently in place, please refer to Section 2.3.1 which explains the policy framework currently in Rwanda in support of the CE.

2.2 Economic analysis of CE trends in Rwanda

Over the last two decades, Rwanda has experienced rapid economic growth and development. With a GDP of approximately 7.9% reported in 2019 the country is on the path to becoming a middle-income by 2020.⁸ However, despite its improving economic status, Rwanda still faces considerable challenges, such as high and persistent extreme poverty, reliance on vulnerable agricultural systems, and insufficient coordination across sectors.

The following sections analyse Rwanda's economic structure and circular economy-related trends including trends in resource extraction, manufacturing and services, consumption patterns.

2.2.1 Economic structure

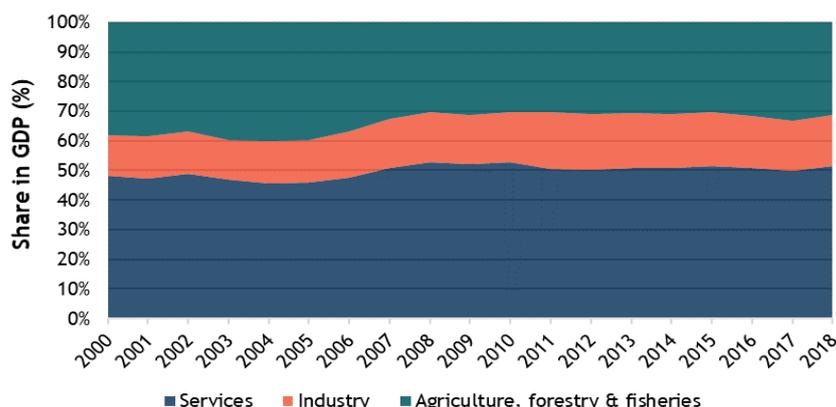
The structure of Rwanda's economy is strongly dependent on agriculture. In the year 2000, agriculture, forestry and fisheries accounted for 38% of the country's GDP, although this share started declining slowly after 2005, after which it stabilised again around 30% during the last decade (Figure 2-1). The decline in the relative contribution of the primary sector to Rwanda's economy has gone hand in hand with an increased share of industry in the country's GDP, which increased from 14% in 2000 to 17% in 2018. The share of services increased only slightly during this period, growing from 48% to 51%.

⁶ Government of Rwanda (2012) [Rwanda Vision 2020](#)

⁷ PACE. Projects. [African Circular Economy Alliance](#)

⁸ PlanA (2019) [From Waste to Revenue: Upcycling in Rwanda](#)

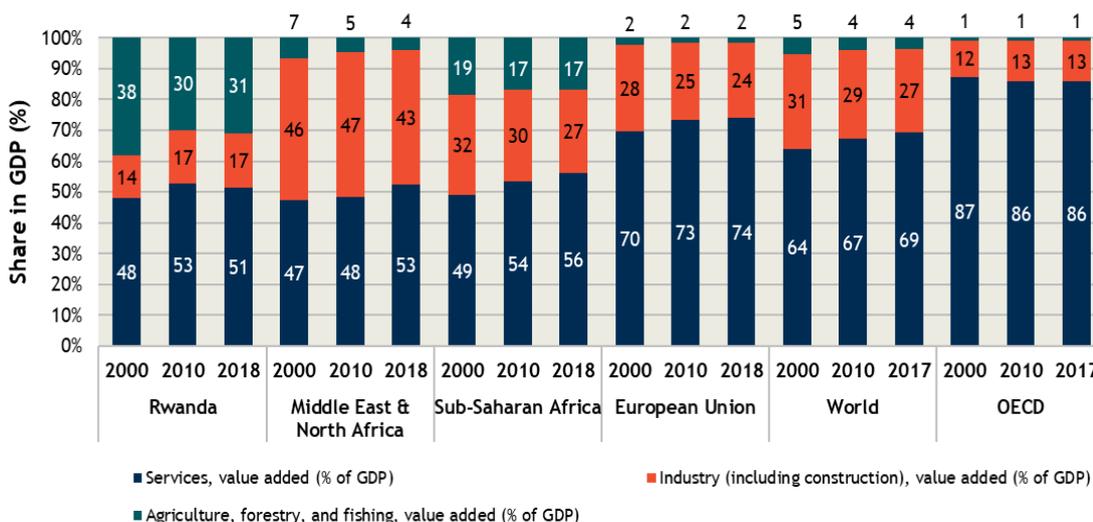
Figure 2-1 Contribution of the primary sector, industry and services to Rwanda’s economy.



Source: World Bank - World Development Indicators.

Compared to other economies the share of agriculture in Rwanda’s economy is significant - twice the size of the sub-Saharan African average with the share of industry being half that of their sub-Saharan counterparts. The differences become even larger when compared to the global average, where agriculture only contributes to 4% of GDP and the contribution of the services sector is almost 20 percentage points higher than in Rwanda (Figure 2-2).

Figure 2-2 Comparison economic structure Rwanda with regional averages



Source: World Bank - World Development Indicators.

2.2.2 Circular economy-related trends by lifecycle stage

The Following sections elaborate on the circular economy trends in Rwanda from a lifecycle perspective, as the circular economy affects the activities across the value chain. The circular economy is often understood as the new word for resource efficiency or waste policy 2.0, but it is actually a radically different model for structuring the *entire* economy.⁹ As such, the shift to a circular economy which is ‘*restorative and regenerative by design*’¹⁰, requires a far-reaching transformation of the economy, affecting entire supply chains, from resource extraction, through production and eventually waste treatment after a product’s useful

⁹ Ellen MacArthur Foundation. [Circular Economy. Concept](#)

¹⁰ Ellen MacArthur foundation (2015) [Towards a Circular Economy: Business Rationale for an Accelerated Transition](#)

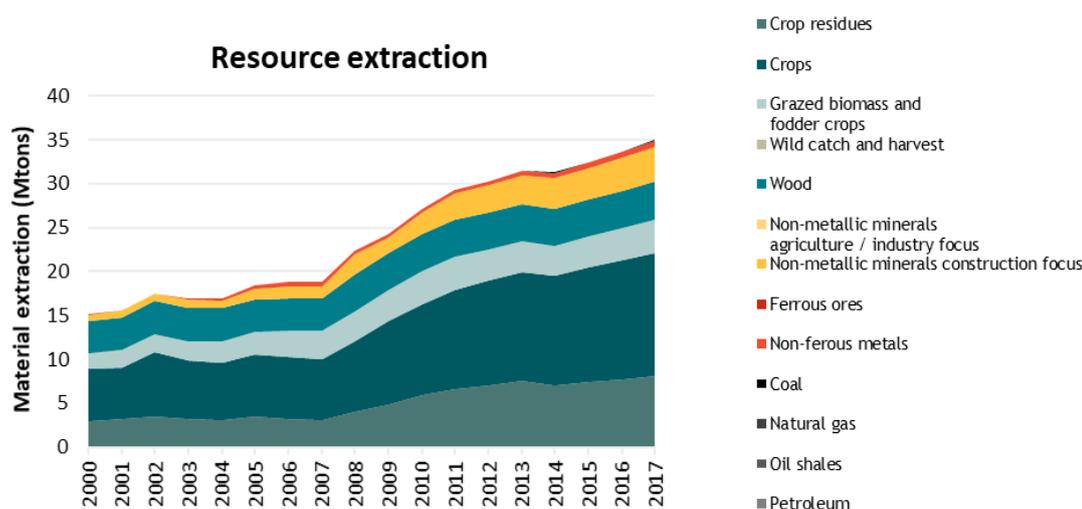
life. For this reason, the lifecycle perspective is an especially useful angle to study the circular economy, as it does look at all the lifecycle stages of products and pays attention to the consumption phase. The latter aspect is key, since changing consumption patterns and models can make an important contribution to a shift to a (more) circular economy. Because the lifecycle perspective is a central feature of circular economy thinking, we have also structured this chapter along these lines, looking at trends concerning the following aspects of the value chain:

- Resource extraction;
- Production and processing;
- Consumption
 - On a natural resource level;
 - On a product level/ from the consumer perspective.
- End-of-life stage: waste generation and management.

2.2.3 Trends in resource extraction

Rwanda's resource extraction (first stage of the value chain) has been steadily increasing over the last two decades. The largest part of the resource extraction in Rwanda relates to the extraction of different types of biomass (Figure 2-3), accounting on average for 90% of the total resource extraction in the period 2000-2017. Crops and crop residues accounted for two thirds of this biomass production. Next to biomass, non-metallic minerals accounted for 8% of the resource extraction from 2000-2017, where cement and limestone accounted for the largest extraction volumes.¹¹

Figure 2-3 Resource extraction in Rwanda by type for the period 2000-2017

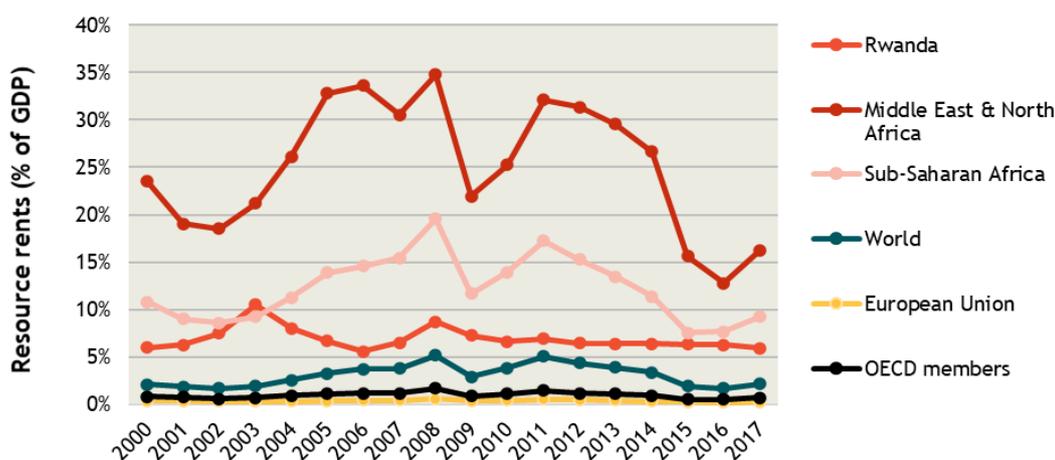


Source: UN SDG Indicator 12.2 Domestic Resource Extraction

The extraction and trade in natural resources is a significant source of income for Rwanda's economy, accounting on average for around 7% of the GDP during the last two decades. Resource rents in Rwanda are a bit more than twice as high as the global average (Figure 2-4), and considerably higher than in the EU (0.4%) or the average of OECD countries (1%). However, within the African context resource rents in Rwanda are relatively low, as resource rents in sub-Saharan Africa averaged at 12% in the period 2000-2017 and in the MENA region at 25%.

¹¹ USGS (2016) [The Mineral Industry of Rwanda in 2016](#).

Figure 2-4 Resource rents as share of GDP (%) in Rwanda compared to regional averages



Source: World Bank - World Development Indicators.

The lion’s share of the resources rents or income in Rwanda derives from forestry (Figure 2-5). During the period 2000-2017, resource rents from this sector accounted on average for 98% of the resource rents generated in the country. According to estimates, the forest cover in Rwanda declined with 63% between 1960 and 2007, from 659,000 ha to 240,750 ha in 2007¹² which is equivalent to an average annual forest loss of 2.1%. The rapid increase in population is increasing the pressure on forests in terms of encroachment and deforestation. Most of Rwanda’s forests are heavily degraded and the productivity of plantation forests, which represent around two thirds of Rwanda’s forest cover, have a relatively low productivity level.¹³ The most recent policy plans focus on promoting the implementation of agroforestry and afforestation. Currently, the ambition is to increase the forest cover in Rwanda to reach 30% by 2020. Furthermore, there are key policies in place by government to address privatization of the remaining forest reserves to increase the economic contribution of forestry to the GDP asserting that this needs to be in line with the “Made in Rwanda” policy for local economic beneficiation for the furniture and construction industry as opposed to export of unprocessed materials.

Figure 2-5 Resource rents in Rwanda as share of GDP (%) by type of resource



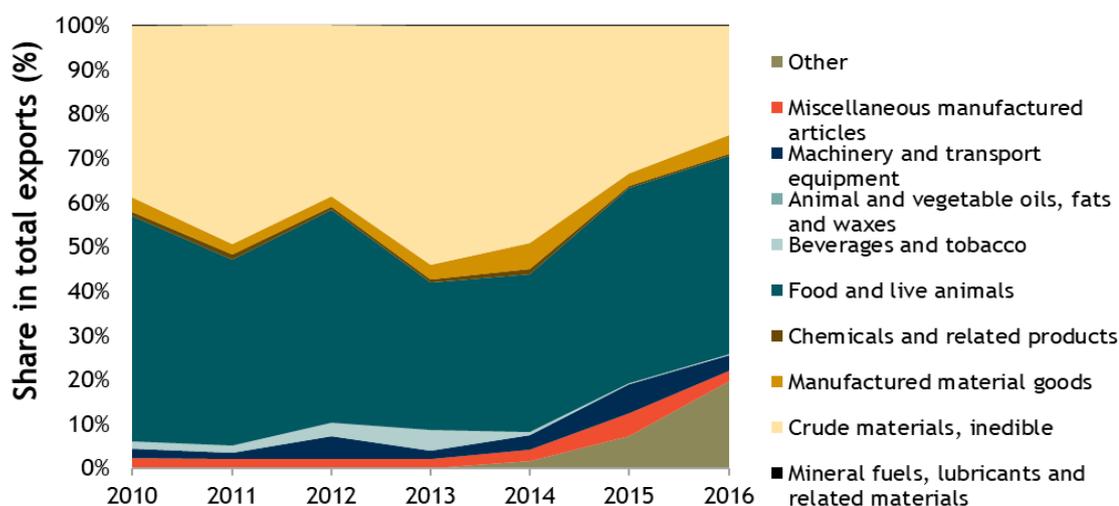
¹² Rwanda Environment Management Authority (2007) [Rwanda State of the Environment and Outlook report -Chapter IV: Forest and protected areas.](#)

¹³ Rwanda Water and Forestry Authority - Forestry - Overview.

Source: World Bank - World Development Indicators.

In Rwanda, exports of crude materials and food products dominate (Figure 2-6), both accounting on average for 42% of the total exports during the period 2010-2016.¹⁴ After 2014, exports of manufactured articles, machinery and equipment and other products increased, but these still make up a relatively small part of Rwanda's total exports. Although food products represent a large share of Rwanda's exports, the country is still a net food importer. In terms of export value, the most important food export products for Rwanda are coffee and tea (worth US\$ 133 M in exports in 2016), followed by cereals and cereal preparations (especially rice) and meat products. When it comes to Rwanda's crude material (inedible) exports, the metal tin and the rare earth metal molybdenum account for the largest share of the export value, accounting for US\$ 35 M and US\$ 39.6 M in 2016, respectively.

Figure 2-6 The share of different products in total exports from Rwanda in the period 2010-2016.



Source - UN Comtrade

2.2.4 Circular economy in production/processing in key sectors

Agriculture sector and food production

The Agricultural sector in Rwanda is a key component of the country's GDP and attracts substantial interest in Circular Economy and regenerative opportunities for the country. Throughout the report there is discussion on the issues of food waste with products not reaching market, and agricultural residues that have attracted funding and knowledge-sharing partnerships to unlock CE-based approaches. There is an opportunity to focus on regenerative agriculture, such as organic fertilizer production which could reduce Rwanda's importation of synthetic fertilizers and directly support 55.7% of farmers who rely on organic fertilizers.

EU companies like Agrotech Ltd have invested into Rwanda operating nationally, distributing agricultural products that facilitate regenerative agriculture¹⁵. The Dutch company This Side up¹⁶ has worked with local coffee cooperatives in Rwanda looking at the facilitation of CE built on sharing knowledge regarding regenerative agroforestry and building a community of equal farmers and roasters. Their concept of regenerative agroforestry includes the incorporation of native trees to coffee plantations. This is not only contributing to the long-term regeneration of declining national forest stocks in the region but also improving the biodiversity of the farming landscape (also see section 4.5).

¹⁴ UN Comtrade.

¹⁵ Dijkxhoorn Y., et al 2016: [Horticulture and floriculture in Rwanda](#)

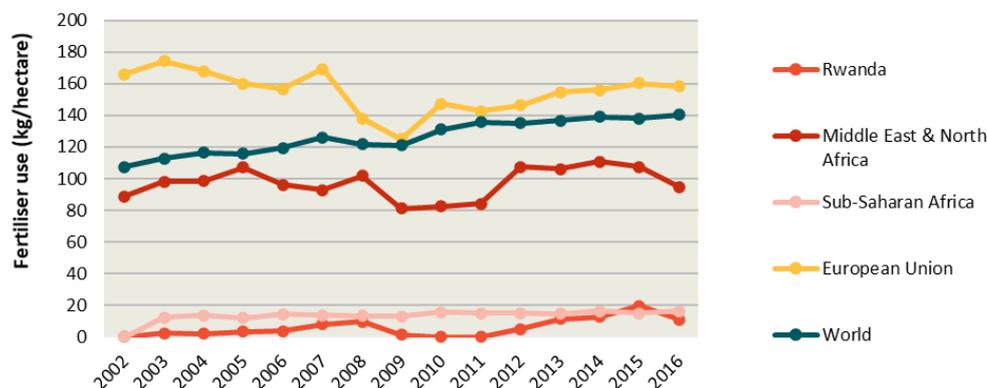
¹⁶ Alexander Daniel, ReNature: [Agroforestry Model Farm in the highlands of Rwanda](#)

There is a significant need for knowledge dissemination to inform policy making using agriculture waste valorisation to circular urban farm systems. Major local issues ranging from food waste, inefficient aquaculture systems to insufficient organic fertilizer outputs need intervention as critical issues facing regenerative agriculture in Rwanda. Circular Economy related program activities are looking to reduce dependency on pesticides and antimicrobials, reduce excess fertilization, increase organic farming, improve animal welfare, and reverse biodiversity loss in Rwanda’s agricultural and animal rearing systems. Recommendations on this implementation are expanded on later in the report.

With regards agricultural waste there is specific focus on post-harvest losses with the Rwandan government aspiring to curb current losses of 16 percent to 5 percent by 2024. The second Economic Development and Poverty Reduction Strategies (EDPRS 2) funding by the EU has already addressed mitigation programs in this regard, and a further focus is engagement with the EU on agri-processing industries to reduce this further. The National Green Fund in Rwanda (FONERWA) is also addressing financing on CE-related activities in agriculture.

The following figure demonstrates the fertilizers use intensity in Rwanda compared to regional averages (Figure 2-7). It clearly demonstrates that fertiliser use is still very low in Rwanda (on average 6kg/ha in the period 2002-2016) compared to the world average (97 kg/ha), the European Union (155 kg/ha), and even compared to the Sub-Saharan African average (13 kg/ha). Rwanda might be able to increase yields by increasing fertilizer use, but this also represents an opportunity to do this mostly with organic fertilizers, so that nutrient loops are closed and the growth in mineral fertiliser needs is reduced.

Figure 2-7 Fertilizer use intensity in Rwanda compared to regional averages



Source: World Bank - World Development Indicators.

Construction and Infrastructure

Following the updated Rwanda urban Master plan (Kigali and the six (6) secondary city’s i.e. Musanze, Rubavu, Rusizi, Muhanga, Huye, Nyagatare), the construction industry is rapidly developing to accommodate high demand. Around 373,000 additional households will need to be accommodated for nationally and at least 310,000 houses in Kigali from 2017 to 2032. Even though currently Kigali holds half of the Urban population, the Government has ambitious plans to develop the secondary cities (Musanze, Rubavu, Rusizi, Muhanga, Huye, Nyagatare) as part of their Rwanda Urban Development project (RUDP). It is important that circularity should be embedded in the City Masterplans. As the Government is looking forward to relocating some of its institutions in secondary cities, massive infrastructure projects are going to be undertaken and attracting DFIs. A notable infrastructure priority is Domestic Housing Units. Kigali City is required to build at least 31,000 housing units annually in this 15 year period, and other secondary cities also face a similar challenge as cities host the majority of the Rwandan Population. In a circularity perspective, it’s crucial to assess the impact of

such rising housing demand on the land restoration amid Rwanda's small land size and address sustainable materials and recycled secondary materials in construction.

Through the Kigali Cooling Efficiency Programme, Rwanda has started to implement "Cooling Rwanda Project" a one-year project that is targeting 1 Million square meters of cool roofs implemented by Rwanda Green Building Organization in partnership with Rwanda Housing Authority and the Ministry of Infrastructure. The project is in alignment with the Kigali Amendment, a protocol that is abided by countries to reduce the production and consumption of hydro-fluorocarbons (HFCs) with a target of avoiding 4.0-degree Celsius by the end of the century. In Addition to the National Cooling Strategy "Rwanda Green Building Minimum Compliance System", Rwanda also adopted the Green building certification strategy in line with the sustainable building model. Leveraging on several rating systems including energy efficiency and environmental performance - the green certifications will ensure that the construction industry plays a significant role in mitigating Climate Change while promoting resource efficiency.

Notable projects driving the green building agenda in Rwanda include Green City Kigali, a modern city that will Integrate efficient and renewable energy, e-mobility Infrastructure, sustainable waste management, urban forests while tapping on local resources. With estimated costs between \$4 and \$5 Billion, the project is expected to provide 30,000 housing units and 10% of them are dedicated to low-income residents from 1st to 2nd Ubudehe Categories (social-economic classifications) in alignment with promoting Urban Inclusivity. Furthermore, there are ongoing projects that aim to restore wetlands into eco-parks and recreational activities. Nyandungu Urban Wetland Eco-Tourism Park project is expected to integrate an artificial lake, indigenous species and recreational facilities with the aim of boosting local knowledge and research while promoting green building technologies. The Rwanda Housing Authority is set to establish the "National Green Urbanization Centre of Excellence". Notable Players in Green Building include Global Green Growth Institute, Rwanda Housing Authority, Rwanda Green Fund, Rwanda Green Building Organisation (RwGBO), and different private companies.

Plastics

The global use of single use plastic items is increasing exponentially. These items take hundreds of years to degrade, are a major global and national issue and blamed for clogging oceans and killing marine life. In Rwanda, single use plastics contribute to flooding and prevent crops from growing because rainwater cannot penetrate the soil when it is littered with plastic and are associated with the killing of livestock when ingested.

There are no primary plastic bag production industries in Rwanda following prohibition laws enacted in 2008 and 2019. As of today, in Rwanda, there are five (5) major companies that are involved in recycling plastic: Agroplast ltd, Ecoplastic ltd, Softpackaging ltd, SOIMEX Plastic ltd and Electromax ltd. They all recycle plastic waste into new materials like trash bags, sheeting, agricultural tubing/polythene bags, silage bags, rubbish bags, sacks, plastic tubing, etc.

According to the 2019 New Plastics Economy Global Commitment Report¹⁷, the Government of Rwanda (GoR) committed to 5 key actions, namely taking action to eliminate problematic or unnecessary packaging; encourage reuse models where relevant to reduce the need for single-use plastic packaging or products; incentivising the use of reusable, recyclable or compostable plastic packaging; increasing the collection,

¹⁷ Ellen MacArthur Foundation, June 2019: [New Plastics Economy Global Commitment](#)

sorting, reuse and recycling rates, and facilitate the establishment of necessary infrastructure and related funding mechanisms, and; stimulating the demand for recycled plastics. In an EU Commission event in September 2020, Rwanda volunteered with Peru to table a draft resolution on a global agreement on plastics in view of UN Environment Assembly 5 scheduled for February 2021 as part of the CE Action Plan.

Manufacturing

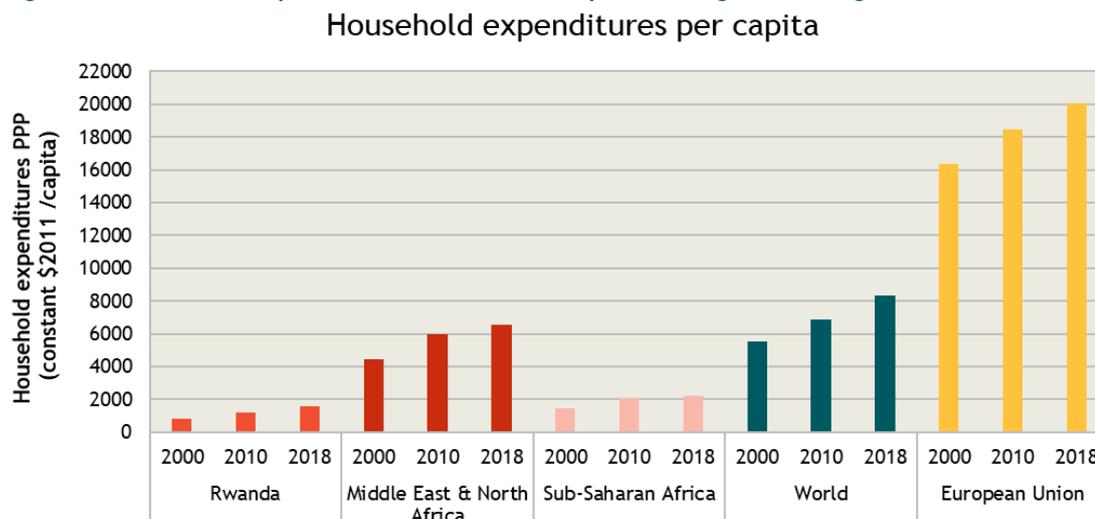
Rwanda’s Green Growth and Climate Resilience Strategy (GGCRS) has a focus on promoting green industry and private sector investment to improve the operating climate for business and industry, in part by ‘greening’ special economic zones and industrial parks as defined in more detail in Section 2.3.3.

2.2.5 Trends in consumption patterns

Overall consumption trends

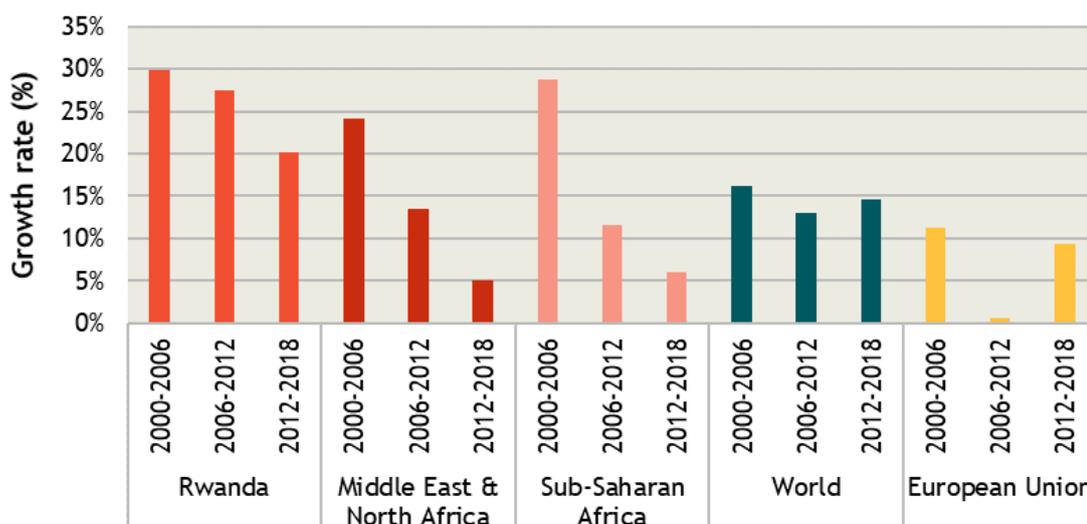
The overall consumption levels have been steadily growing in Rwanda over the last two decades. During this period, per capita household expenditures based on PPP almost doubled from \$US 804 in 2000 to \$US 1595 in 2018 (Figure 2-8), whereas the GDP per capita grew by 149%. Although the per capita expenditures of households in Rwanda grew faster than the average Sub-Saharan country (Figure 2-9), the absolute per capita consumption levels were still 28% lower in 2018 than in the average Sub-Saharan country. Compared to the rest of the world, the differences are even more pronounced, as per capita household expenditures in Rwanda in 2018 were only one fifth of the global average and 8% of the EU average (including a correction for differences in purchasing power) (Figure 2-8).

Figure 2-8 Household expenditures for Rwanda compared to regional averages



Source: World Bank - World Development Indicators - Households and NPISHs Final consumption expenditure, PPP (constant 2011 international \$) per capita.

Figure 2-9 Growth in household expenditures in Rwanda compared to regional averages

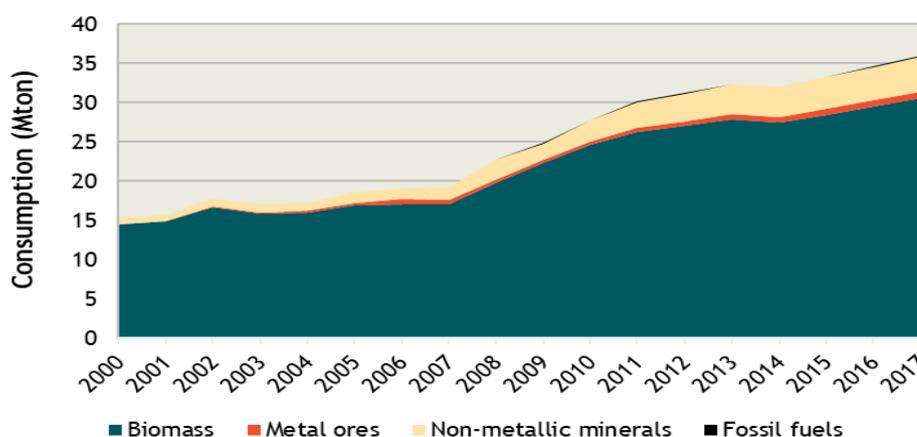


Source: World Bank - World Development Indicators - Households and NPISHs Final consumption expenditure, PPP (constant 2011 international \$) per capita.

Trends in material consumption

Along with the growth of the population and the economy, Rwanda’s domestic material consumption has grown as well. According to UN data, domestic material consumption¹⁸ increased with 136% from almost 15 Mton to almost 36 Mton (Figure 2-10). However, it is important to note that this UN dataset gives a rough estimate of domestic resource consumption and can also have significant data gaps. As an example, no local fossil fuel use is reported for Rwanda in this dataset, whereas the country had a net import of \$US 25.4 M worth of fossil fuels in 2016.¹⁹ Part of the growth in resource consumption in Rwanda can be explained by population growth as the number of inhabitants in Rwanda grew from 7.9 M to 12.3 M between 2000 and 2017. Furthermore, because of economic growth and an associated increase in consumption levels, domestic material consumption per capita also increased with 56% during this period. However, it should be noted that absolute per capita resource levels in Rwanda are still very low (Figure 2-11). In 2017, Rwanda’s per capita resource consumption was 27% lower than the Sub-Saharan average, 74% lower than the global average and 77% lower than the European (continent) average.

Figure 2-10 Overview of domestic material consumption by type in Rwanda for the period 2000-2017.

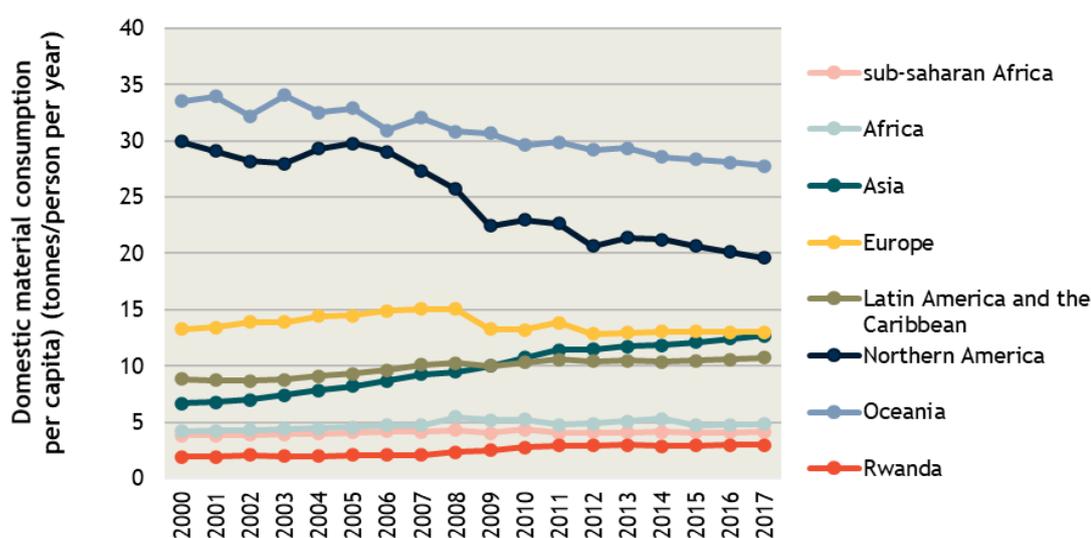


Source: SDG Indicators - Indicator 12.2.1 Domestic Material Consumption by type.

¹⁸ Domestic Material Consumption = Domestic Material Extraction + Imports - Exports

¹⁹ UN Comtrade - Trade in Mineral fuels, lubricants and related products.

Figure 2-11 Material consumption per capita in Rwanda compared to regional averages



Source: SDG Indicators - Indicator 12.2.1 Domestic Material Consumption per capita.

Globally, cement, steel and plastics account for almost 70% of the direct global greenhouse gas (GHG) emissions from industry and therefore, it is relevant to look at the trends in the consumption footprint for these materials in Rwanda. Cement consumption in Rwanda is currently very low, with a consumption level of only 0.036 tons/capita,²⁰ which is 93% lower than the global average. In general, data on the consumption of many materials and products in Rwanda is very scarce, which makes it difficult to compare material consumption in the country with that of others.

Water consumption

Water production and consumption are growing in Rwanda. The residential sector is the largest water consuming sector, responsible for a total water consumption of 18 million m³, which is equivalent to a consumption of 1.5m³/capita.²¹ It should be noted, however, that this only includes water consumed from centralised water production sources. According to a recent report by the WHO,²² only around 50% of Rwanda's rural population and 75% of its urban population have access to basic water services.

Transport

By the end of 2018, there were around 82 thousand cars on the road in Rwanda (including jeeps and pick-ups).²³ This means that the number of cars per capita in Rwanda is around 0.007. The main mode of mobility in Rwanda is public transport through the Express Bus, which has superseded the Share Taxi on major routes. E-Mobility has received some attention in Rwanda as it looks at Green mobility to reduce vehicle pollution in Rwanda. A wide range of private sector EU stakeholders are already involved (Volkswagen). E-Mobility/Car sharing Policy Interventions are also being considered. Rwanda drives strategy to encourage public transport rather than accommodate private transport and are moving to a more advanced public system post 2019 dubbed Generation 2²⁴ to revolutionise public transport through IT support and phone applications with better route planning, a better vehicle mix and strict scheduled services.

²⁰ PPC (2018) [Integrated Report 2018](#).

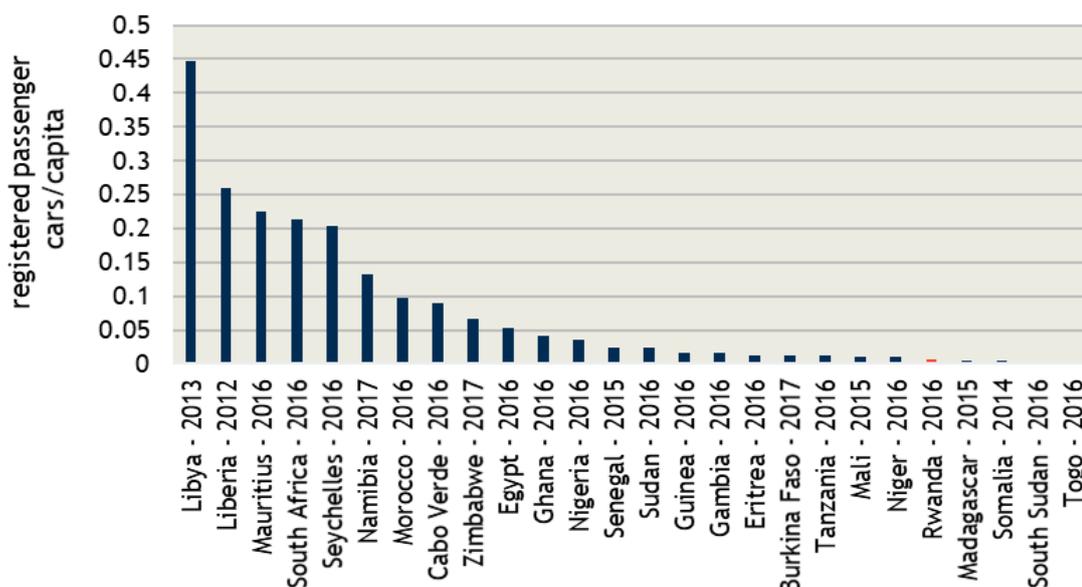
²¹ NISR (2019) [Rwanda Statistical Yearbook 2019](#).

²² UNICEF & WHO (2019) [Progress on household drinking water, sanitation and hygiene 2000-2017](#)

²³ NISR (2019) [Rwanda Statistical Yearbook 2019](#).

²⁴ <https://www.newtimes.co.rw/news/inside-next-generation-kigali-public-transport>

Figure 2-12 Car ownership per capita in Africa, highlighting Rwanda.

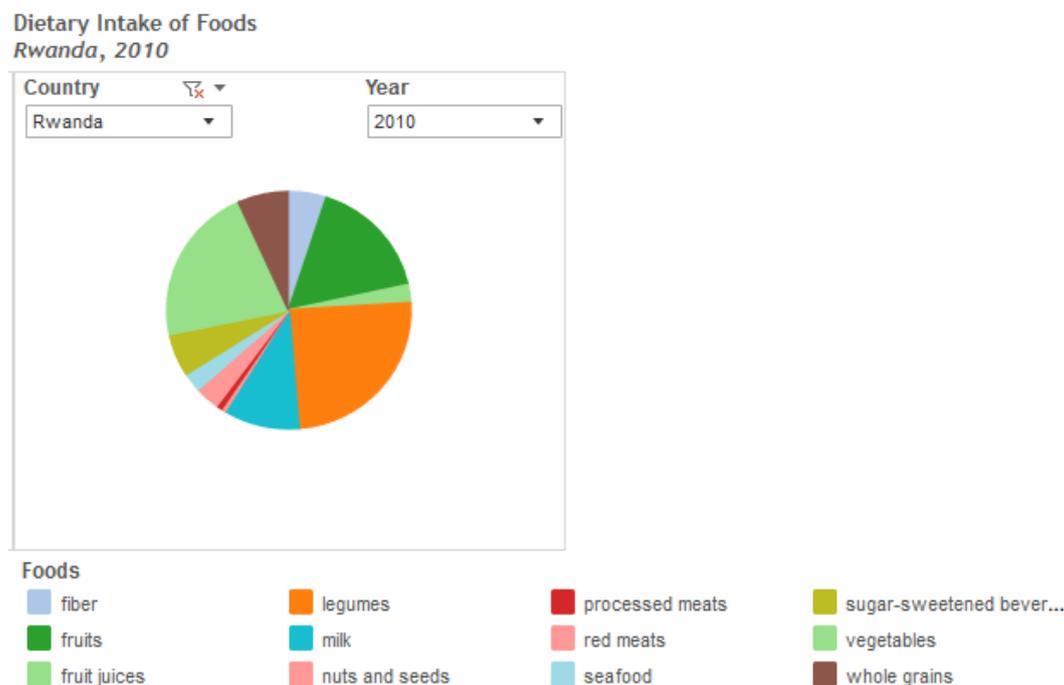


Source: WHO - Global Health Observatory (GHO) data - Number of registered vehicles.

Food

Most of the diet in Rwanda is still vegetable based with meat and milk products making up a relatively small share in the overall diet, which is favourable from a resource efficiency point of view (Figure 2-13).

Figure 2-13 Diet composition in Rwanda in 2010



Source: Global Dietary Database

2.2.6 The end-of-life stage: reverse logistics, reuse, waste generation and management

Waste generation and collection: A major consequence of Rwanda’s population and economic growth is increasing volumes of waste. The quantity of waste collected in Kigali has proliferated from 180 tonnes per day in 2012 to more than 500 - 800 tonnes per day in 2016, of which organics make up the largest percentage.

Waste generation is more concentrated in areas around the Kigali city centre. Waste collection, unfortunately, does not match waste generation, as only 49% of household waste is collected (250-400 tonnes per day in Kigali)²⁵. Generally, there is no source separation and all waste ends up dumped at Nduba Site, where some manual sorting is undertaken. Most of the waste collection in Kigali is outsourced to private service providers.

Waste Disposal: The Nduba dumpsite 20 km north of Kigali is the destination for all municipal solid waste (MSW) from three districts in Kigali. Where serviced, household, commercial and industrial waste is collected on a regular basis and then disposed of at the Nduba open dumpsite. While some waste is sorted by authorized waste pickers, there is still a large amount of plastic waste intermingled with organic waste at the dumpsite. As a result, the Nduba dumpsite is in critical condition since there is no waste processing apart from waste sorting, waste spreading and soil coverage. There is no leachate treatment or gas management at the site. The city government estimates that the existing Nduba dumpsite, which covers an area of about 15 ha, will reach its capacity by the end of 2019 and yet was still operational at the time of this report publication. Currently, City of Kigali (CoK) and the Water and Sanitation Corporation (WASAC) are actively tendering for companies to take on the daily management and remediation of Nyanza and Nduba dumpsites as a top priority²⁶.

Waste Characterization: A study²⁷ identified five municipal solid waste streams in Kigali, namely: (1) Greens, comprising garden waste and agricultural residues; (2) Food Waste, comprising domestic kitchen waste, commercial organic wastes, and industrial by-product wastes; (3) Recyclables, comprising all packaging waste products; (4) Other Waste comprising textiles, special care waste, e-waste and inert waste and (5) Construction & Demolition Waste comprising all building industry waste. The food waste portion showed to be much higher than anticipated²⁸ at 59.7% (average) and a very high 66.5% from low-income areas. Food Waste was commingled with other wastes but Greens (mainly yard- derived wastes) were separated from Food Waste during the sorting work on site. Low-income areas in Kigali City are typically informal settlements, slum-like, with little cultivating space thus agricultural waste and subsistence farming using waste is almost non-existent. Greens typically comprise plant foliage, grass and branches, and are usually co-mingled in low- and middle-income areas at the time of collection.

Waste operators usually mix Greens and household waste when loading in the waste trucks. Household ‘dirt’ comprises 12% of the total municipal solid waste fraction being collected, which is very high. The ‘dirt’ is associated with yard waste and house compound sweepings or garden residues, as observed when it was being collected.

68% of waste delivered to Kigali Capital city, specifically Nduba Landfill, is organic waste²⁹. Lack of segregation at the source and inefficient collection system results in the organic waste ending up in landfills. According to the recent NISR’s Agricultural statistical survey, 55.7% of farmers used organic fertilizers while 24.6% inorganic fertilizers³⁰; this highlights the need of value-added strategies that transform organic waste into compost. Further, the EU may support interventions for utilization of organic waste as part of waste-to-energy projects.

²⁵ Rajashekar (2019) [Assessing waste management services in Kigali](#)

²⁶ Water and Sanitation Corporation (2019) [WASAC Projects](#)

²⁷ Ibid, 24

²⁸ Ibid

²⁹ Isugi and Niu (2016) [Research on Landfill and Composting Guidelines in Kigali City](#)

³⁰ National Institute of Statistics of Rwanda (2020) [Seasonal Agricultural Survey Report - Season A, 2020](#)

Table 2-1 Waste quantity and character of disposal in Kigali

Waste Quantity Analysis		Municipal Solid Waste (MSW)		
		Collected & Disposed (t/day)	Collected & Disposed (t/year)	Collected & Disposed (%)
Organics	Greens (G)	91 t/d	28,448 t/yr	15%
	Food Waste (F)	369 t/d	115,651 t/yr	60%
	Total	460 t/d	144,099 t/yr	74%
Recyclables (R)	Plastic	20 t/d	6,211 t/yr	3%
	Paper & Cardboard	33 t/d	10,445 t/yr	5%
	Metal	2 t/d	774 t/yr	0%
	Glass	7 t/d	2,128 t/yr	1%
	Total	62 t/d	19,558 t/yr	10%
Other (O)	Textiles	17 t/d	5,416 t/yr	3%
	Special Care Wastes	1 t/d	387 t/yr	0%
	Other Waste	74 t/d	23,201 t/yr	12%
	Total	93 t/d	29,004 t/yr	15%
C&D	Total	2 t/d	774 t/yr	0%
TOTAL		618 t/d	193,434 t/yr	100%

Source: Rapid Assessment & Options Analysis: Waste Disposal in the City of Kigali report, September 2019

Waste recovery: Only 2 percent of the Municipal Solid Waste is currently being recycled, and an even lower percentage of organic waste is used in a beneficial manner. Although there is a central disposal system, people continue to dump their solid and liquid wastes illegally in rivers, wetlands, ditches, roadsides and other public spaces. Multiple critical waste management issues have been identified at the designated landfill sites like Nduba dumpsite. A couple of initiatives focused on the recovery of plastics and Waste of Electric and Electronic Equipment (WEEE) are presented in Chapter 2.5.2.

Plastic Waste: In 2004, ministerial instructions on the use and manufacturing of plastic bags with a thickness of 60 microns and below were adopted. Due to the lack of alternatives to polythene bags and single use plastics, this policy did not reduce the proliferation of environmental pollution by plastic bags. Nevertheless, the instructions managed to halt the use of coloured carry bags which were found on local markets.

In 2008, the law No 57/2008 of 10/09/2008 relating to the prohibition of manufacturing, importation, use and sale of polythene bags in Rwanda was adopted. Cognisant of the fact that other types of plastics (which are not polyethene) pose equally harmful effects to the environment; the enforcement of the above mentioned law was extended to ban all types of carrier/shopping plastic bags and plastics for wrapping of goods.

2.2.7 Bioenergy and Food Security Assessment and Capacity Building for Rwanda-FAO

Although not related to EU applications, Food and Agriculture Organisation (FAO) alongside the Government of Rwanda launched a project to support the country in assessing sustainable bioenergy options to reduce reliance on wood fuel. FAO is conducting extended research on the production of food and biomass for energy generation on the same land, through multiple-cropping systems, or systems mixing annual and perennial crop species. This project is expected to contribute to Rwanda's Nationally Determined Contributions (NDCs) targets to implement commitments of Paris Agreement on climate change, the project will use FAOs'

Bioenergy and Food Security (BEFS) approach to assess the sustainable bioenergy options of the country. As the government of Rwanda aimed at reducing the reliance on wood fuel for cooking from 83 percent of the households to 42 percent by 2024, the research project will assist in disseminating the potential frameworks to adapt and inform the policymaking.

2.2.8 E-waste Awareness Campaign (2020-ongoing)

GIZ Eco-Emploi Programme in collaboration with Enviroserve Rwanda Green Park, Rwanda Utilities Regulatory Authority (RURA), and Rwanda Environment Management Authority (REMA) launched a nationwide awareness campaign to build a sustainable e-waste management ecosystem in Rwanda.

2.3 Policy framework supporting circular economy activities

This section addresses how the policy framework in Rwanda supports circular economy activities including legislation, strategies or visions, and environmental standards.

2.3.1 Overview of the policy framework in the context of circular economy

The most relevant standard and legislation in Rwanda when it comes to its relevance to the CE is the “Organic Law on Environmental Protection, Conservation and Management”. This law regulates the protection of Environment in Rwanda. It gives the right to every natural or legal person in Rwanda to live in a healthy and balanced environment. The principle of sustainability of environment and equity among generations emphasizes human beings at the core of Sustainable Development.

In addition, the National Environment and Climate Change policy³¹ was introduced in June 2019. One of the main tenets of this policy is to “promote the circular economy to advance sustainable consumption and production patterns”. Through several policy strategies and actions, the government aims to put in place the legal and institutional frameworks for a circular economy, incentivise businesses and organisations to adopt circular economy principles, and promote the development of clean, resource efficient technologies. It also specifically mentions the goal of promoting industrial symbiosis among firms.

In the National Law on the Environment³² adopted in 2018, a chapter is devoted to “conservation and protection of the built environment”. This chapter predicates the correct management and disposal of solid waste, liquid waste, hazardous and toxic waste, and electronic waste. It also sets forth the requirement of specific projects to carry out an environmental impact assessment, strategic environmental assessment and environmental audit and also discusses the use of the ‘polluter pays principle’. Moreover, the law provides space for specific standards for the use of environmentally sound technologies within agriculture, infrastructure, business and industry.

Also, in 2008, the law N° 57/2008 of 10/09/2008³³ relating to the prohibition of manufacturing, importation, use and sale of polythene bags in Rwanda was adopted. Cognisant of the fact that other types of plastics (which are not polyethylene) pose equally harmful effects to the environment, the enforcement of the above-mentioned law was extended to ban all types of carrier/shopping plastic bags and plastics for wrapping of goods.

³¹ Ministry of Environment Rwanda (2019) [National Environment and Climate Change Policy](#)

³² [Official Gazette no.Special of 21/09/2018](#)

³³ Water Law Gazetted (2018) [Official Gazette no.Special of 21/09/2018](#)

The new law n° 17/2019 of 10/08/2019³⁴ relating to the prohibition of manufacturing, importation, use and sale of plastic carry bags and single-use plastic items comes as a review of the law against polyethylene bags. The major changes between the existing law of 2008 and the draft are:

- I. In addition to polyethylene bags, the new law has increased the number of banned plastics items to include all single use items (where alternatives exist or which can be avoided). Examples of the concerned single use plastics include drinking straws (imiheha), disposable plastic plates and cups, disposable cutlery plastic forks and knives;
- II. The payment of an environmental levy by importers of goods packaged in plastics materials. Revenues from the collection of this levy will be used to fund projects related to plastic waste management.

The new law will reduce the increasing habit of unnecessary consumption and disposal of items which become a burden to the environment. Studies indicate that approximately 91% of plastic globally is not recycled³⁵. This is an indication that efforts have to be made to control the increasing consumption of single use plastics bearing in mind that their recycling does not offer total remedy of the issue.

In addition to that, Rwanda's Vision 2020, which has been implemented since 2000, provided concrete goals for transforming Rwanda into a middle-income country by 2020. Goals included the development of an efficient private sector, infrastructure development, and the promotion of regional economic integration and cooperation. In the areas of private sector development, industrial parks are mentioned to promote local businesses and attract foreign investment. Vision 2050³⁶ will build on what Vision 2020 has achieved and is currently under development but not yet been promulgated and gazetted through parliament. In addition, the two Economic Development and Poverty Reduction Strategies (EDPRS1 and EDPRS2), implemented in 2008 - 2013 and 2013 - 2018, introduced objectives for the attainment of the Vision 2020 Government of Rwanda's 'Programs of Actions' (PoAs). The last plan (2013-2018) mentions the goal of stimulating investments in priority areas including the development of economic zones and industrial parks, as well as promoting the 'green economy' through the promotion of green innovation in the industrial and private sectors.

Rwanda's Green Growth and Climate Resilience Strategy (GGCRS), is one of the PoAs. Its action 7 focuses on promoting green industry and private sector investment and aims to improve the operating climate for business and industry, in part by 'greening' special economic zones and industrial parks. One of the main goals of this program is to "Employ efficient and zero waste technologies, practices and design in Special Economic Zones (SEZ) and provincial industrial parks". The GGCRS specifically calls for stimulating energy and water efficiency; green site preparation, building and design; and waste treatment options within SEZ and industrial parks.

2.3.2 Environmental standards

The "Organic Law on Environmental Protection, Conservation and Management" regulates the protection of Environment in Rwanda. It sets out the general legal framework for environment standards, protection and management in Rwanda. It also constitutes the environment as a one of the priority concerns of the Government of Rwanda. Chapter IV of the Organic Law Article 65 clearly calls for the need to subject projects to mandatory Environmental Impact Assessment. Article 3: States that every person has the duty to protect,

³⁴ FONERWA (2018) [Law on Single Use Plastics In Rwanda](#)

³⁵ Laura Parker (2018) [Here's how much plastic trash is littering the Earth](#)

safeguard and promote the environment. The State shall protect, conserve and manage the environment. Article 65: further specifies that every project shall be subjected to environmental impact assessment prior to its commencement. It shall be the same for programs, plans and policies likely to affect the environment. Specific details of projects referred to in this article shall be spelt out by the order of the Minister in charge of environment. The Organic Law also puts in place the National Fund of the Environment in Rwanda (FONERWA). The article 66 of the Organic Law on the environment specifies that it has created, to the level of the Provinces, of the City of Kigali, of the Districts, the Cities, the Sectors and the Cells, Committees responsible for the conservation and the protection of the environment.

Furthermore, it is important to note that Rwanda has a standard regulation N°:002/EWASTAN/SW/RURA/2015 of 24th/April/2015 governing solid wastes recycling in Rwanda. The standard regulation aims to provide a regulatory framework for the design, installation and operations that recycle, compost or convert solid wastes in Rwanda.

2.3.3 Nationally driven financial programmes and initiatives supporting circular economy-related sectors

There are not many national programmes in Rwanda dedicated specifically to the promotion of circular economy. Two specific nationally driven programmes supporting the circular economy would be FONERWA and Rwanda's Green Growth and Climate Resilience Strategy (GGCRS). The Rwanda Green Fund or FONERWA is a fund for environmental and climate change action which was established in 2012 by the Rwandan government. The fund serves a cross-sectoral financing mechanism to achieve the countries' sustainable development objectives. The main vision of FONERWA is to respond to Rwanda's current and future financing needs for environment, climate change, and green growth to accelerate goals of national sustainable economic development, and by nature some of these initiatives contribute to CE development in the country. To date this initiative has approved 42 projects using USD \$6m financed from GoR and leveraged USD \$83m in project finance support³⁷.

GGCRS promotes green industry and private sector investment aimed at helping to improve the operating climate for business and industry. One of the main goals of this program is to "Employ efficient and zero waste technologies, practices and design in Special Economic Zones (SEZ) and provincial industrial parks". The GGCRS specifically calls for stimulating energy and water efficiency; green site preparation, building and design; and waste treatment options within SEZ and industrial parks.

The National Industrial Research and Development Agency (NIRDA) has established the Cleaner Production and Climate Innovation Center (CPCIC established 2017). This centre is in charge of all CE activities, except for research. The main mission of the centre is to become a one stop centre of excellence which provides and promotes cutting edge, modern access to green technologies and business services for enhanced productivity, climate resilience, competitiveness, environmental compliance and sustainable developments results. The activities of the centre are:

- Policy guidance especially regulatory requirements: CPCIC engages with government and regulators to develop appropriate policies, strategies, guidelines and standards to help climate friendly solutions and increased socio-economic benefits to be developed and deployed, policy needs analysis, policy advice to support market creation and deployment activities, technology standards, certification and environmental performance regulations, and policy information dissemination programs, etc.;

³⁷ FONERWA online statistics [here](#)

- **Awareness and Technical Training services:** The centre promotes the concept of cleaner production, Eco- innovation, mitigation and adaptation measures to address climate change and environment issues and building capacity for private and public sector in support of sustainable development results. The centre also provides a range of technology related guidance and support including technology needs/options assessments, facilitating R&D collaborations, facilitating technology transfer from national, regional and international actors, running technology demonstration programs, and providing support to develop technical skills. In addition, provides access to technical facilities and services to design, prototype, test and demonstrate green products;
- **Business and consultancy services:** CPCIC provides a wide range of business and consultancy services including advice on green technology, market and customer needs, business advisory and incubation services (e.g. biofertilizer, business development, strategy and planning, team development, and fundraising advice) to help businesses grow; infrastructure support for start-ups, support to develop business networks and links with international partners. It also provides access to expert technical capabilities, equipment and other resources to move climate innovative concepts to reality (e.g. low carbon energy initiatives, chemical leasing, etc.) The degree of financial sustainability is the key performance indicator that the Centre should always control and report on in order to monitor, ensure the continuity of the centre's activity and self-reliance;
- **Access to Finance:** CPCIC advises the developers to address finance barriers that business institutions facing in developing new climate technology solutions, provide access to small grants, provide leverage to secure larger grants or loans (proof of concept grants or loans, prototype demonstration funding, connections to potential investors, financial training and skills development). In addition, it facilitates access to global and national "Green Financing" windows and de-risk public or private "Green Projects and investments" by advising on the design of projects and applications;
- **Networking and information dissemination:** CPCIC use existing communication and public relations tools (webpage, documentation and publications of cases studies, social media, media, outreach, public lectures, etc.). It provides adequate coordination among key stakeholders (national partners, regional and international organizations for technology diffusion and climate change issues) and sharing experience, cleaner production and climate innovation best practices and knowledge.

CPCIC is now expanding the scope of engagement, for a broader and more sustainable program of resource-efficient and cleaner production (RECP) activities with the private sector on environment and climate activities more broadly. Increasing opportunities for female innovations and identification of special mentorship and planning. These above services are provided across all sectors especially in industry, agriculture, energy, transport, environment, urbanization, water and waste. Rwanda is also quite proactive in the eco-tourism sector which presents opportunities for promoting a circular economy.

2.4 Trade and investments in the Circular Economy in Rwanda

There is substantial trade ongoing between Rwanda and its international trading partners, although the share of trade in the total economic output is still below the world average and also below the trade share of the Sub-Saharan Africa.³⁸ In 2016, around 14% of Rwanda's exports were going to the European Union and similarly around 8% of Rwanda's imports originate from the European Union.³⁹ Trade of environmental goods and services in Rwanda is also quite low compared to other African countries, accounting for just 3% of the total trade volume in 2016. Imports dominate the trade balance in environmental goods and services, particularly

³⁸ World Bank - World Development Indicators - Trade (% of GDP)

³⁹ UN Comtrade

imports of renewables. Since 2013, trade tariffs in Rwanda have been higher than in the Sub-Saharan Africa, the MENA region, the EU and the world average. This may have acted as a barrier for growth in international trade. Also, customs and administration related costs in Rwanda associated with trade of products and services are higher than in Sub-Saharan Africa, North Africa and the World average. This would hinder trade in other words the ease of doing business. The quality of logistics in Rwanda is improving steadily which suggests transport time and costs of goods are being reduced. Since 2016 it is considered to outperform the Sub-Saharan Africa and catching up with the MENA and world average scores. This improving trend can largely be linked to Rwandan policies based on the EDPRS on infrastructure and development with the creation of new development-driven trade policies.

Growth rates in Rwanda over the past ten years have been very high compared to other regions in the world and the world average. However economic growth has been volatile. Inflation has also been volatile over time showing monetary instability in the country. On the contrary, Rwanda reflects higher stability and sustainability of public finance than the average African country. Foreign investments have been instable in the past decade with current levels of investment being above world average and the MENA region. The ease of starting a business in Rwanda has become easier over time. From 2013 onwards, it is twice as easy to get credit in Rwanda than in Sub-Saharan Africa and North Africa on average, and much easier than in the world on average. This is a direct outcome of the Rwandan development-driven trade policies to promote infrastructure development. Unlike in several other African countries, political instability is not playing a hindering role in this regard.⁴⁰ Corruption however is still an issue, even when Rwanda scores better than Senegal, Morocco, South Africa, Ghana, Egypt, Kenya and Nigeria in this regard.

2.5 Existing awareness and capacities on CE in Rwanda

2.5.1 National awareness on CE

The Rwandan government increasingly recognizes the opportunities of a green and circular economy to generate sustained economic growth while ensuring social well-being and mitigating environmental risks. This is among others, reflected in the National Environment and Climate Change Policy adopted in 2019. The policy reiterates the Rwanda's commitment to promote (1) a green economy that is resource efficient, low-carbon and climate resilient; (2) a circular economy to advance sustainable consumption and production patterns; (3) green technologies and procurement; (4) green urbanisation and green rural settlements, and (5) green mobility.⁴¹

To further facilitate the country's sustainable development, Rwanda also incorporated green and inclusive growth goals into its Vision 2020⁴², the draft Vision 2050, the National Strategy for Transformation (NST1, 2017-2024) as well as other related strategies at different levels.⁴³ Although the concept of CE is not explicitly addressed within these frameworks, relevant aspects of the concept, such as the establishment of a proper country-wide waste management system, are included.

In an effort to fast-track Rwanda's transition in this field, the Ministry of Environment (MoE), Rwanda Green Fund and partners from across government hosted the inaugural National CE Forum in August 2019. The

⁴⁰ International Finance Corporation (2011) [Enterprise Surveys](#)

⁴¹ Republic of Rwanda (2019) [Voluntary National Review Report](#)

⁴² <https://www.unenvironment.org/explore-topics/green-economy/what-we-do/advisory-services/africa-green-economy-project/rwanda>

⁴³ UN Sustainable Development Goals (2019) [Rwanda Voluntary National Review](#)

forum, which was attended stakeholders from the private sector, civil society and government agencies, explored the opportunities of a CE and discussed needs of support for the country's transition to green growth.⁴⁴ The forum concluded with a range of recommendations, covering the design of a capacity building and technical advisory programme on CE and the increased expansion of awareness by close cooperation with the media and other stakeholders. While CE has thus received attention from the government, the coming years will show the extent to which Rwanda complies with these self-imposed recommendations.⁴⁵

2.5.2 Businesses/industries awareness

To date, the majority of Rwandan businesses continue to operate within a conventional 'take, make, dispose' model of consumption and production and largely lack awareness of CE-related business opportunities.⁴⁶ However, there is a growing number of industry initiatives, which focus on certain aspects of the CE such as repair, waste recycling as well as product rental and leasing. One of Rwanda's most notable initiatives in this context is the establishment of a state-of-the-art dismantling and recycling facility for WEEE or e-waste in the Bugesera district in 2017. The facility, which is the second of this kind in Africa, was financed with the support of the FONERWA. It has the capacity to process 10,000 tonnes of e-waste annually and collects end-user electronic equipment's from offices and homes and either refurbishes them or recycles the raw materials.⁴⁷ The refurbished or recycled output can be used by local and regional plastic and metal manufacturers to produce new products, thus supporting Rwanda's efforts to foster a CE. In 2018, the government of Rwanda signed a lease agreement with Enviroserve Rwanda Green Park acting as a subsidiary of the Emirati Company Enviroserve Services LLC from Dubai to manage the recycling facility until 2028.

In addition, and in the wake of Rwanda's ban of single use plastics items, the private sector has also increasingly taken part in fighting against plastic pollution by engaging in various plastic recycling activities. EcoPlastic is one of these companies, aiming to provide both recycling services as well as innovative and eco-friendly plastic products. EcoPlastic collects used plastic through partnerships with individuals, businesses and the government. Once the plastic waste arrives at the factory, it is sorted, washed, dried and subsequently recycled. The recycled raw material then serves as primary input for the new production process, thus ensuring a minimal impact on the environment from the necessary use of plastic that still exists in Rwanda.⁴⁸ As the local market for recyclable materials and organic composts are currently rather small, most CE-related industry initiatives are, however, not yet applied on a larger scale.⁴⁹ Further initiatives, which were conducted in cooperation with EU companies are listed in chapter 5.5.

Table 2-2 Example for CE-related industry initiative on awareness in Rwanda

Watoto Vision on Africa
<p>Watoto Vision on Africa (WVA) is an NGO that is working to provide opportunities for sustainable livelihoods to vulnerable communities. WVA runs a project in the Gasabo District that aims to alleviate the solid waste management problem. The mission here is not just to improve the (minimal) collection and disposal system, but to create and build upon the upcycling of solid waste into products that provide an income source for the local people involved. Watoto has established a growing circular and upcycling model driven by women and based on handicrafts</p>

⁴⁴ FONERWA (2019) [Rwanda hosts first national circular economy forum to advance green growth.](#)

⁴⁵ FONERWA (2019) [Recommendations National Circular Economy Forum](#)

⁴⁶ The New Times (2019) [Rwanda Keen on Cutting Waste to Zero](#)

⁴⁷ FONERWA (2019) [Rwanda Green Fund E-Waste Factsheet](#)

⁴⁸ EcoPlastic website. Recycling: <https://ecoplasticranda.com/-Recycling->

⁴⁹ GGG (2019) [Solid Waste Management in Secondary Cities of Rwanda.](#)

produced solely from local solid waste otherwise destined for the overloaded dumping grounds. After collecting usable pieces of trash from the tip, the Watoto members clean, revamp and repurpose waste to sell it.⁵⁰

2.5.3 Consumer awareness of CE

Rwandan consumers are mostly unaware of CE and CE-related consumption practices, such as leasing and Product Service Systems (PSS). With regards to waste disposal, the majority of consumers (especially in urban areas) still follow the uncontrolled ways of handling waste such as illegal open dumping and burning, including potentially hazardous materials such as WEEE.⁵¹ According to the Global Green Growth Institute there is a general lack of awareness on municipal waste collection services and households are unlikely to use services due to unaffordability and dissatisfaction with irregularity of the services”.⁵² Notably, a survey covering 120 households in the cities of Huye and Muhanga, indicates that the level of willingness to pay for service is FRW 3,000 (EUR 2.8) which falls in within the current waste collection fee structure⁵³.

2.5.4 Overview of awareness creation initiatives

Over the recent years, a number of awareness creation initiatives for CE-related measures have been launched in Rwanda by both state-organised donor-funded initiatives and social entrepreneurs. Some of these initiatives are referred to in table 2-3 below.

Table 2-3 CE-awareness creation initiatives in Rwanda

Beat Plastic Pollution
<p>In 2018, Rwanda launched a nationwide awareness campaign on the dangers of plastic pollution to humans, farm animals, aquatic lives and the environment. The so called “Beat Plastic Pollution campaign”, ran for one week only and focused on raising awareness on the dangers of plastic pollution as well as engaging the private sector to invest in alternatives like disposable plastics that are friendly to the environment. The campaign was kicked off in Kigali, with a policy conference on strategies to address plastic waste in Rwanda. At the conference participants discussed strategies and policy solutions to combat the use of plastics and the business opportunities in the reduction, re-use and recycling of plastics. Using a wide range of education and sensitization campaigns the campaign particularly aimed to raise citizen’s awareness on the dangers of plastic disposal to their health.⁵⁴</p>
Umuganda, National Clean-up Day
<p>Umuganda is a mandatory national clean-up day organised and enforced by Rwanda’s government on the last Saturday of every month from 8:00 AM to 11:00 AM. Rwandans who do not participate in the clean-up can be fined FRW 5,000 (about EUR 4.7), not a small sum considering the average income of roughly EUR 130 a month. Apart from digging drainage ditches or street sweeping a significant percentage of Umuganda efforts also centre on environmental protections such as planting trees. To support the clean-up activities Rwanda’s government also employs professional street sweepers, gardeners and road crews.⁵⁵</p>
E-waste Awareness Campaign: Enviroserve and GIZ Eco-Emploi Programme

⁵⁰ PlanA (2019) [From waste to revenue: Upcycling in Rwanda](#)

⁵¹ National University of Rwanda (2011) [Assessment of e-wastes status and trends in Rwanda and development of recommendations for the prevention and management of e-wastes](#)

⁵² GGGI (2019) [Solid Waste Management in Secondary Cities of Rwanda - Muhanga & Huye](#)

⁵³ Ibid.

⁵⁴ Xinhua (2018) [Rwanda steps up environmental campaign on dangers of plastic waste](#)

⁵⁵ NPR (2018) [How Rwanda tidied up it’s streets](#)

On March 5th 2020, Enviroserve Rwanda Green Park and the Gesellschaft für Internationale Zusammenarbeit (GIZ) in collaboration with Rwanda Utilities Regulatory Authority (RURA) and Rwanda Environment Management Authority (REMA) launched a nationwide awareness campaign to build a sustainable e-waste management system in Rwanda. The campaign is scheduled to run until October 2020.⁵⁶ Following the launch event, Enviroserve published pictures and a promotional video⁵⁷ and issued a call for e-waste collection on World Environment Day⁵⁸. Since the campaign is still underway, its overall effectiveness and impact are yet to be assessed.

2.5.5 National capacities on CE

Education and skills gaps

The Rwandan education system, managed by the Ministry of Education, comprises six years of primary education, three years of lower secondary education, three years of upper secondary education and four years of higher education. The objectives of Rwandan education are providing free education, fostering of peace, eradication of discrimination, development of human capital as well as the promotion of science technology and intellectual productivity.⁵⁹ Although the concept of CE remains yet to be integrated as a part of the education system, the Rwandan government is increasingly committed to implement environmental and sustainability aspects at all educational levels. Currently Environmental Education (EE) in Rwandan schools is mainly taught through carrier subjects such as science, elementary technology and civic education (in elementary schools) as well as geography and general paper (in secondary school). EE lacks a base in secondary schools and at tertiary education institutions, it is still very much fragmented, compartmentalised, exam oriented. The Kigali Institute of Education (KIE), the National University of Rwanda (NUR) and the Kigali Health Institute (KHI) are the only educational institutions that have integrated EE into their curricula⁶⁰. In addition, environmental clubs are often used to supplement school curricula with experiential learning.

With the aim to further advance current EE approaches, the REMA developed an Environmental Education for Sustainable Development (EESD) Strategy for Rwanda in 2010. The strategy aimed to attain sustainable development in Rwanda through appropriate learning, capacity-building programmes and development of skills in sustainable use of resources at all levels.⁶¹ The corresponding guidelines⁶² make explicit reference to “wasteful consumption” and “waste management” as key issues to be discussed with students. The strategy adopts an experiential learning approach, e.g. by encouraging teachers to conduct field trips for instance to nearby rivers, lakes and watersheds, and waste dumping sites. Given the apparent absence of EE and CE-related issues into the Rwandan education system, it appears that the strategy has not yet been implemented on a broader scale and has so far served as a guiding document without further binding commitments.

2.5.6 Vocational training capacities

In order to meet the major objective of the Vision 2020 of creating a knowledge-based and technology-led economy, the Rwandan government is committed to invest in the development of human resources. Technical and Vocational Education and Training (TVET) is considered to be one of the necessary pillars to end poverty and reach the status of a middle-income country. In the wake of a TVET sector reform in 2008, two new bodies were created within the Ministry of Education: the Workforce Development Authority (WDA) and the Integrated Polytechnic Regional Centres (IPRCs). The WDA is in charge of organising the TVET strategy at a national level; the IPRCs develops centres of expertise on a provincial level.⁶³

⁵⁶ FONERWA (2020) [Green Rwanda Media Review](#)

⁵⁷ Enviroserve Rwanda (2020) [Green Park and GIZ Eco-Emploi Programme](#)

⁵⁸ Enviroserve (2020) [Twitter post](#)

⁵⁹ Abraham, E.E. et al. (2019) [Education for sustainable development a case study of Rwanda](#)

⁶⁰ REMA (2010) [Rwanda Environmental Education for Sustainable Development Strategy A Strategy and Action Plan for 2010-2015](#)

⁶¹ Ibid

⁶² REMA (2010) [GUIDELINES FOR INFUSING EDUCATION FOR SUSTAINABLE DEVELOPMENT INTO SCHOOLS IN RWANDA](#)

⁶³ VVOB Online: [Rwanda Technical and Vocational Education Training](#)

As part of the efforts to develop and improve the TVET system the WDA and the IPRCs are also undertaking first tangible efforts to facilitate CE-related TVET approaches. In October 2014, for instance, IPRC Kigali in partnership with Rwanda Transport Development Agency (RTDA) and the Institution of Engineers Rwanda (EIR) organised a one day workshop under the theme: “Recycling technology in road construction: The appropriate solution for road sustainable development”. The workshop was attended by 100 engineers from Rwanda and East Africa. Furthermore, Rwanda’s state-of-the-art e-waste dismantling and recycling facility in the district of Bugesera is currently engaging in the training of young people, equipping them with skills to repair, maintain and recycle WEEE. ⁶⁴

Despite the Government’s commitment to develop and improve TVET, the respective efforts often lack effectiveness and relevance to the reality of the workplace. Even in those occupational fields that show high demand for skilled workforce, like the construction sector, TVET graduates still show a lack of hands-on competencies and remain unemployed. In 2008, the Rwandan Ministry for Education found that the country’s TVET landscape insufficiently addresses the educational needs across various priority sectors (tourism, mining, ICT services, food processing, coffee, tea, alternative technologies and handcraft) and largely neglects sector development tendencies.⁶⁵ Furthermore, school management and teachers often lack specific qualifications or training themselves, resulting in weak and ineffective TVET.⁶⁶ While some improvements may have materialized in the meantime, there is currently little evidence suggesting that environment and CE-related skills development have become an integrated part of the Rwandan TVET system.

⁶⁴ The New Times (2019) [Rwanda’s e-waste dismantling and recycling plant creates green Jobs for youth](#).

⁶⁵ Republic of Rwanda Ministry of Education (2008) [TECHNICAL and VOCATIONAL EDUCATION and TRAINING \(TVET\) POLICY in RWANDA](#)

⁶⁶ VVOB Online: [Rwanda Technical and Vocational Education Training](#)

3 Impacts and benefits of the CE in Rwanda

3.1 Existing impacts and benefits

The Rwandan government increasingly recognizes the opportunities of a green and circular economy to generate sustained economic growth while ensuring social well-being and mitigating environmental risks. This is reflected in the policies, programmes and initiatives discussed in the previous chapter. The implementation of Circular Economy principles propagates the triple-bottom-line impacts and benefits sustainable and accelerated growth. Benefits include job-creation and skills development and the creation of new business opportunities; increasing local and international competitiveness benefiting exports and a more positive trade balance; transitioning to economic growth using waste as a resource and creating vertically integrated value-chains; increasing positive social and environmental impacts and creating a firm platform to launch new partnerships and leverage international funds for CE project development.

3.1.1 Economic impacts and benefits

A number of the initiatives discussed within this document relate positively to the economic development of Rwanda directly, as well as their related impacts and benefits. There are circular processes in place in the agricultural sector relating to food waste that reduce the negative impacts of lost income to farmers and this impacts food security and nutrition to the citizens. Since 2006, Rwanda has increased their rate of food security from 48% to 81%⁶⁷, and the GoR has pledged to eradicate food insecurity by 2025. Rwanda could save up to 12% of its annual GDP and reduce greenhouse gas emissions by 16 per cent if the country could cut down food loss and wastage along the value chain. As part of the strategy to reduce post-harvest losses, infrastructure investments have been made for farmers' use in 2019/2020 fiscal year Rwanda has built 369 maize drying shelters, 49 rice drying grounds, 33 storage facilities, 60 additional cold rooms and 160 farmers trained and coached on post-harvest best practices. The potential impact of 12% of GDP through adopting CE principles and reducing post-harvest losses is motivation enough to change.

Private transport is still seen as a luxury to most, but e-mobility and ride-sharing reduce costs to individuals as well as ensuring their access to economic activity and income. Reducing congestion, infrastructure costs and emissions are all additional benefits.

With an understanding of the growing e-waste issues in Rwanda, the government implemented a national policy on e-waste in 2018⁶⁸, where it was estimated the annual e-waste generation in the country was 9,417 tons. EnviroServe Rwanda has been working with the GIZ to develop comprehensive e-waste strategies for the country and particularly looking at training 500 individuals as repair specialists throughout the country. The facility collected 3000 tons of e-waste in 2019, but has the capacity to process three times that volume meaning that there will be little scope for competition in this sector. In a country with lower disposable income the refurbishment of old computers is an essential element to help bridging the digital divide and get more people with access to computers and the internet. This facility has sold or donated 2000 computers to schools since inception and created more than 400 jobs.

⁶⁷ The New Times, October 2020: [What is being done to end food waste in Rwanda?](#)

⁶⁸ Republic of Rwanda, 2018: [National e-Waste Management Policy for Rwanda](#)

From a policy perspective, the direct drive from the government has created investment-friendly opportunities that drive SME development and Direct Foreign Investment and this is largely based on sustainable CE-based directives: Rwanda registered \$USD 398 million Direct Foreign Investment in 2018⁶⁹. It is notable that Energy was among the top sectors that received DFIs, as it had huge demand as of 2019, Current National electrification Rate is at 40% (Rural at 12%, Urban at 72%).

Some of the policies mentioned previously are driving a development-friendly trade platform to bring investment and opportunities to Rwanda. Circular Economy plays a major role in shaping this economic development and this is encapsulated in the policies and directives of the Rwandan government.

The momentum created warrants expanding the transition towards circular economy activities both within the region and with the EU. Government has indicated its resolve with the likes of the privatisation of forestry resources stating clear goals of biodiversity protection (regulating designated disturbed areas for commercial afforestation compared to unhindered deforestation previously happening) and enhancement, expansion of commercial reserves and local beneficiation for the furniture and construction sector. Addressing alternative and renewable energy options is focussed on halting deforestation for fuelwood demands and there is full understanding of the economic impacts from ecosystem services that will be derived from such interventions, as well as the direct economic benefits from sustainable forestry industries development and local beneficiation.

The waste sector realistically has hardly scratched the surface in terms of CE options on available materials and resources, and this has substantial scope for growth.

3.1.2 Social impacts and benefits

Many of the project initiatives can similarly be seen to be driving social impacts and benefits, from housing, infrastructure, services, education, mobility, nutrition, health and well-being. People are being educated to the issues of mismanaged waste and how this is linked to issues such as flooding and disease, but more importantly to a sense of pride and place in the communities - it is not simply an economic or environmental issue. The benefits are being brought forward through education to both schools and tertiary elements in the TVET colleges and Universities.

Social impacts and benefits are foremost in the thinking of many policy and project applications, from the economic development impacts on health, education, nutrition, energy, transport and job-creation through each of the sector development opportunities. The forestry sector stakeholders understand the negative impacts of wood harvesting for fuel and the negative health impacts associated with dirty energy; the agricultural sector stakeholders acknowledge the impact of pre-harvest inefficiencies in nutrients and water and post-harvest impacts of losses due to inefficiencies and lack of agri-processing options; in the transport sector the local economic realities of vehicle ownership versus e-mobility and rideshare options to get people to school and work are understood; the impacts of waste in the environment on tourism, animal health, flood management and simple visual impact; in manufacturing and industry there is the imperative of embracing CE to not pollute or impair the environment and provide decent jobs; and the government understand the social needs and rights of its people.

⁶⁹ UNCTAD (2019) [World Investment Report](#)

3.1.3 Environmental impacts and benefits

The Centre of Excellence in Biodiversity & Natural Resource Management⁷⁰ has been researching the circular economy perspective with their Rwandan Freshwater Biodiversity Information System (RBIS) to support decision-making for conservation and sustainable use of Rwanda's freshwater resources. Whilst this initiative mentions the aim to extend this system throughout Rwanda to meet economic transformation and Sustainable Development Goals, the outcomes are aligned with Circular Economy principles. A healthy biodiversity makes for a healthy environment. Projects relating to the coffee trade and forestry industry are also looking at critical elements of biodiversity protection as well as enhancement or regeneration. The past deforestation practices were unsustainable and had a massive environmental impact, but with 30% forestry coverage still remaining, the move to privatization is designed to protect and enhance the remaining resources and expand commercial forestry for local consumption so as to reduce the impact on indigenous forests. Moving to sustainable and renewable energy sources (hydropower electricity, solar, CNG from methane, biogas, LPG) as an alternative to charcoal are key priorities that will benefit the environment, specifically indigenous forests and biodiversity.

Environmentally there is a critical understanding of the impacts of previous deforestation on biodiversity, water quality, water yield, health and climate impacts. The losses in the agricultural system and biodiversity losses from poor management in monoculture and coffee as examples of past poor agricultural practices have been recognised, and pilot projects have shown a clear path forward. CE principles applied in forestry residues and agricultural waste could drive production of organic composts that will contribute significantly to carbon sequestration and healthy soils to boost organic agricultural output. The government has shown leadership in understanding the plastic waste issues and derived not only policies to mitigate the impacts but driven social understanding as to the consequence of littering and poor waste management practices. This offers future opportunities in developing the waste sector in a circular manner that mitigates impacts and opens options for investment in the sector to drive appropriate innovations and technologies in waste beneficiation that further the CE directive and can create strong partnerships and relationships for the private sector and other development partners.

3.2 Future Impacts and benefits of a CE transition in Rwanda

As the Rwandan economy moves away from a traditional linear economy towards a more circular economy, this will be expected to have economic, social and environmental impacts. The following subsections present our modelling results, highlighting the direction and magnitude of potential impacts of the CE in Rwanda.

3.2.1 Modelling approach and framework

The modelling of the macro-economic impacts of the circular economy transition in Rwanda was carried out using Cambridge Econometrics' FRAMES model. This is an advanced input-output model, designed to enable the assessment of socioeconomic and environmental effects of energy, environment, and economy policies (for details see Annex B).

A conventional difference-to-baseline approach is followed. The circular economy (CE) scenario is compared against a baseline⁷¹ in which no explicit assumptions are made about circular economy activity (a 'business-as-usual' scenario, in other words), in order to compare outcomes between the two.

⁷⁰ CoEB (2018)

⁷¹ The baseline is E3ME's standard projection to 2030 for the Rwandan economy, based on official published economic and energy forecasts. See Annex B for more details.

We have adopted an ‘activities’ approach (rather than a ‘policies’ approach) to modelling the CE scenario. This choice means that the analysis does not assess potential impacts of specific policies but instead looks directly at the links between specific changes in an economy and the direct, indirect and induced effects, without making any explicit assumptions about whether these changes are driven by policies, behavioural change or new technology.

3.2.2 Modelling inputs for the CE scenario

Circular economy narrative

Based on our research on the trends in and opportunities for circular economy activities in the eight case study countries, five priority sectors have been chosen to be covered in the modelling exercise. Those are the waste sector, electronics manufacturing, the plastics sector, the agri-food sector and the construction sector. It should be noted that some specific circular activities that are currently commonly mentioned within the European policy and industry context were left out as we did not consider them realistic to be implemented within the coming decade, due to a lack of industrial development or circular economy awareness or the fact that the impacts will only materialise on a longer timescale (e.g. building design for de-construction or modular building design).

The sectors that we have focused on are the waste sector, the plastics (packaging) sector, electronics, agriculture and construction. The waste sector is an important enabler of a (more) circular economy and to be effective in this waste collection rates and recycling rates need to increase. Plastic (packaging) waste is a daunting problem in most African countries, a combination of more effective plastic waste collection and the recycling of plastic waste into new plastic packaging can make an important contribution to solving this urgent problem. E-waste is another challenge in several African countries, but with proper and safe treatment practices in place it also represents an opportunity for reusing and remanufacturing, resulting in an increased supply of affordable EEE products as well as an opportunity for recycling of valuable materials present in the E-waste, when high-value CE strategies are not feasible. Agriculture is still a critical part of the economy in many African countries. In this sector, substantial potential resides in the improvement of handling, storage and distribution of food products to prevent losses and to increase the use of organic fertilizers. Lastly, construction is a booming activity in Africa, but up to now circular practices are virtually absent. Therefore, for the short term there seems to be potential for increasing the use of secondary materials in this sector, either directly or via construction products that incorporate by-products or waste materials.

Modelling assumptions

Where possible the aforementioned sectoral narratives have been translated into modelling assumptions. It should be noted that the aim of the exercise has not been to forecast the future in 2030, but to explore the impacts that more increased circularity could have by that year, were this to become a reality. To this end, we made evidence-based assumptions about the form and scale circular economy activities could take in Rwanda by 2030 and used these as inputs into the model. These model inputs are summarised in **Error! Reference source not found.**

Table 3-1 Circular economy activities and corresponding modelling inputs

Category	Circular economy activity	Modelling input
Waste management	Improved waste collection rate	Increase in waste sector output

Electronics, electric equipment & E-waste	Improved recycling of valuable materials in e-waste	Investment in recycling sector to improve health & safety standards (50% funded by industry, 50% funded through public/ODA financing)
		Exports of materials recovered from e-waste recycling
	Increased use of recycled materials in electronics production, replacing virgin metals and plastics	Shift in plastics' intermediate demand: reduced purchases from metals and plastics sectors, replaced by purchases from recycling sector
Agriculture	Prevention of food loss in agricultural supply chain through improved storage and logistics	Substitution of agricultural imports by domestic agricultural production
		Investment in storage and logistical capabilities (50% funded by industry, 50% funded through public/ODA financing)
	Increased use of organic fertilisers materials in agriculture, replacing use of mineral fertilisers	Shift in intermediate demand in agriculture: fewer purchases from chemicals, more purchases from agriculture
Plastics packaging	Increased use of recycled feedstock in plastics production, replacing virgin feedstock	Shift in plastics' intermediate demand: reduced purchases from chemicals sector, replaced by purchases from recycling sector
Construction	Increased use of recycled minerals in construction, replacing virgin minerals (glass, cement, sands, ceramics)	Shift in plastics' intermediate demand: reduced purchases from non-metallic minerals sector, replaced by purchases from recycling sector

Modelling limitations

As shown in the table, the circular economy activities and the related modelling assumptions focus on recycling and trade activities as well as on raw material inputs. There are two main reasons for this. First of all, due to the lack of well documented data, other activities ranking higher in the waste hierarchy, such as high-quality refurbishing (e.g. in the EEE sector), had to be neglected. Secondly, the technical construction and set up of the FRAMES model restricted the type of assumptions and inputs that could be used. For instance, in such a demand-driven framework, it is difficult to model an increase in recycling when this is not fully coupled with an increase in demand for recycled materials across sectors. As such, growing activity in the waste sector was limited to increasing waste collection rates. Furthermore, some activities are hard to represent in the modelling as the sectoral aggregation is too coarse to allow for modelling for changes in production processes within sectors. These limitations are important to take into account, when interpreting the results presented in the following sections. The impacts that circular economy could potentially bring to the chosen sectors and countries are thus not fully covered in the modelling, and could thus differ from the modelling outcomes in reality.

3.2.3 Modelling results

The modelling results presented in this section reflect differences between the CE scenario and the baseline by 2030, rather than the net effect of economic developments occurring between 2020 and 2030. For instance, if the price level in the CE scenario is reported as -1% by 2030, this does not imply that deflation occurred in the CE scenario, but that inflation was slightly lower in this scenario than in the baseline scenario.

Economic impacts and benefits

Our modelling suggests that circular economy activities in Rwanda would have a positive impact on the Rwandan economy. By 2030, Rwanda's GDP is projected to be around 0.6% higher in 2030 in the circular economy scenario compared to the baseline scenario. In other words, this suggests that the Rwandan economy would be slightly larger as a result of increased circular economy activity than it would be in a 'business-as-usual' situation. **Error! Not a valid bookmark self-reference.** shows the CE scenario results for each of the components of GDP, as well as for the price levels. Results for the CE scenario are presented as differences from the baseline scenario by 2030, in absolute (monetary) and relative (percentage) terms.

Table 3-2 Macro-economic impacts of the CE scenario

Variable	Absolute difference from baseline scenario by 2030 (€2019)	Relative difference from baseline scenario by 2030 (%)
GDP	+ €151m	+ 0.6%
Consumer	+ €48m	+ 0.3%
Investment	+ €55m	+ 0.8%
Exports	+ €10m	+ 0.2%
Imports	- €40m	- 0.4%
Price level	-	- 0.2%

These results suggest that the positive economic impacts would be spread relatively evenly across the components of GDP: consumption, investment and the trade balance all see an improvement as a result of circular economy activity.

Some of these impacts can be attributed to the direct effect of the input assumptions in the circular economy scenario. The investment impact is partly driven by scenario assumptions of increased investment in the agricultural and recycling sectors, which account for around €21.5m of the total €55m investment impact. We have also assumed a fall in imports of agricultural products of €64m (as a result of better prevention of food losses in the supply chain), which has directly affected the trade balance to a significant degree.

However, much of the impact would equally result from the downstream effects of these and other circular economy activities. Notably, the investment and import substitution shocks to agriculture lead to increased demand for other sectors through higher investment spending (benefiting sectors such as construction and 'electrical & machinery'), and higher intermediate demand for inputs from its suppliers (such as financial and business services). The increasing competitiveness of the agricultural sector also allows it to export some of its produce, which along with the scenario assumption of increased exports of recycled materials from e-waste, contributes positively to the trade balance.

Equally, the model suggests that circular economy activity would have induced effects on aggregate demand, as rising employment in key sectors (see section 3.2.1) would lead to higher disposable incomes, and so to greater consumer spending in sectors such as retail, education and health, and agriculture. Higher consumer expenditure on imports would also dampen the impact of the assumed drop in agricultural imports: hence the results suggest a smaller impact on imports (-€40m) than would be expected from the size of the assumed fall in agricultural imports (-€64m).

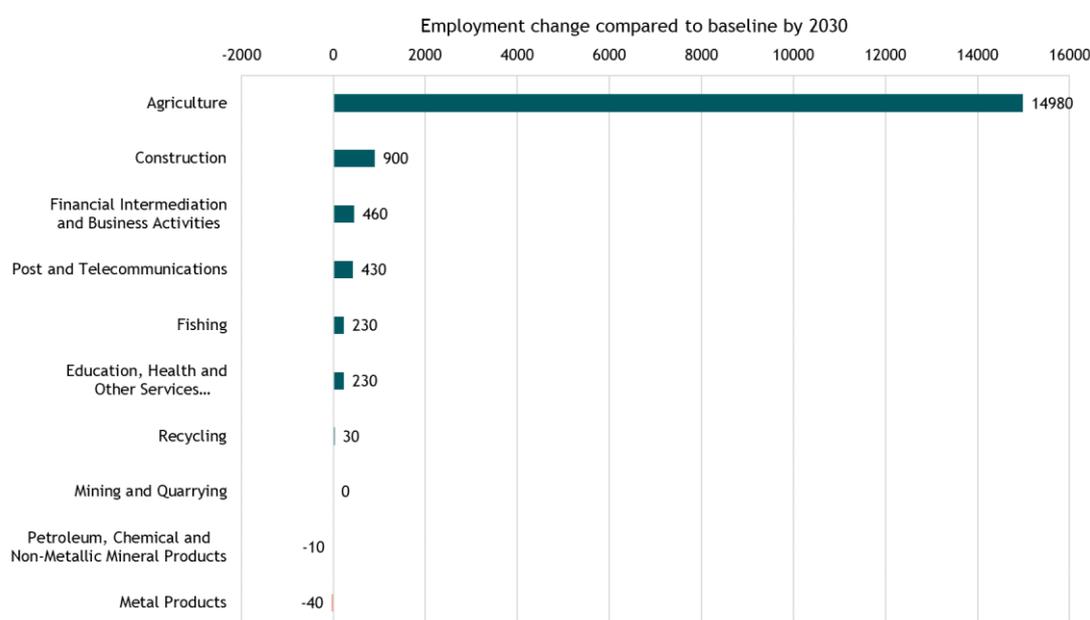
When interpreting these economic results, it is important to note that not all of the projected impacts in the CE scenario would necessarily be sustained beyond 2030. On the one hand, we may expect a permanent

impact from circular economy activities such as preventing food losses in the agricultural supply chain, or increasing waste collection rates, assuming efforts are made to maintain these practices in the future. On the other hand, some of the projected GDP impacts are a direct result of time-limited injections of funds into the economy, such as the assumed increase in investment in agriculture. We have assumed that half of this investment stimulus would be funded either through public deficits or official development assistance: if this type of funding were to be discontinued from 2030, then we would expect the GDP impact to be somewhat smaller from 2031 onwards.

Social impacts and benefits

In line with the positive economic effects, the circular economy in Rwanda would also have positive employment effects. Overall, a net increase in employment relative to the baseline scenario of around 0.2% is projected, or approximately 17,300 additional jobs compared to the baseline (Figure 1).

Figure 3-1 Absolute employment changes in selected sectors in CE scenario (relative to the baseline scenario)



In line with the economic impacts, the largest employment impacts in the CE scenario would be seen in the agricultural sector, which accounts for almost all the net employment impacts seen in the modelling results. The higher employment in agriculture relative to the baseline would be a direct consequence of greater circular economy activity in this sector. It should also be noted that the modelling exercise does not consider current knowledge gaps in agriculture. Therefore any increase in circular economy activity in the agriculture sector will have to go hand in hand with education, training and skills development in the areas of regenerative agriculture, agricultural waste valorisation and circular urban farming systems.

These impacts on agricultural employment should be interpreted with caution, however, due to a limitation in the modelling methodology. The employment impacts observed in the CE scenario reflect an implicit assumption that the additional output in domestic agriculture due to prevention of food losses is as labour-intensive as other forms of agricultural production, when in reality it is likely that this circular economy activity would be much less labour-intensive than most agricultural production.

Circular economy activity would also have a direct, positive impact on employment in the waste management sector, as output and employment would need to increase in order to meet higher collection rates than in the 'business-as-usual' scenario.

Employment in other sectors would also indirectly benefit from circular economy activity. Increasing investment expenditure in agriculture would lead to higher demand for construction, and higher consumer spending levels would lead to higher demand for telecommunication and financial and business services, generating positive employment impacts in these sectors.

The net employment impact of greater use of recycled materials in construction and electronics, plastics and metals production would be roughly neutral, as gains in employment in the recycling sector relative to the baseline would be offset by a marginally larger decline in employment in the metals and petrochemical sectors.

As explained throughout this report, CE strategies can have important impacts on informal workers. The model is only capable of quantifying changes in overall employment volumes, but not to assess the impacts of specific groups within the workforce in qualitative terms. This means that the shifts in economic activities in this assessment can affect the job types and skill sets required. Involving informal workers in the economic transformation process is thus crucial for achieving societally beneficial outcomes.

Environmental impacts and benefits

Our model suggests that the economic growth seen as a result of circular economy activity in Rwanda would produce higher carbon emissions than in the baseline, with CO₂ emissions forecast to be 0.4% higher than baseline levels by 2030.

The transport sector, among the most energy- and carbon-intensive sectors in the Rwandan economy, would be responsible for the greatest part of the projected increase in emissions. As circular economy activities generate economic benefits that spread throughout the economy, business and consumer demand for transportation services would increase, leading to greater consumption of fossil fuels. For the impacts of circular economy activities to be carbon neutral, Rwanda would likely need to take separate measures to ensure that the transport sector sees higher take up of renewable energy sources. Smaller CO₂ emissions increases would also be seen from the recycling sector, which would see its output rise as a direct result of greater circular economy activity, as well as from households.

It is important to take account of some methodological limitations when interpreting these environmental impacts. Firstly, our modelling likely overestimates emissions impacts from certain circular economy activities, such as in agriculture, as we faced limitations in how accurately we could model these activities. For instance, we modelled the prevention of food losses in the agricultural supply chain as an increase in demand for domestically produced agricultural goods, to substitute for imports of those goods. This implies that preventing a given amount of food losses requires the same amount of energy as growing an equivalent amount of food. As was the case with employment in this sector, however, it is likely that the former is more energy-efficient than the latter as this food was already produced in the baseline case, but no measures were taken to prevent it from being lost. Similarly, the model does not necessarily capture the effect that greater recycling rates would have on reducing landfill emissions, or the effect of reduced food losses on organic waste emissions, as our results only include emissions from energy use and process emissions.

Secondly, it should be noted that the results presented here only project the emissions impacts in Rwanda, and do not attempt to project the net impact on global emissions. For instance, a substitution of imports for domestic production would, all else being equal, result in no net change in emissions, as production has simply relocated from one place to another. However, this development is represented in our results as an increase in emissions in Rwanda, without taking account of any corresponding decrease in emissions outside of its borders.

Thirdly, these emissions impacts should be seen in the context of environmental goals, more broadly defined. For instance, the increase in emissions as a result of circular economy activities must be weighed against the abatement of other forms of pollution, such as that generated by uncollected waste. Economic statistics such as national accounts generally do not capture the broader co-benefits of increasing waste collection output in terms of human health, ecosystem services reduced pollution, resource savings and natural capital.

4 Cooperation between the EU and Rwanda

Chapter 4 provides an overview of the status quo of CE-related cooperation between EU and Rwanda. At the end of each subsection we phrase some general opportunities for improvement. Specific recommendations are provided in chapter 6.

4.1 Policy dialogues

Bilateral collaboration between Rwanda and the EU mainly commenced in the form of humanitarian aid in the wake of the 1994 genocide. Under Article 8 of the Cotonou Agreement, the first two dialogue meetings were held in 2005 and featured a variety of humanitarian and domestic policy related discussion points and the establishment of benchmarks. At that time, institutionalized aid policy dialogues between African states, the EU, and their donors had become more common, as Rwanda was open to discuss governance issues or reforms as part of their collaboration. The following years featured pro-active dialogue engagements between the EU and Rwanda, with consensus on the positive progress of collaborative efforts. As a result, dialogue meetings were held up to four times a year.

After the 2010 presidential election, a more critical perception of aid funds started to develop. Ongoing governance concerns culminated in the summer of 2012. After the UN published a report accusing the Rwandan government of backing rebel groups in Eastern DC in 2012, the EU and many member states suspended or withdrew their development aid funds.⁷² The aid flow was re-established around six months after the report.⁷³ Today, the on-going partnership between Rwanda and the EU is reflected by the 11th National Indicative Programme (NIP) 2014-2020 for Rwanda, which links with the country's 2nd Economic Development and Poverty Reduction Strategy (EDPRS II, 2013-2018) as the mid-term strategy for implementing its Vision 2020. The primary components of the NIP, which focus on the three areas energy, agriculture and governance play a key role in the thematic topics of policy dialogue.⁷⁴ Notably, the concept of CE is not yet represented in the declarations of the EDF NIP with Rwanda. As a result, joint institutionalized policy dialogues in relation to CE are generally uncommon between both parties.

In the past, events hosted by the EU Commission or the EU Delegation to Rwanda, have also been a place for continued policy dialogue. These events usually offer a more informal setting for exchange between EU and Rwandan state actors. A selection of the most relevant events hosted or joined by Rwanda is presented in the table below.

Table 4-1: Dialogue events with relevance for CE-related policy dialogue

European Development Days (EDD)
A notable event in this context of policy dialogue between the EU and development partners, are the European Development Days (EDD), which featured the participation of President Kagame in 2019. ⁷⁵ The EDD 2020 (postponed to 2021) has dedicated a thematic focus on green and circular economy and hence could provide an important exchange platform for both countries for CE activities. ⁷⁶

⁷² Hackenesch (2018) [The EU and China in African Authoritarian Regimes](#)

⁷³ Centre for European Studies (2017) [The case of EU sanctions towards Rwanda](#)

⁷⁴ The New Times (2019) [EU Highlights Priorities in Rwanda](#)

⁷⁵ European Development Days (2019) [Addressing Inequalities](#)

⁷⁶ European Development Days (2020) [Green Deal for a Sustainable Future](#)

African, Caribbean and Pacific Group of States (ACP)-EU Assembly
Rwanda also hosted the 38 th ACP-EU Assembly in Kigali, which featured the participation of European parliamentarians and representatives of the 78 African, Caribbean and Pacific countries of the Cotonou Agreement. Several high-level state actors came together to discuss various topics, including climate change and food security, migration and the post-Cotonou ACP-EU Agreement. Environmental sustainability and sustainable industrialisation were featured in the agenda, but the discussions were lacking a specific focus on CE. Since the event was organized as a meeting between ACP and EU members, the discussions did also not put a particular focus on bilateral relationships between Rwanda and the EU.
Global Climate Change Alliance Plus (GCCA+) conference
In October 2019, Rwanda hosted a regional conference of the Global Climate Change Alliance Plus (GCCA+). The conference did not explicitly feature CE as a central agenda item but acknowledged the interlinkages between “growing energy demands and rapidly increasing greenhouse gas emissions from key sectors including transport and waste”. ⁷⁷
2019 climate diplomacy week
During the 2019 climate diplomacy week in late September/early October 2019, Rwanda hosted a series of conferences, exhibitions, events in relation to youth unemployment: “Jog & Bike Climate Event”, ⁷⁸ EU representatives in Rwanda collaborated with local youth organizations to conduct a boot camp for entrepreneurs operating CE businesses.

In an effort to spur Africa’s transformation to a circular economy which delivers economic growth, jobs and positive environmental outcomes at the national, regional and continental levels, Rwanda, South Africa and Nigeria in 2016 founded the African Circular Economy Alliance. As the Alliance is open to membership from national institutions and public sector entities, international organizations, funding institutions and research centres it offers an ideal platform for the EU to engage in future dialogue with Rwanda and the rest of the continent on CE-related issues. Current member countries include: Governments of Cote d’Ivoire, Ghana, Nigeria, Rwanda and South Africa. Current strategic partners include: African Development Bank, Africa Circular Economy Network, Global Environment Facility, Government of Finland, PACE, UN Environment, UN Development Programme and World Economic Forum.⁷⁹

Overall, the above is an indication that both the EU and Rwanda are willing to engage in a comprehensive political dialogue on various sustainable development issues. However, CE aspects have not yet become an integral part of this dialogue. For example, the National Forum on Circular Economy 2019 (organized by the Rwandan government, the Ministry of Environment and the Rwandan Green Fund (FONERWA)), which culminated in a series of recommendations for future action, was not used as an opportunity for bilateral exchange between Rwanda and the EU. This shows that, there is still room for strengthening and intensifying the discussions on the role of CE in the country.

Table 4-2 Opportunities and Barriers for future policy dialogues between Rwanda and the EU

Opportunities and Barriers for future CE-related policy dialogues between Rwanda and the EU
<ul style="list-style-type: none"> • The organization of the first National Circular Economy Forum in 2019 indicates the growing importance of CE in Rwanda. This represents a valuable opportunity for the EU to formalize discussions on this topic in coordination with FONERWA, e.g. by launching a 4-part discussion series on the key areas for recommendations captured by the event⁸⁰ (research and development; knowledge and data sharing; access to finance; capacity building and awareness).

⁷⁷ GCCA (2019) [Climate Smart Africa](#)

⁷⁸ EEAS (2019) [Climate Change Awareness in Kigali](#)

⁷⁹ PACE (n.d) [African Circular Economy Alliance](#)

⁸⁰ FONERWA (2019) [National CE Forum Recommendations](#)

- Building on the existing structures of bilateral exchange and the work of the EU Delegation in Rwanda, future policy dialogue between Rwanda and the EU may also focus on supporting the development of a national circular policy, the setup a well functional national circular economy (CE) related policy dialogue framework and develop a national strategy on CE
- Future formalized forms of policy dialogues may also focus on the linkages between CE and the current key areas of the NIP (energy, infrastructure and agriculture) e.g. by evaluating the importance of waste-to-energy, and the utilization of agricultural residues. To this regard the programming document for the period of 2021 - 2027 which is currently being developed, has to be accounted for as well.

4.2 Development cooperation projects and programmes, including by the EU Member States

With the NIP 2014-2020 as the primary agreement for relations between Rwanda and the EU, EU-funded development cooperation programmes mainly focused on energy and agriculture as three priority sectors, alongside aspects of governance, civil society and human rights.⁸¹ Apart from a few small-scale initiatives, projects facilitating the transition towards a more circular development model in Rwanda are mostly absent.

Within Rwanda's agricultural sector, development cooperation projects have so far mainly focused on food security, with more recent projects, also focusing on sustainable farming and climate-smart agriculture.⁸² One example is the Capacity Development for Agricultural Innovation Systems (CDAIS) project which is supported by the EU and implemented by FAO in partnership with Agrinatura (a consortium of 31 European universities and research institutes). The project follows a community-based approach that works through reflection, group learning and increased engagement, helping farmers to better adapt innovative methods for water sharing. Future projects in the agriculture sector ^{83, 84, 85}. The current lack of CE-approaches in the sector may be addressed by the forthcoming Team Europe Initiative on a Rwandan Green Deal for Inclusive Development. The initiatives particularly aims to tap on the potential of Rwandan agriculture to drive a green transformation and create decent jobs, through smart investments in value chains geared towards feeding the cities and the inclusive and green development of rural areas and secondary cities. As such it can form an important basis for potential joined-up and CE-related development cooperation between the EU, the EU Member States and Rwanda over the coming years.

The EU also supports the equal access to employment in Rwanda by setting up so-called innovation hubs in four secondary Rwandan cities. Supplementing these efforts, another EU-funded project implemented between 2015 and 2018 aimed at improving the situation of youth in the Rwandan informal sector by increasing their technical, financial and entrepreneurial skills, ensuring access to information and financial business services by contracting more than EUR 1.6 million.⁸⁶ Technical and vocational training approaches like this also represent a major chance to integrate citizens into emerging business sectors, e.g. by considering the country's informal workforce for an increasingly formalized waste management system.

A particular focus of several development cooperation projects in Rwanda is to support the use of sustainable energy. A recent example is "The Prepaid Energy" project, which received financial support from the EU to

⁸¹ EEAS (2016) [Rwanda and the EU](#)

⁸² EEAS (2020) [Teaming Up for Agriculture in Rwanda](#)

⁸³ EEAS (2020) [Sharing Water in Rwanda's Breadbasket](#)

⁸⁴ KT Press (2020) [Nasho Irrigation Project](#)

⁸⁵ Ibid

⁸⁶ EEAS (2018) [Youth Employability in the Informal Sector](#)

the tune of EUR 6 million in order to supply up to 70,000 Rwandan households with off-grid solar energy. On top of the project's impacts on livelihoods on over 49,000 rural-based households, the project has a circularity component "Own-to-rent", which minimizes the growing solar waste stream by adopting leasing models for electricity generation.⁸⁷ Yet, long-term end-of-life management strategies from off-grid electricity systems (ensuring controlled disposal of solar panels and battery systems) are not addressed. In addition, EU-funded projects in Rwanda have promoted the efficient use of biomass for cooking stoves^{88 89}. These initiatives offer entry points for CE-related management concepts in the energy sector (e.g. in the context of bio-based energy).

Several EU member states are also independently involved in development cooperation projects in Rwanda. The Dutch government and its development agency SNV, for instance, have engaged in a joint programme called Water for Growth (W4G),⁹⁰ aiming to support the local Integrated Water Resources Management Program (IWRM). Signed in a Memorandum of Understanding (MoU) in 2015, the programme includes the application of best practices in the management of wastewater. In 2018, SNV provided an additional EUR 22 million to finance the Rwandan IWRM.⁹¹

SNV further implements the USAID-funded Isuku Iwacu project (Rwanda Rural Sanitation Activity, running from 2016-2020) which aims to improve access to correct, consistent use of household sanitation and hygiene facilities. The project seeks to benefit 300,000 Rwandans with a range of sanitation technologies while safely handling waste. The project is targeting to set up a sanitation center in Kayonza, Nyanza, Ruhango, Nyabihu and Ngoma districts.⁹² Another notable initiative is SNV's Opportunities for Youth Employment (OYE) project, which seeks to boost job creation in CE-related areas of agriculture, energy and Water Sanitation and Hygiene (WASH) and has trained 400 masons, supervisors and appliance manufacturers (e.g. supporting biogas initiatives).⁹³ SNV is also funding the HortInvest project (in partnership with Agriterra, Holland Greentech, IDH Sustainable Trade Initiative and CDI Wageningen), a four year, EUR 16 million investment program that will run from 2018 to 2021. HortInvest among other things aims to reduce post-horticultural harvest loss of over 40,000 farmers.

Sweden also has an established development cooperation agenda with the Rwandan government. Besides implementing projects strengthening national capacities for creating environmental sustainability (e.g. through SIDA's 2-4 weeks long International Training Programmes)⁹⁴, the focus is primarily on research cooperation (4.6).⁹⁵

Belgium, which has deeply rooted historical relations with Rwanda, is also actively supporting a circular and sustainable development in Rwanda. The Belgian Development Agency i.e. Enabel, is currently financing and implementing CE-related projects in the energy sector (Forest management and woody biomass energy support (FMBE)⁹⁶), agricultural development (Inclusive and sustainable value chain development in the pig and poultry sector⁹⁷) and urban development and management (Urban Development in Rubavu, Musanze and

⁸⁷ Rwanda Energy Group (2014) [Rent to Own Solar Home Systems Project](#)

⁸⁸ EUEI (2009) [Biomass Energy Strategy Rwanda](#)

⁸⁹ The New Times (2019) [Rwf5bn Project to Promote Clean Cooking in Rwanda](#)

⁹⁰ SNV (2019) [Water for Growth https://snv.org/project/water-growth-w4g](https://snv.org/project/water-growth-w4g)

⁹¹ Rwanda Development Partners (2018) [Finance Integrated Water Resources Management Programme](#)

⁹² SNV (2020) [Isuku Iwacu](#)

⁹³ SNV (2019) [Opportunities for Youth Employment](#)

⁹⁴ SIDA (2017) [International Training Programmes](#)

⁹⁵ UN Rwanda (2019) [Sweden and UN Rwanda partnership to support UNDP II](#)

⁹⁶ FMBE (2016) [Forest Management and Woody Biomass Energy Support](#)

⁹⁷ VCD-PPS (2019) [Value Chain Development in Pig and Poultry Sector](#)

Rwamagana).⁹⁸ Enabel is further funding the Local Competitiveness Facility (LCF). LCF is designed as a matched grant facility. It supports private business partnerships focusing on value chain integration and funds innovative economic partnerships to enhance pro-poor local economic development. It has a total volume of RWF 1.3 billion and focuses on the following sectors: agri-business and processing; handcrafts (as per the National Hand Craft Strategic Plan); tourism; ICT and, finally, distribution and services.⁹⁹ In partnership with the Rwandan Ministry of Local Governance, Enabel has funded business partnerships in 4 piloting districts: Nyagatare, Gisagara, Rutsiro, Gakenke Rutsiro. Since 2016, over 150 businesses mainly consisting of agricultural projects have received funding (e.g. honey, banana and bamboo processing).¹⁰⁰ Although the LCF currently has no particular focus on CE, the approach of local value chain integration and private partnerships offers the potential to support local operations that often already implement fundamental aspects of the CE-concept

Although no longer part of the EU the UK and its Department for International Development (DFID) has in the past set a particular focus on addressing e-waste pollution in Rwanda with its investments. DFID, for instance, invested in the new e-waste recycling facility in Bugesera, which now operates under to management of Enviroserve. The project aims to allow safe disposal of hazardous electronic waste and ensure the financially sustainable recycling of electronic equipment in the country.¹⁰¹ The project was launched in 2014 with a USD 1.5 million investment by FONERWA (see 4.3) and has, amongst other things, led to the development of the National E-waste Management Policy. Today, the facility has the capacity to employ more than 1,000 people - making it the second state of art e-waste dismantling and recycling facility in Africa.¹⁰²

Lastly, the German government through the Gesellschaft für Internationale Zusammenarbeit (GIZ) is funding the project “Promoting the economy and employment in Rwanda”. The project has gone into a second phase (implemented from 2020-2022) and targets ICT industries, including e-waste. Together with Enviroserve Rwanda and the Rwanda Environment Management Authority (REMA), GIZ carried out awareness raising programmes (see section 4.5.1 on national awareness above) and seeks to train up to 500 current repair specialists throughout the country.¹⁰³

Table 4-3 Opportunities and Barriers for future CE-related development cooperation between Rwanda and the EU/EU Member States

Opportunities and Barriers for future CE-related development cooperation between Rwanda and the EU/EU Member States
<ul style="list-style-type: none"> • Building on the solid base of development cooperation projects in the agricultural sector in Rwanda, future development cooperation may benefit from an increased focus on sustainable agricultural practices such as the utilisation of agricultural residues, the reduction of post-harvest loss, or regenerative farming. To this regard the upcoming Team Europe Initiative on a Rwandan Green Deal for Inclusive Development offers significant potential for possible joined up intervention by the EU and the EU Member States over the coming years. • Donor-funded projects have so far focused on agriculture and sustainable energy, whereas solid waste management has not yet received particular attention. A notable exception includes a project supported by FONERWA, which resulted in the publication of a National E-waste Policy in 2016; yet, this has not yet led to further regulatory initiatives for e-waste management in Rwanda. As such, there is ample room for the EU to become more active and finance development cooperation projects in the waste management space, e.g. by supporting the set-up of an integrated waste management framework.

⁹⁸ EcoDev (2020) [Economic Development MIR Sector](#)

⁹⁹ LCF (2020) [Local Competitive Facility](#)

¹⁰⁰ LCF (2020) [Local Projects](#)

¹⁰¹ Africa Green Growth Forum (2017) [Launch of Rwanda's E-Waste Recycling Facility](#)

¹⁰² Ibid

¹⁰³ GIZ (2018) [Promotion of Economy and Employment Programme](#)

- According to the Rwandan Ministry of Infrastructure (MoI), the country is characterised by "a backlog in waste legislation enforcement as well as in coordination and promotion of existing efforts to recycle and dispose waste properly". Yet, there are currently no donor-funded projects structurally promoting the establishment of a structured waste management system in the country.
- Against this background, the EU could explore potentials for cooperation with the National Task Force under MoI, which is in charge of developing the country's waste management system in line with the international waste hierarchy. Particular areas of interest to the EU may include plastics and e-waste, for which private sector involvement (e.g. through Extended Producer Responsibility) is not yet common practice.
- As the current programming period under the NIP is coming to an end, the next programming period that is currently being developed within the framework of the EU Green Deal offers significant potential to increase the focus on CE-related issues in development cooperation with Rwanda

4.3 Activities by the European Investment Bank (EIB) and other European Development Finance Institutions (DFIs)

The majority of EU DFI activities in Rwanda focus on private sector support or infrastructural issues. However, first activities such as the establishment of the FONERWA, supported by a financial contribution to the fund from the German KfW and UK DFID, already take a central role in achieving sustainable development and supporting the implementation of CE-related activities in the country. FONERWA aims to be a driver for green growth in Rwanda by providing unheralded technical and financial support to the best public and private projects that align with Rwanda's commitment to a green economy.¹⁰⁴ In 2019, FONERWA, among other things, supported the Rwandan government in organizing the first National Circular Economy Forum. Recommendations resulting from the Forum touched upon access to finance and suggested a) providing further support to private and civil society initiatives in aligning with CE principles through FONERWA funding; and b) building domestic capacities for developing investment proposals to mobilize financing for circular businesses and initiatives.¹⁰⁵ Notably, FONERWA also enables other DFIs to better embed projects in the local context.

The KfW, for instance, funds various projects at district level addressing climate change adaptation via FONERWA. Projects include the development of electric motorcycle taxis with solar-powered battery charging systems, constructing and disseminating low-cost rainwater harvest techniques as well as the design and implementation of a national e-waste management strategy.^{106 107 108} In addition to the support of FONERWA, KfW also supports sustainable Rwandan microfinance banks. This not only enables Rwandans to save for emergencies and to conduct financial transactions but also allows SMEs to gain access to credit that they can invest in their businesses. Finally, the KfW is engaged in financing a project planning a new sustainable and energy-efficient district for Kigali. The project is led by the Swedish architecture and engineering company Sweco.¹⁰⁹

The EIB has been involved in projects in Rwanda since 1977 and has since signed an amount of EUR 100 million for 13 projects. Since 2009, the EIB has been working closely with the Bank of Kigali. In 2019, the two banks signed their largest ever financing cooperation agreement, amounting to RWF 30 billion (EUR 27.5 million). Under the umbrella of this agreement the Bank of Kigali will support new business investment across Rwanda

¹⁰⁴ FONERWA (2020) [Resource Mobilization](#)

¹⁰⁵ FONERWA (2019) [National Circular Economy Forum Recommendations](#)

¹⁰⁶ FONERWA (2018) [Electrifying Rwanda's Moto Taxis](#)

¹⁰⁷ FONERWA (2014) [National E-Waste Management Strategy & Facility](#)

¹⁰⁸ FONERWA (2014) [Rooftop Rainwater Harvesting in High Density Areas](#)

¹⁰⁹ SWECO (2019) [New Sustainable District for Kigali](#) /

in agriculture, manufacturing and tourism.¹¹⁰ In 2018, the EIB and the Rwandan Ministry of Finance and Economic Planning further signed a EUR 45 million loan to finance transformational improvement of sanitation infrastructure in the city of Kigali. In addition to financing support from the Government of Rwanda and the African Development Bank, the European Investment Bank's 25-year loan will finance a EUR 96 million wastewater and sanitation project in which the EIB has also played an important role in the technical, economic and environmental planning. The construction of Kigali's first wastewater network and treatment plant will significantly improve health, reduce pollution and carbon emissions, as well as make Kigali a more attractive place to live and work.¹¹¹

Table 4-4 Opportunities and Barriers for CE-related investments in Rwanda by the EIB and DFIs

Opportunities and Barriers for CE-related investments in Rwanda by the EIB and DFIs
<ul style="list-style-type: none"> • The active role of FONERWA as a first-mover in supporting national dialogue around CE and facilitating the embeddedness of other DFIs' projects in Rwanda represents a valuable opportunity for the EU (through EIB and the European Sustainable Development Fund) to develop tailor-made projects and provide investment support. • The relatively strong focus of Rwanda's economy on agriculture and the relatively large number of initiatives of other DFIs in this area will require extensive coordination in case the EU decides to support projects in the agri-food sector. The World Bank is currently doing the overall coordination and the co-chair of the agricultural sector since June 2020. • A specific opportunity could be to focus on regenerative agriculture, such as organic fertilizer production, which could reduce Rwanda's importation of synthetic fertilizers and directly support 55.7% of farmers who rely on organic fertilizers. Other notable regenerative agriculture options are circular urban farming systems e.g. indoor aquaculture. • Opportunities can be identified in a number of other areas, which have yet received less attention but may require substantial investment support. Notable examples include the built environment (e.g. by facilitating the integration of CE principles into Rwanda's Rise High Building Strategy) and the expansion of waste treatment infrastructure (particularly for e-waste and plastic waste).

4.4 Trade and investments in the Circular Economy

The Rwandan economy does currently not support high added-value processes but is instead still focused on the earliest phases of raw material production. In many of the international value chains, Rwandan production therefore operates at the bottom end. Increasing the productivity and exports of the country's main commodities such as coffee and tea alone will not be sufficient to advance the Rwandan economy. Therefore, the Rwandan government is committed to expand and diversify the economic base, particularly with regard to exports.¹¹²

In an effort to develop and improve the trade relations between their countries and the EU, the East African Community (EAC) including Burundi, Kenya, Rwanda, Tanzania, and Uganda, has elaborated an Economic Partnership Agreement (EPA) with the EU.¹¹³ Although the EPA is not addressing Circular Economy as such, it does set a clear focus on promoting the sustainable development within the EAC. This will, for instance, be achieved by reinforcing cooperation on the sustainable use of resources in the fisheries and agriculture sector as well as by foreseeing further dialogues on trade in services and trade-related rules addressing sustainable development, competition policy, investment and private sector development. Despite the EPA having been

¹¹⁰ EIB (2019) [New Collaboration Between EIB and Bank of Kigali](#)

¹¹¹ EIB (2018) [Rwanda: EIB Backs First Public Sewerage Network](#)

¹¹² Government of Rwanda (2012) [Rwanda Vision 2020](#)

¹¹³ EU EAC EPA (2106) [Economic Partnership Agreement EU and East Africa Community](#)

signed by Rwanda and Kenya in September 2016, it has not entered into force yet, as the non-signature of the three remaining EAC members is blocking the ratification.¹¹⁴ As a Least Developed Country (LDC), exports from Rwanda (with the exception of arms) do, however, fall under the EU's Everything But Arms preferential scheme, under which it enjoys duty-free and quota-free access to the EU Market^{115 116}.

In line with its Vision 2020, which aims to facilitate the country's development towards a sustainable and more services-based economy, the Rwandan government further issued a range of import restriction and tariffs. Notable restrictions include a ban on single use plastic bags, which came into force in 2005. In September 2019, the government enhanced its legal ban on plastics by enacting a new law (n° 17/2019 of 10/08/2019) relating to the prohibition of manufacturing, importation, use and sale of plastic carry bags and single-use plastic items (see section 2.3.1). Rwanda has also been aggressively regulating the import of second-hand clothes and footwear into the country. Since 2016, the government has increased taxes on these goods, from USD 0.20 up to USD 4 per kg in the next financial year. Tariff on used footwear has also jumped from USD 0.20 to USD 5.

In the past Rwanda's environmental trade policy has shown significant gaps in particular with regard to the import of e-waste. As a result, the import of used and near-end-of-life equipment had increased fivefold between 2010 and 2014, adding up to an annual generation of 9,417 tons of WEEE, in a period of time where no adequate treatment facility for e-waste was available in the country.^{117 118}.

Table 4-5 Opportunities and Barriers for trade and investment in CE

Opportunities and Barriers for future trade and investment in CE
<ul style="list-style-type: none"> • Although the currently blocked EPA between the EAC and the EU represents a challenge for EU-Rwanda trade, the situation could provide an opportunity for a revision of the agreement putting a stronger focus on supporting the transition to a green, circular economy within the region. • Supporting the implementation of higher added value operations in Rwanda's priority export sectors - for instance the roasting of coffee or the production of leather and leather goods (as opposed to exporting raw hides and skins) - could offer the potential to strengthen Rwanda's role in global trade, also increasing opportunities for the enhanced trade of environmental goods and services¹¹⁹. • Overall, the trade environment in Rwanda is facing a multitude of challenges due to its geographic location. Future collaborative activities between the EU and Rwanda on a trade policy level need to encourage a harmonization of standards to facilitate trade of goods in general and specifically for environmental goods and services. • With various import restrictions introduced in the country lately, Rwanda is rather protective of their own industries. Establishing new trade partnerships requires a detailed examination of the countries' trade regulations, as well as needs and capacities of the country.

¹¹⁴ European Commission (2014) [Economic Partnership Agreement](#)

¹¹⁵ UNCTAD (2010) [Rwanda's Trade Policy Framework](#)

¹¹⁶ UNCTAD (2008) [Duty-Free and Quota-Free Market Access for LDCs](#)

¹¹⁷ Rwanda Government (2016) [National E-Was Management Policy for Rwanda](#)

¹¹⁸ Ibid

¹¹⁹ Rwanda Government (2010) [Rwanda Trade Policy](#)

4.5 EU companies with circular economy operations in the country

There are no circular missions or dedicated platforms connecting EU companies to Rwandan firms on CE-related topics. The recently inaugurated European Business Chamber (EBC) to Rwanda provides advocacy and promotes business exchange and policy conversations to its 16 members. Other business dialogue platforms between Rwandan and EU companies include the Kigali Green Drinks events, which are organized on a monthly basis. The events receive support from the German government and are promoted as “very simple and unstructured [events] where people come together to network, (...) find jobs, develop new ideas and enjoy themselves with other like-minded, eco-friendly professionals, activists or novices in their area”.¹²⁰ Apart from this, Expo Rwanda, the largest exhibition in Rwanda, provides an opportunity for EU and Rwandan companies to showcase their goods and services. The following table provides an overview the most relevant EU companies with CE-related operations in the country.

Table 4-6 EU companies with CE-related operations in Rwanda

Heineken (NL)
Bralirwa is a Rwandese beverage company and part of the Dutch company Heineken. As part of its commitment to develop a sustainable PET recycling system, Bralirwa and other PET producers have engaged Coped, the leading Rwandese waste management company, to develop a PET recycling system for Rwanda to increase collection of PET waste to be shredded for further sustainable uses. The project aims to improve the current system, where PET bottles used in Rwanda are exported to China, by establishing a local recycling system that has the potential to become a profitable business model for waste management companies within the country ¹²¹ .
Sweco (SeacE)
The Swedish company Sweco is an international architecture and engineering service provider with experts from Germany, the Netherlands and Sweden. In 2019, the city of Kigali started working closely with Sweco to develop a new district for low and middle-income residents in Kigali. The project is supposed to be implemented as part of the city's sustainability strategy to develop more energy-efficient and sustainable living spaces. As part of the project, Sweco will also launch and manage an international urban planning and architectural design competition on behalf of FONERWA. ¹²²
This Side Up Coffee (NL)
The Dutch company This Side Up has helped to set up several coffee cooperatives in various countries including Rwanda. Their approach towards the facilitation of CE builds on sharing knowledge regarding regenerative agroforestry and building a community of equal farmers and roasters. Their concept of regenerative agroforestry includes the incorporation of native trees to coffee plantations. This is not only contributing to the long-term regeneration of declining national forest stocks in the region but also improving the biodiversity of the farming landscape. With their circular coffee fund, This Side Up Coffee encourages sales partners to collect the money that is saved each time a consumer brings their own cup. The saved money is donated to the fund in order to invest in sustainable coffee farming ¹²³¹²⁴ .
Volkswagen (DE)
The recently adopted car importation and valuation laws impose heavy taxes on used cars based on the date of manufacture and the value of the cars. Their aim is to reduce the greenhouse gases. As a consequence, some EU companies started to take advantage of the Made In Rwanda policy to establish themselves in the local Rwandan market. A notable example is Volkswagen's car plant opened in 2018, a first of its kind in Rwanda. With a USD 20 million investment and a goal of creating up to 1,000 jobs, the Volkswagen Factory annually produces around 5,000

¹²⁰ Green Drinks (2019) [Green Buildings and Design](#)

¹²¹ Heineken Company (2020) [Plastic Recycling in Rwanda](#)

¹²² SWECO (2019) [New Sustainable District for Kigali](#)

¹²³ Renature (200) [Agroforestry Model Farm](#)

¹²⁴ This Side Up (2019) [Abakundakawa Rshashi](#)

Polo cars. Their unique business model incorporates a ride-sharing app “Move app” that promotes circular mobility in Kigali city.
Worldloop (BL)
After having launched the first e-waste recycling facility (WEEE Centre) in Kenya in 2011, Worldloop has set up a additional collection and dismantling centre in Rwanda. A large part of hazardous fractions which were collated in Rwanda have been sent to Belgium to be treated using more efficient recycling processes with lower environmental impact than local treatment or landfill ¹²⁵ .
STRAWTEC Business Solution (GER)
STRAWTEC Business Solution (SBS) is a German company focused on sustainable, green building and construction technologies in Rwanda. SBS started its operation in December 2015. The company vision is to become the ecological housing provider in Rwanda, delivering high quality and ecological housing for people of all paygrades. The company provides an alternative to common cement made walls by replacing them with wheat and rice straw. The technology being used ensures high-quality strawboard panel. This technology has been existing for more than 80 years and has been used to build more than 250,000 houses in Europe, America, and Oceania. Farmers often burn straw once wheat has been harvested and this pollutes the environment. Now they can sell that to STRAWTEC, which generates an additional income.

As outlined in Table 4-6, Rwanda has already attracted a number of impactful EU companies with diverse CE-related and sustainability objectives. Their presence might draw attention to Rwanda’s sustainability strategy and encourage more EU companies to establish a CE-related cooperation in Rwanda.

Table 4-7 Opportunities and Barriers for expanding CE-related activities in Rwanda by EU companies

Opportunities and Barriers for expanding CE-related activities in Rwanda by EU companies
<ul style="list-style-type: none"> • Business dialogues on CE-related opportunities between Rwanda and EU companies have not yet reached an institutionalised level. Yet, some industries have recognised Rwanda as an upcoming and promising regional hub. The EU can support further matchmaking activities by liaising with and contributing to existing events, such as Kigali Green Drinks and Rwanda Expo. • Looking at the list of EU companies active in Rwanda provided above, opportunities can be identified in the sectors of agri-food processing, mobility, ICT/e-waste and buildings/construction. The beverage company Heineken will likely form a central role in supporting the introduction of private sector-led approaches to management of packaging waste based on Extended Producer Responsibility. • The inauguration of the European Business Chamber (EBC) in March 2020 provides an excellent opportunity for the EU to facilitate matchmaking between European and Rwandan business partners; thus far, the EBC has not hosted CE-related events and is likely to be receptive to receive further support from Brussels. In this context, actively engaging the Rwandan Private Sector Federation (PSF) represents a valuable opportunity for strengthening the role of CE-related issues in the Rwandan private sector. • As there are currently no circular missions or platforms that connect EU-Companies with Rwandan businesses on CE approaches, a cooperation with local platforms that offers a good opportunity to facilitate the dialogues and business exchanges between EU and local companies. Kigali Green Drinks is a large community of professionals who leverage their monthly event to dialogue on sustainability matters and promote knowledge sharing and business exchanges. Furthermore, the Expo Rwanda, the largest exhibition in Rwanda, provides a great opportunity for EU and Rwandan Companies to showcase their Environmental goods and services as well as to exchange ideas.

¹²⁵ WorldLoop (2013) [Award for Environment](#)

4.6 Research and technical cooperation

Currently there are no bilateral agreements on joint research initiatives or other framework documents that govern technical cooperation between the EU and Rwanda. However, Rwanda is still participating in several cooperation initiatives, which were implemented in order to nurture the scientific exchange network between European and African researchers.

The foundation for coordinating the exchange on science and technology stems from the Coordination and Advancement of sub-Saharan Africa-EU Science & Technology Cooperation Network (CAAST-NET) project initiated in 2008. The project, in which Rwanda was represented by the Ministry of ICT & Innovation, helped establish a scientific network between African and European researchers and scientists and created valuable linkages to other EU-Africa research initiatives.

Between 2010 to 2012 representatives from CAAST-NET and officials of the Economic Community of West African States (ECOWAS) secretariat met in several exploratory assemblies in Abuja on a regular basis.¹²⁶ However, unlike other African countries, Rwanda was not part of any follow-up research initiatives. Additionally, CAAST-NET was primarily implemented to develop a foundational scientific network with no particular thematic focus on circular economy related research partnerships. Hence, there has not yet been a coordinated effort to advance CE-related research cooperation between the EU and Rwanda. Instead, smaller individual research projects are common forms of joint efforts in the fields of science, technology and innovation.

In partnership with the University of Rwanda, REMA initiated the Rwanda Environmental Research Strategy.¹²⁷ The strategy prioritizes resource overexploitation as one of the issues that need to be addressed by Rwandan academics and researchers. The strategy is implemented by REMA in collaboration with the Ministry of Education and involves other Rwandan institutions, such as the Ministry of Environment, the Ministry of Agriculture and Animal Resources, the Rwanda Agriculture Board, the National Agriculture Export Development Board and the Rwandan Private Sector Federation.

Rwanda is further involved in the EU initiative for Development of Smart Innovation through Research in Agriculture (DeSIRA), which aims at supporting research and innovation projects in Africa, Asia, Latin America and strengthening research capacities and research governance involving key actors at national, regional, continental and global levels. Under the umbrella of DeSIRA, the Belgian Development Agency (Enabel) in Rwanda together with the International Union for Conservation of Nature (IUCN) launched the Agroforestry Rwanda Project, which aims to increase the pace and scale of agroforestry-based restoration of degraded agricultural lands and sustainable use of biomass energy, with associated improvements of land health, livelihoods and poverty reduction. The projects multi-stakeholder approach involves several in-country partners, such as the International Centre for Research in Agroforestry (ICRAF), the Ministry of Environment (MoE) and the Rwanda Forestry Authority (RFA), the Rwanda Agriculture Board (RAB), the Ministry of Infrastructure (MININFRA) through its Agency, Rwanda Energy Group (REG) for the matters pertaining to biomass consumption, as well as the Rwanda Standards Board (RSB) for the testing and certification of improved cooking stoves.¹²⁸

¹²⁶ CAAST-NET (2012) [Sub-Saharan Africa-EU Science & Technology Cooperation Network](#)

¹²⁷ Rwanda Government (2011) [Rwanda Environmental Research Strategy](#)

¹²⁸ DeSIRA (2020) [Agroforestry Rwanda](#)

A key role in circular economy related research and knowledge sharing is further played by the National Industrial Research Development (NIRDA). A notable example is a recent technical project “Cow in The Car” that aims to maximize cows value chains. The project had involved numerous innovators and businesses in recovering cow hides and skins in leather and footwear production.¹²⁹ NIRDA had also initiated open calls in banana-wine and garment value chains to tap into the agricultural value chain. As part of the Rwandan National Circular Economy Forum in 2019, Mr Olivier Kamana gave a presentation on behalf of NIRDA. In this context, Mr Kamana highlighted that the need for coordinated research and development efforts for advancing the transition towards CE in Rwanda. In this context, the development of a Cleaner Production & Climate Innovation Centre (CPCIC) deserves particular attention and has the potential for becoming a key vehicle for driving the CE-related research agenda in Rwanda.

Table 4-8 Opportunities and Barriers for future CE-related research and technical cooperation between Rwanda and the EU

Barriers for future CE-related research and technical cooperation between Rwanda and the EU
<ul style="list-style-type: none"> • Even though Rwandan CE-related research and technical cooperation activities are still in an infant stage the EU Delegation to Rwanda’s new program “Enhancement of Rwandan Higher Education in strategic fields for sustainable growth” will provide a basis for research and knowledge exchange between EU and Rwandan Institutions. • In addition, the formation of the Rwandan CPCIC under the aegis of NIRDA represents an excellent opportunity for aligning the EU’s research and development agenda with Rwanda’s needs in the field of CE. • The successful cooperation between the university of Rwanda and REMA shows the potential that lies in enabling academic institutions to be engaged in policy-making. Research cooperation with universities bear great potential to create a link between the private and public sector, and can help to better communication the progress and results from projects on the ground.

¹²⁹ NIRDA (2019) [Cow in the Car Programme](#)

5 Recommendations

Rwanda has embraced the vision of Circularity for their future. Further collaboration between the EU and Rwanda should enhance and grow a transition to a Circular Economy in the country, ensuring this is done in a coordinated manner with all stakeholders. Future trade agreements should drive this vision with a collective mandate to ensure that investment becomes the driver of the Circular Economy. Education, advocacy and policy need to drive the message of Circularity to ensure a sustainable future for the country. Whilst Rwanda can benefit from similar European policies, these also need to embrace and contextualise local culture, economic realities and environmental constraints or opportunities.

An initial priority emanating from the outcomes of this report could be to develop some sharing platform where the many European and local initiatives are tabled and strategically linked to create a single directive to advise and inform future project developments in the country. Projects are isolated and some level of cohesion and collaboration could lead to a greater level of additionality for these initiatives and spread the benefits more regionally.

5.1 General recommendations

5.1.1 Recommendations for strengthening policy dialogues

There have been several policy dialogues between Rwanda and a number of the EU Member States, but these need to be coordinated, focussed and formalised with tangible, aligned and implementable strategies, policies and legislation. An important recommendation for EU Development Cooperation seems to be the need for better enabling academic institutions to be engaged in policy-making, and to act as link between the private and public sector, and in communication of progress and results from projects on the ground. Mentioned throughout the report are multiple programmes with EU Member States, non-EU Member States, and DFI's but there is little coordination or any focussed collective strategy. The GoR needs to address this through their internal structures, but the opportunity to focus and align the projects, programmes and policy development applications with EUMS projects should be a key deliverable. Most of the projects described in this report have a specific outcome and sector focus without understanding and aligning the cross-cutting impacts between sectors.

There are a number of recommendations that follow regarding strengthening policy dialogues with additional recommendations on possible lead agencies and support agencies that could implement this. These are suggestions only - these organisations have not been consulted on their participation.

A National circular policy, legal and institutional framework and strategy is needed

The updated Rwanda environment and climate change policy of June 2019 considers circular economy as a key policy action to promote sustainable production and consumption for Rwanda. To put this in practice, it is of paramount importance that specific CE national policy with legal frameworks, institutional strengthening and accompanying strategies are developed. Rwandan national policies, Rwanda-EU policy dialogues, cooperation programmes and financial support / budget support should be better linked. There should be a strategic alignment of projects across the different sectors both to avoid duplication, and to understand and align the cross-cutting impacts across sectors. This needs to be guided by aligned policies with a unified strategy on CE development for the country and implemented through legislative controls and systems.

Potential organisations involved could be:

Lead: MINICOM, MoE, NIRDA, Rwanda Resource Efficient and Cleaner Production Centre (RRECPC), Rwanda Development Board (RDB), Special Economic Zones Authority of Rwanda (SEZAR), EU

Support: FONERWA, MINECOFIN, REMA; other development partners

Circular Economy (CE) awareness raising, capacity development, applied research, technical skills development among key stakeholders

Raise awareness and understanding of CE concepts and programs among key stakeholders i.e. government, development partners, Private Sector and research institutions and communities. The EU may partner/cooperate with key government institutions (MINICOM, MoE, Ministry of Education (MINNEDUC), FONERWA, Ministry of Finance and Economic Planning (MINECOFIN)) to develop CE related applied joint research and develop technologies that will propel green growth and low carbon development in Rwanda. These should be based on a collective strategy that follows prescribed policy and implemented/monitored through prescriptive legislative controls.

Potential organisations which could be involved:

Lead: Ministry of Trade and Industry (MINICOM), MoE and EU

Support: REMA, FONERWA, RDB, NIRDA, PSF, Research institutions and other development partners

Set up a well-functioning national Circular Economy (CE) related policy dialogue framework in Rwanda

A national CE related policy dialogue framework is recommended to guide all CE related discussions and program implementation, monitoring and evaluation. All key CE related stakeholders may be encouraged to join the policy dialogue platform.

In Rwanda Development Partners (DPs) under the division of labour have different sectors they are traditionally affiliated with and contribute to. MINECOFIN in partnership with DPs agree which specific sectors to intervene. The GoR and DPs have established different coordination forums, i.e., Sector Working Groups (SWGs), Joint Sector Reviews (JSRs), and Join Action Development Forums (JADFs) that aim to facilitate smooth coordination of GoR national priority program development, implementation, monitoring and evaluation. This may be one of the main entry points for EU CE dialogue to influence policies, programs and projects related to CE.

Potential organisations which could be involved:

Lead: MINICOM, MOE and EU

Support: REMA, FONERWA, NIRDA, RDB, DPs, research institutions, Civil Society Organisations (CSOs) and Private Sector

5.1.2 Recommendations for successful development cooperation projects and programme

CE approaches may provide solutions to environment related issues i.e., resource depletion, biodiversity loss and increase in GHG emissions. The EU may partner/cooperate with GoR concerned institutions with budget support to reinforce strategies to implement circular economy concepts that can enhance climate resilience and adaptive capacity to protect natural capital in Rwanda. The EU may further help incentivize the private sector to optimise the use of circular economy principles across various sectors of the economy and also promote resource efficiency and cleaner and greener production (RECP) technologies, development and transfer. This needs to be guided by aligned CE policies and legislation where budget support is channelled

to achieve strategic outcomes and locally developed legislation can drive this through economic instruments (penalties, incentives, taxes and budget support).

Potential organisations which could be involved:

Lead: FONERWA, MINECOFIN, MINICOM and EU

Support: MINICOM, RDB, PSF, other development partners or stakeholders

5.1.3 Recommendations for effective cooperation with the European Investment Bank (EIB) and other European Development Finance Institutions (DFIs)

Rwanda needs to adopt innovative financial models and instruments that would catalyse investments in CE related activities. Currently, the Rwanda Green Fund (FONERWA) is the ground-breaking environment and climate change fund for Rwanda that can create a strategy for resource mobilization towards the circular economy in Rwanda. FONERWA is also in the process of establishing Rwanda Catalytic Green Investment Facility/Bank that could also play that role provided there are policies, laws and regulations in place to incentivize the process of triggering CE related activities. The EU may partner with FONERWA to lead the resources mobilization process for Rwanda to implement the circular economy programs and develop financial instruments such as co-financing, grants and guarantee instruments to leverage finance from the private sector to implement CE programs/projects/initiatives as discussed in Section 5.2.

Potential organisations which could be involved:

Lead: MINICOM, EU

Support: RDB, NAEB, PSF, REG, MINGRI, MININFRA

5.1.4 Recommendations for advancing trade and investments in environmental goods and services between the EU and Rwanda

Building on Rwanda's National transformation strategy, the EU would foster Investment in environmentally-friendly technologies that would accelerate the transition to a circular economy. From the big data technology in availing and analysing the waste data, Robotics in dismantling the hard-to-recycle materials to Mobile apps in providing ride-to-hailing or product extension or reusability services, there are potential technologies to develop.

From agriculture to mobility, local innovation hubs host green and circular projects that need assistance. Through member states & institutions, the EU should provide holistic financial and capacity-building support to the local industry to foster innovation. By creating blended programs that entail both capacity building and financial support (loans or grants), the EU would be accelerating the translation of circular economy in Rwanda, while enabling entrepreneurship growth and green jobs as aligned with the National transformation strategy. Grants would be a fitting financial modality as most of the technical projects undergo a series of pivots and R&D before being financially sustainable.

On the trade side, there are a number of fertile platforms that can drive the European concept of the New Green Deal to develop Rwanda as an up and coming trading partner with sustainable and locally processed materials that can become the cornerstone of long-term fair trade between the two. Further, as per the discussion in 2.4.2, more favourable trade tariff regulations and the inclusion of sustainability chapters in future trade agreements could promote CE in Rwanda.

In addition, Joint Venture Partnerships are regarded as one of the strategies to reduce the trade deficit, boost GDP through locally made goods and services, utilize local resources and create jobs. The EU is highly recommended to facilitate joint venture (local and EU) Investments for CE-related businesses in the areas of energy, regenerative agriculture, aquaculture, e-mobility, and waste valorisation. It is highly recommended for EU CE missions or business forums to support and facilitate the synergetic practices for EU and local companies.

5.1.5 Recommendations to create a supportive environment for EU / African companies with circular economy operations in Rwanda

In order to promote circular economy in Rwandan industry, manufacturing and construction, it is critical to upgrade Industrial Parks (IPs) and Special Economic Zones (SEZs) into Eco Industrial Parks (EIPs) and Industrial Symbiosis (IS) CE approaches. The EU may partner with the GoR concerned institutions to initiate a program/project to operationalize EIPs CE approaches in Rwandan industry, manufacturing & construction through upgrading existing and planned IPs and SEZs.

Chapter 4 highlight the many initiatives that have taken place to create a supportive environment for EU/African collaboration. This included the European Development Days (EDD) with a focus on CE, particularly for the next event rescheduled to 2021 with a focus on Green and Circular Economy. It is recommended that these events should be encouraged and developed to provide an essential exchange platform between the EU and Rwanda. The 38th ACP-EU Assembly was hosted in Kigali as was the Global Climate Change Alliance Plus (GCCA+) and future such discussions should create a focus on CE and address bilateral relationships to formalise a CE strategy going forward. More events like the Climate Diplomacy Week, matchmaking events and dialogue platforms can underpin a supportive environment.

5.1.6 Recommendations to advance research and technical cooperation between the EU and Rwanda

Rwandan institutions (e.g. NIRDA) are currently doing CE-related research and a significant need for knowledge and technology transfer to the Private Sector is foreseen. Different knowledge-sharing events and platforms are needed for these exchanges, as well as a web-based centre for excellence that promotes locally developed solutions to global environmental challenges. In 2019 the Rwanda Green Fund and partners hosted the inaugural National Circular Economy Forum and it should be encouraged that this event be held at least every second year. We can follow the recommendations of this event such as creating a capacity building and technical advisory group to increase awareness on CE in the country.

While CE related educational programs are not wholly embedded in the Rwanda Educational Programs, we recommend the EU to cooperate with high institutions of learning to organize University Exchange Programs specifically designed to promote CE knowledge sharing between Rwandan and EU-based Universities.

Although not a focus of this CE report, Rwanda is in urgent need of increasing energy access and supply to its citizens. There is a great opportunity in applying CE related renewable and alternative energy sources and technology. The EU may consider cooperating with the GoR concerned institutions to increase CE related Micro/ Pico Hydro, Solar PV, Waste to energy - biogas digesters and pyrolysis systems. This will enable productive nighttime activities, save on kerosene fuel costs and increase health benefits. These renewable energies can reach rural areas without need for grid extension and promote lower fuel bills from an economic perspective and reduced time collecting fuel wood from a social impact perspective. This, in turn, will lead to lower carbon emissions and reduced forestry resource use where its unsustainable demand is not in line with the Circular Economy principles.

Potential organisations which could be involved:

Lead: EU, MINEDUC, NIRDA and Higher institutions of learning

Support: MINICOM, MoE, MINECOFIN, RDB, FONERWA, REMA

5.2 Sector-specific recommendations

5.2.1 Agriculture

From agricultural waste valorisation to circular urban farm systems, there is a significant need for knowledge dissemination to inform policy making. Major local issues ranging from food waste, inefficient aquaculture systems to insufficient organic fertilizer outputs need intervention in Rwanda. Development programs/projects and research should address this issue taking into consideration environmental regulatory requirements and national development strategies. These programs should also consider expertise and knowledge sharing to fill local knowledge gaps in the area of regenerative agriculture.

The EU may build on the existing development cooperation programs in the agricultural sector in Rwanda to initiate programs/projects that promote CE related activities. Key CE program actions/interventions may aim to reduce post-harvest food loss and waste; soil and water conservation in order to reduce soil erosion / maximise rainfall infiltration; promote integrated nutrient management; integrated pest management; organic waste recycling and wastewater irrigation; and promote sustainable farming practices like mulching, drip irrigation, crop rotation and no-tillage farming practices. It is vital for the EU to increase its intervention in the post-harvest loss mitigation programs as this aligns with one of its priority Agenda “Sustainable Agriculture” and opens opportunities for structured finance into CE opportunities. More specifically and given that Rwanda produces and exports a large amount of agricultural produce, applying circularity approaches to reduce post-harvest losses can unlock significant economic potential. Crops such as bananas, Irish potatoes, and tomatoes are highly affected. Improper transportation, poor post-harvest packaging systems and insufficient agri-processing industries mean that local farmers endure loss while generating large amounts of food waste. The Rwandan Government aspires to curb such post-harvest losses. This presents an opportunity for the EU to increase its intervention in the post-harvest loss mitigation programs through CE principles that reduce losses, increase economic output and positively impact social and environmental outcomes. This could build on the EUs involvement in this challenge through the TA TECAN initiative. While the EU had put efforts in curbing the post-harvest loss through EDPRS2 funding, greater effort would be needed to reinforce the public-private partnerships (PPPs) and attract an array of EU-based agri-processing industries that can enter in the Rwandan market to fill the gap required to minimize the post-harvest losses.

With food needs increasing due to rapid population growth, regenerative agriculture plays a key role in producing food in ways that the environment is not further degraded. A notable investment opportunity is organic fertilizer production, which could reduce Rwanda’s importation of synthetic fertilizers and enhance outcomes for the 55.7% of farmers who rely on organic fertilizers. Organic fertilizer production presents a win-win situation as it would tackle the growing organic waste stream in Rwanda (which is currently about 64% of generated waste) and serve the growing local demand for fertilizers. Other notable regenerative agriculture options are circular urban farming systems e.g. Indoor Aquaculture developed as a CE model with agri-protein implementation (using food waste to breed larvae of flies for fish food). Further, aquaculture can be a component of regenerative food systems (for example when food waste is use as feedstock for fish)

with large potential for offsetting negative impacts to riverine biodiversity in Rwanda. Organic wastes from food, agriculture and forestry wastes can also be used as feedstocks for energy (anaerobic digestion) with organic fertilizer by-products or using applications in gasification and pyrolysis to extract fuels, create electricity and develop biochar markets. Even though the Ministry of Agriculture made strides in easing the acquisition of an aquaculture license, there is still more effort required to develop the aquaculture industry in Rwanda, and that's where the EU can intervene to assist in policy-making, financing as well as knowledge-sharing and the application of CE technologies and techniques.

Potential organisations which could be involved:

Lead: MINAGRI, RAB, NAEB and EU

Support: PSF, MINICOM, NIRDA, MoE, FONERWA, REMA and development partners or stakeholders that intervene in the sector

5.2.2 Construction

With the ongoing and future construction projects in Rwanda, the EU should assist in developing energy efficiency in both commercial and domestic buildings. While there is an initial framework for the commercial buildings, it's vital to consider the domestic buildings needed in the future as a result of the growth of Rwanda's secondary cities. To maximize the actual operation of projects in energy efficiency, equity or concessional debts would be appropriate, while grants would fit in projects' feasibility studies. In a circular perspective, it is also crucial to assess the impact of the large, rising housing demand considering land restoration needs and Rwanda's small size. It is important for EU DFIs to consider Rwanda's Rise High Building Strategy to address densification initiated by the Rwanda Housing Authority¹³⁰. The DFIs involved in high rise buildings would not only save virgin land but also pave a way to shared Infrastructure areas and co-housing. It is also important to support the country's plan of setting up the green parks in Kigali as well as in each secondary city. Renewable energy to power housing and water-reuse of wastewater treatment units are circular initiatives that will need to be embedded in such housing units. Moreover, it's vital to note that to achieve compact urban growth, Rwanda needs to use local resources efficiently as it aligns with its Made In Rwanda Policy. This would be more impactful through the presence of Infrastructure Resource Recovery Industries, and DFIs would be positioned in this aspect too.

The EU may partner with the GoR concerned institutions to initiate a program/project to operationalize Eco-Industrial Parks using CE approaches in Rwandan industry, manufacturing & construction sectors through upgrading existing and planned IPs and SEZs.

Potential organisations which could be involved:

Lead: MINICOM, RDB, SEZAR, EU and PSF

Support: MINECOFIN, FONERWA, MoE, REMA and other development partners or stakeholders

5.2.3 Waste

The greatest potential for future involvement of EU companies in Rwanda regarding national waste management CE related activities include construction of facilities for wastewater treatment, landfill, solid waste management, transforming plastics into productive uses and e-waste. The EU may prioritize to work on CE in different waste streams, develop those waste streams into business models with already existing private sector companies that can create green jobs while diverting waste from going to landfills and dumping

¹³⁰ Government of Rwanda (2020) [Rwanda Housing Authority](#)

sites. Plastic wastes represent a unique opportunity as a prioritised waste stream where support can be leveraged to create conventional mechanical recycling options with manufacturing outputs from recycled materials; or energy generation either directly through gasification or liquid fuels from pyrolysis. A financial sustainability plan for the application of CE to both liquid and solid waste management is needed next to raising community awareness and capacity development on recycling. A detailed waste characterisation could highlight opportunities in the waste sector that could be the focus of a strategic waste beneficiation directive to create jobs, skills and realise the economic opportunities in the waste value-chain.

There is also a need to clarify the institutional roles and responsibilities around solid waste sorting, collection, transfer and disposal. Further design and development of alternative waste options for integrated and sustainable waste management should be considered starting with the City of Kigali (CoK). Most of the waste delivered to Kigali Capital city, specifically Nduba Landfill, is organic waste. Many farmers use organic fertilizers (a smaller percentage use inorganic fertilizers) which highlights the need of value-added strategies that transform organic waste into compost. At present, lack of segregation at the source and inefficient collection system results in the organic waste ending up in landfills when it could be used as organic fertiliser. The collection and processing systems are not in place for a city-based landfill operation. The infrastructure in the city is already limited and as the population grows, this will further complicate and cost if a centralized landfill approach is followed as waste management process of choice. Against this backdrop, small-scale systems need to be developed that service immediate needs of communities and neighbourhoods. Similar systems to the already existing biogas projects can and should be implemented close to their source of origin for dealing with the other recyclable commodities specifically plastics, glass, paper, tyres and other packaging materials. This should be based on creating small enterprises and SMMES so that empower the local communities to become the masters of their own futures. There are many successful systems and processes across Africa that could be adopted for local waste beneficiation. The EU may support interventions for utilization of organic waste as part of waste-to-energy projects and address other CE approaches to valorisation of this waste.

Potential organisations which could be involved:

Lead: MININFRA, WASAC, PSF and EU

Support: MoE, REMA, FONERWA, City of Kigali, Other development partners or stakeholders

5.2.4 Transport

In Rwanda, there is a growing need to implement CE e-mobility initiatives (e.g. car sharing, Mass Rapid Transit (MRT), Light Rapid Transit (LRT) and public taxi) that support a low carbon economy. There is also a need for Freight Congestion Policy Programs. Given that freight transportation dominates most of Kigali routes, the EU can assist and share expertise with the Rwandan Government and the different stakeholders engaged in Urban Freight Strategies (MININFRA, RURA, RTDA are still) in policy-design aimed at reducing freight travel distance.

It is crucial for the Rwandan government to promote a sharing economy that minimizes car-ownership and alleviates the congested road networks in Rwanda. A notable sharing concept in Rwanda is the Move App initiated by Volkswagen Rwanda, Gura Ride, and Yego Moto that is taking advantage of the sharing economy to rethink car/Motor ownership. Since the sharing economy is still in its initial phase in Rwanda, this represents an interesting opportunity for the EU for joint policymaking, supporting awareness programs and different sharing economy projects. This could be extended to the development of e-vehicles for the country.

Potential organisations which could be involved:

Lead: MININFRA, RURA, and EU

Support: RTDA, CoK and other development partners or stakeholders.

6 Conclusion

With its agricultural focus and, to some extent, metals and other minor contributors to the GDP, Rwanda offers itself as the perfect platform to showcase the development of a Circular Economy. There is little doubt that the economy of Rwanda will start to diversify, and the expansion of the circular economy priority areas discussed in this report can ensure a productive yet sustainable future for its citizens. Rwanda has failed systems that need rectifying and foremost to these is the waste management in the country. Issues such as food waste need to be unpacked in relation to their social, environmental and economic impacts relating to a national Circular Strategy.

This report reveals that the Rwandan government is taking into consideration opportunities presented by circular principles across different strategies and policies. Policy developments indicate the government is currently conducting legislative reforms in the environmental and climate change policies to include circular economy aspects by creating an enabling environment for this transition. The opportunity is to align strategy, policy and legislation as discussed in the Recommendations to create a clear path forward for the country and underpin its relationship with the EU and create a common framework for all future CE developments. Rwanda has already experienced the economic benefits of policy and strategy over the last decade aligned with sustainability and green economic growth focus areas and can enhance this through future developments aligned to CE principles and the political support this currently enjoys. Rwanda has indicated its intention to drive this agenda and this provides fertile ground for future collaboration and support.

Sector specific policy and development have already raised the trade and investment profile of the country and policy directives in this regard have already yielded significant increases in FDI in the last decade. There is appetite and intent to drive this forward and recognition that Circular Economy policies and directives can accelerate this positive economic growth. Opportunities in manufacturing, construction and transport may be somewhat different to the EU perspective of developed economies but open future options for EU collaboration and partnerships.

The top sectors with the greatest CE potential are Waste Management - including wastewater, solid waste, plastic and e-waste; Agriculture; Manufacturing; Construction and Transport. There are many initiatives highlighted in this report across each of these different sectors, culminating in the recommendations in the previous section that would help to plot the path forward for Rwanda to enjoy future growth on a sustainable agenda to the benefit of its citizens and trade partners.

Last but not least, the forward-looking modelling assessment carried out in this study shows that implementing a set of circular economy actions between now and 2030 could lead to an increase in economic activity and create additional jobs. GDP would increase by 0.6% (increase of €151 million) compared to business as usual and the trade balance would improve, through a considerably larger reduction in imports than the increase in exports estimated. Moreover, 17,300 additional jobs (increase of 0.2%) would be created compared to business as usual. The largest employment impacts in the CE scenario would be seen in the agricultural sector.

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Annex A - List of Stakeholder Interviews

Interviews were completed with the following stakeholders. The focus was on development partners of the EU and not the UN (UNhabitat, UNDP) or the World Bank:

1. Inhee Chung, Country Representative, Global Green Growth Institute (Rwanda);
2. Tony Adesina, CEO of Safi Ltd (Gura Ride);
3. Juliet Kabera, Director General Rwanda Environment Management Authority (REMA);
4. Hubert Ruzibiza, CEO, Rwanda Green Fund (FONERWA);
5. Theobald Mashinga, National Program Manager, Environment, Natural Resources and Climate Change, SIDA/Rwanda;
6. Dr Olivier Kamana, Head of R&D Department at National Industrial Research and Development (NIRDA);
7. Wenceslas Habamungu, MD of Eco-Plastic Ltd Rwanda;
8. Dr Beth Kaplin, Director of the Center of Excellence in Biodiversity & Natural Resource Management (CoEB) at University of Rwanda;
9. Mr Livingstone Mugisha, Green Economy Expert, GIZ: Rwanda.
10. Mr. Massimiliano Pedretti, Energy Portfolio Manager, EU Delegation to Rwanda

Annex B - Trade and investments in the Circular Economy in Rwanda

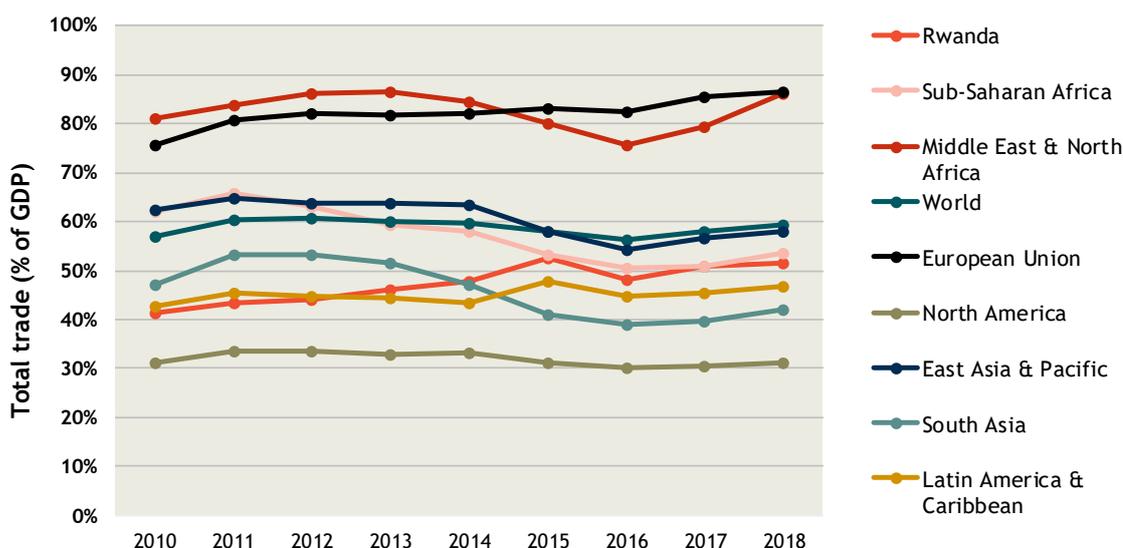
This section looks at the level of trade and foreign investments occurring in Rwanda and the factors that influence trade and investment. First, an overview will be given on the trends in trade and investment. Subsequently, several economic, financial and political factors that affect the level of trade and foreign investments are investigated.

6.1.1 Overview of ongoing trends in trade and foreign direct investment

Trends in trade

The relative level of total trade (as % of GDP) of Rwanda with other countries is relatively low, below the share of Sub-Saharan Africa, below the average share in the world, and way below the share of the MENA region, which is comparable to the share of the EU. The trend has been more or less steadily upward, with the trade share being 41% in 2010 and increasing to 52% by 2018.

Figure B-1 Share of total trade (Imports + exports) in GDP (%) in Rwanda compared to regional averages for the period 2010-2018.



Source: World Bank - World Development Indicators - Trade (% of GDP)

In 2016, around 14% of Rwanda’s exports were going to the European Union and similarly around 8% of Rwanda’s imports originate from the European Union.¹³¹ Particularly the share of EU exports to Rwanda have varied a lot in the period 2010-2016, with exports to Rwanda reaching 35% in 2011 and going down to 2% in 2012. In 2016 Rwanda accounted for approximately 0.01% of the total Extra-EU trade of the EU more specifically, 0.01% of the extra-EU exports were accrued to Rwanda. In the period 2010-2019, around 9% of the EU exports went to Africa and around 0.1% of this went to Rwanda.¹³² When looking at the EU’s imports from outside the EU, we see that Africa accounts for 7% of those imports in 2019, where imports from Rwanda are negligible. As such, Rwanda is not a very important export / import partner for the EU within Africa.

¹³¹ UN Comtrade

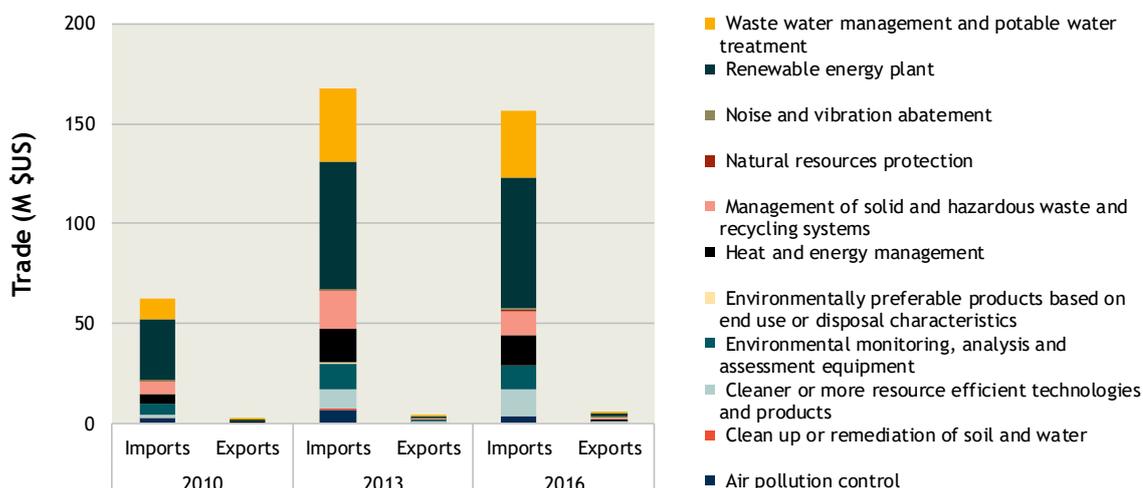
¹³² Eurostat - International trade in goods by partner.

Trade in environmental goods and services

In the late 1990s, the OECD developed a list of sectors that deliver (as part of their output) environmental goods and services. In several economic databases the level of activity in these ‘environmental goods and services sectors’ is monitored, to provide a proxy of the volume of trade in environment-related goods and services. It is important to note though, that in reality only part of the goods and services that are generated in these sectors are related to the environment.

In Rwanda the environmental goods and services sectors accounted for 3% of the total trade volume in 2016. This was also the case in 2010. Although the share of these as part of total trade volume increased to 5% in 2014 and 2015, it then declined again. As seen in Figure B-2, imports dominate the trade balance in environmental goods and services, where renewable energy technologies, water treatment technologies and waste management systems account for the largest part of the imports. Particularly renewables make up for a large share of the imports and their share increasing over time. It should be noted that from 2010 to 2013 imports almost doubled, reaching the 167M\$US in 2013.

Figure B-2 imports and exports of environmental goods and services in Rwanda for the years 2010, 2013 and 2016

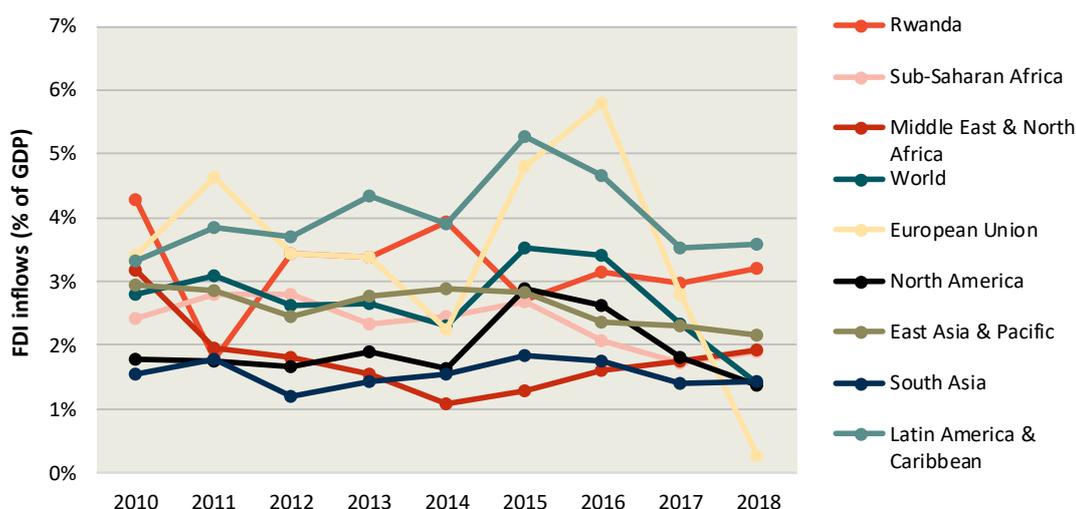


Source: OECD - Trade in Environmental goods and services.

Foreign direct investment

As seen in Figure B-3, the foreign direct investment (FDI) trend in Rwanda has been very volatile. The trend shows that FDI has decreased from 4.3% in 2010 to 3.2% in 2017. From 2010 to 2011 an abrupt decrease was observed. After 2011, the trend has been upwards with some ups and downs. Since 2011, FDI in Rwanda as a share of GDP is higher than on average in the MENA region. In 2017 FDI in Rwanda was higher than the world average.

Figure B-3 Share of Foreign Direct Investment (inflows) in Rwanda as share of GDP (%)



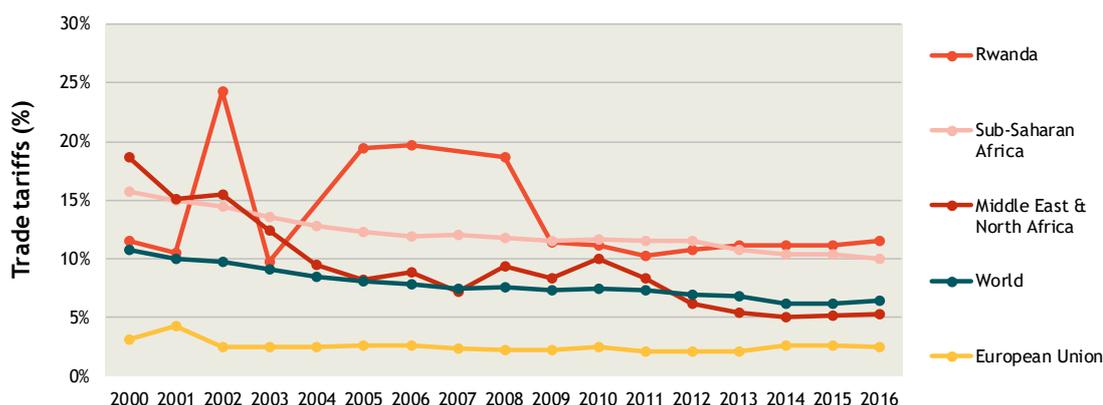
Source: World Bank - World Development Indicators - FDI inflows as share of GDP (%)

6.1.2 Opportunities and barriers for trade

Trade tariffs

Trade tariffs in Rwanda are in 2017 at the same level they were in 2007 namely at 12%. Unlike the relatively steady long-term downward trend observed in the MENA region, Sub-Saharan Africa, the EU and globally, Rwanda’s trend shows several ups and downs. In 2010, trade tariffs in Rwanda were below those in Sub-Saharan Africa and the MENA region. After an abrupt increase from 2011 to 2012 (from 10% to 25%), trade tariffs plummeted again (at 10%) in 2013. However, a more stable, incremental growth trend is identified from 2010 onwards. Since 2013, trade tariffs in Rwanda have been higher than in Sub-Saharan Africa, the MENA region, the EU and the world average. The relatively high trade tariffs in Rwanda may act as a barrier for growth in international trade. When asked for the biggest obstacle in doing business in Rwanda (in 2011), 4.6% of the firms mentioned customs and trade regulations.¹³³

Figure B-4 Mean of the tariff rates applied to all products in Rwanda (%)



Source: World Bank - World Development Indicators - Tariff rate, applied, simple mean, all products (%)

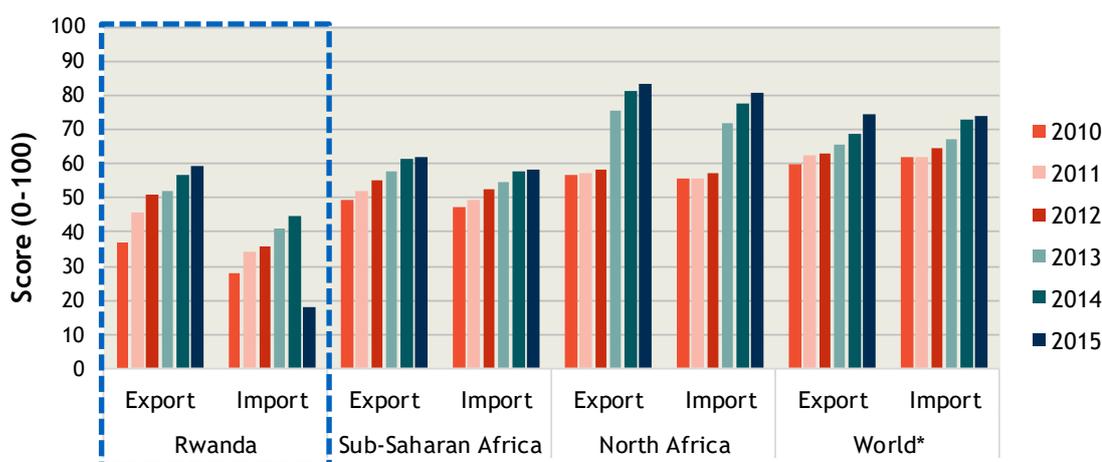
Trade costs

Apart from trade tariffs, there is a wide variety of costs associated with trade of products and services, including cost related to border compliance and documentary compliance. The ‘ease of doing business

¹³³ World Bank - Enterprise survey (2016).

index' of the World Bank scores the position of a country based on empirical research on the trade costs of countries (the higher the score, the easier doing business is for the country). Based on the index results (Figure B-5), Rwanda does not perform very well. This means that customs and administration related costs in Rwanda are high and hindering trade. For the last six years that data is known, Rwanda's average score has remained below that of North Africa, Sub-Saharan Africa and the world. However, in terms of exports, Rwanda's score has improved steadily from approximately 37 in 2010, to 59 in 2015, almost catching up with the score of Sub-Saharan Africa. The score with regards to imports also increased incrementally between 2010 (when the score was 28) and 2014 (the score reached 45) but dropped drastically to 18 in 2015. This is way below the 'ease of doing business' score for imports of Sub-Saharan Africa (58), North Africa (81) and the world (74).

Figure B-5 Score on cross-border trade costs for exports and imports in Rwanda in comparison to global and regional averages

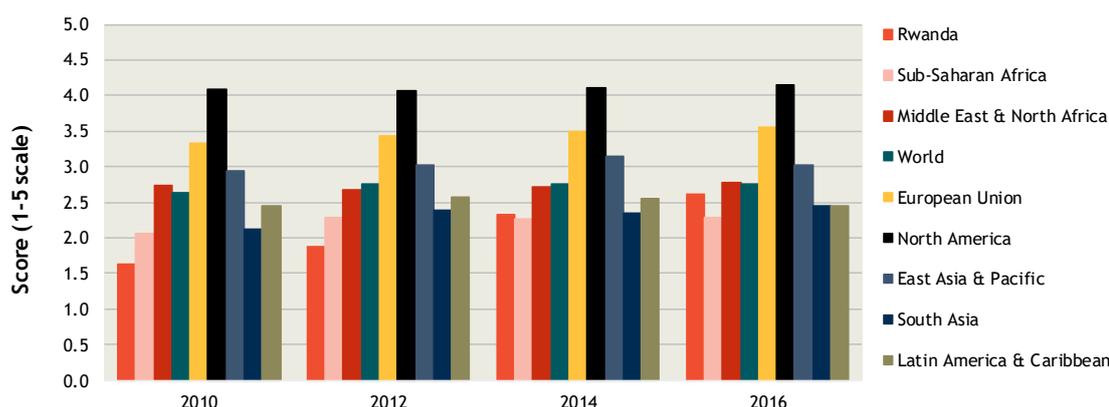


Source: World Bank - Ease of doing business - Trading across borders: Cost to export/import (US\$ per container) (DB06-15 methodology) - Score

Suitability of transport infrastructure for trade

The World Bank monitors the quality transport infrastructure as part of the logistics performance index. Good transport infrastructure is essential in order to facilitate trade, reduce transport time and costs. The results of this index for Rwanda (Figure B-6) show that the quality of logistics in Rwanda is improving steadily. In 2010, with a score of 1.6 Rwanda performed below Sub-Saharan Africa (2.1) and well below the average of the MENA region (2.7) and the world average (2.6). However, since then its score has been growing and in 2016 Rwanda's transport infrastructure scored a 2.6, which is above the performance of Sub-Saharan Africa (2.3) and getting closer to the MENA average score (2.8) and world average score (2.8). This improving trend can largely be linked to Rwandan policies based on the EDPRS on infrastructure and development with the creation of new development-driven trade policies.

Figure B-6 Score of Rwanda in the quality of trade and transport-related infrastructure compared with global and regional averages



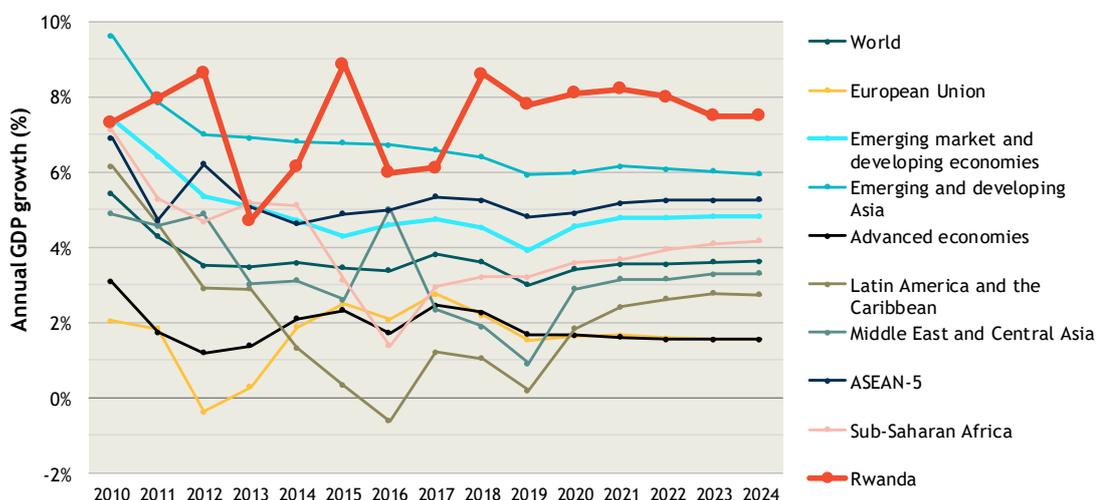
Source: World Bank - Logistics Performance Index - Quality of trade and transport-related infrastructure

6.1.3 Opportunities and barriers for investments

Economic opportunity

As shown in Figure B-7, growth rates (annual GDP growth in %) over the past ten years has been very high compared to other regions in the world and the world average. Economic growth has been volatile though, with fast growth followed by fast economic turndowns every couple of years. The deepest point was reached in 2013 at 4.7%. The current situation and future outlook regarding the economic situation in Rwanda according to the IMF look more stable, with growth rates twice as high of Sub-Saharan Africa and the world average and above several other regions in the world. Growth rates are expected to peak at 8.2 in 2021 and then go slowly down.

Figure B-7 Historical GDP growth and growth outlook until 2024 for Rwanda, compared to global and regional averages



Source: International Monetary Fund - World Economic Outlook

Ease of starting a business

Starting up business activities in another country can be cumbersome, because as an organisation you need to get acquainted with all the rules and procedures in the country. The World Bank, in its ‘doing business’ survey, monitors the ease of starting a business in a country. Rwanda’s score has improved overtime, from 72 (out of 100) in 2009, to 88 (out of 100) in 2018. However, the ‘ease of starting a

business' indicator has suffered several ups and downs, with the score of this indicator increasing in the first years until it reached 90 in 2012, decreasing in the following years to score 81 in 2015, and increasing again from then onwards. In this same period (2009-2018), the average score for the EU-28 went from approximately 84 to approximately 89.

Governance, political stability and regulatory quality

Political instability & security

According to the World Bank's enterprise survey (2011 edition)¹³⁴, political instability is not a problem that many entrepreneurs identify. With just 1.3% of the respondents identifying this as an issue when doing business in Rwanda, political instability does not fall within the top-10 most important obstacles.

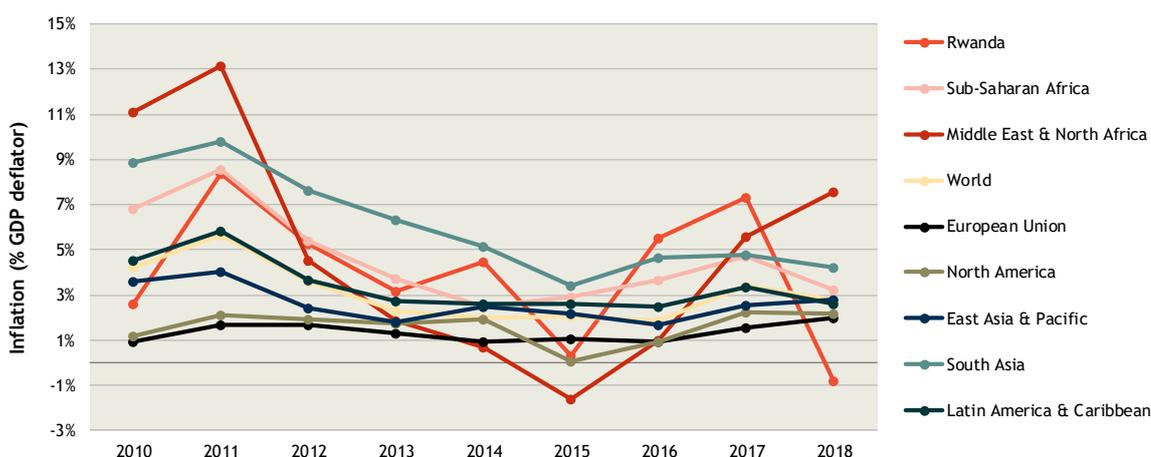
Corruption

Corruption is still a problem in Rwanda, which hampers the economy and acts as a barrier for foreign companies to invest in the country. In the global Corruption Perception Index of 2018 assessing 'the lowest level of corruption' Rwanda ranks 48th, with a score of 56 on a scale from 0-100 (most corrupt-least corrupt). As such, Rwanda scores better than Senegal, Morocco, South Africa, Ghana, Egypt, Kenya and Nigeria. In the enterprise survey conducted in 2016 by the World Bank, corruption was mentioned by only 0.5% of the respondents as the most important obstacle to doing business in Rwanda and 15% of the respondents stated it is a major constraint when doing business.

Inflation

Inflation rates in Rwanda (as share of GDP) have been volatile over time. Rwandan inflation rate in 2018 is negative, at -1%, way below the inflation in 2018 of the MENA region (7%), of Sub-Saharan Africa (3%) and of the world average (3%). Inflation was particularly high in 2011 (9%) and the again in 2017 (7%) when inflation reached high levels, surpassing rates in several other regions including Sub-Saharan Africa, the MENA region and the world average. Inflation rates decreased from 2011 (9%) to 2015 (0%) to increase again after that. From 2017 to 2018, another abrupt decrease in inflation is observed.

Figure B-8 Historical trends in inflation (GDP deflator %) in Rwanda compared to global, regional and continental averages



Source: World Bank - World Development Indicators - Inflation, GDP deflator (annual %)

¹³⁴ Most recent available data

National creditworthiness

Whereas the inflation rate reflects the monetary stability in a country, the creditworthiness reflects the stability and sustainability of public finance. Of the twenty-one African countries that have recently received a credit rating from the rating agency Standard & Poor's, the majority of the countries received a B rating, whereas the lowest rating of CCC+ was given to two countries (Table B-1). On the high side of the spectrum, one country received an A- rating and three countries received a B+ rating. Rwanda's rating was B+, meaning that the country performs better than the African average. The rating agency also thinks that the rating will remain 'stable' in the future. The rating agency Fitch also rates the country with a B+.

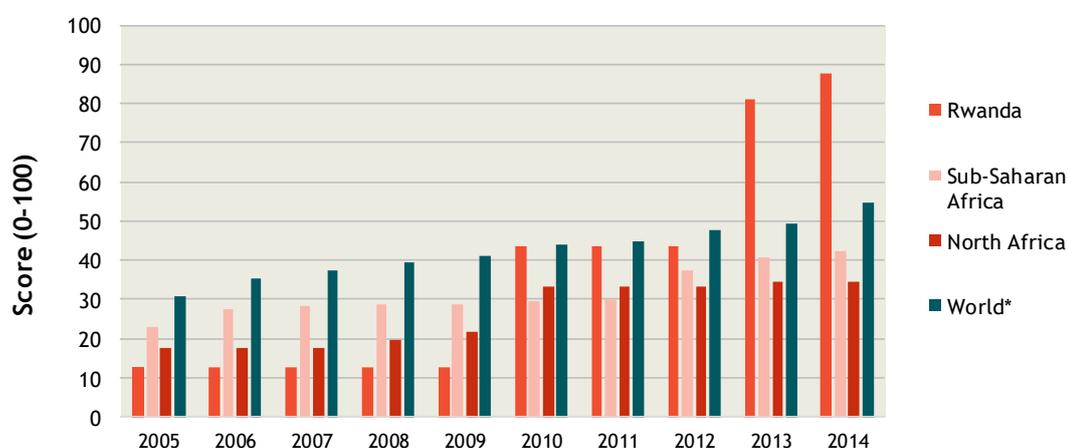
Table B-1 Most recent credit ratings by Moody's for African countries and their outlook (N=20)

S&P rating	# countries	Outlook
A-	1	Stable
B+	3	Developing
B	10	Negative
B-	2	
BB	2	
BBB-	1	
CCC+	2	

Ease of getting credit

For many African countries, access to finance is an important obstacle for people and organisations that want to start up a business. The World Bank's indicator on the 'ease of getting credit' indicates that until 2010, access to finance has been a problem for people and organisations that want to start up a business in Rwanda. From 2010 to 2012, the difficulty or ease of getting a credit in Rwanda was comparable to that of the world average and easier than in North Africa and sub-Saharan Africa. From 2013 onwards, the country's score has sky-rocketed, to the point it is twice as easy to get credit in Rwanda than in Sub-Saharan Africa and North Africa on average, and much easier than in the world on average. This is a direct outcome of the Rwandan development-driven trade policies to promote infrastructure development. The very recent update to the World Bank Enterprise Survey published in 2020, shows that the score has remained as high steadily increasing to up to 90 in 2018.

Figure B-9 Rwanda's score (0-100 scale) for the ease of getting credit compared to global and regional averages



Source: World Bank - Ease of doing business - Getting credit (DB05-14 methodology) - Score

Annex C - Method for modelling of impacts

Part 1 Methodological details of the modelling approach

The FRAMES model

The process of estimating economic and jobs impacts of circular economy activities in Rwanda was carried out using Cambridge Econometrics' FRAMES model. The direct, indirect, and induced impacts of additional circular economy activities are captured in this modelling framework, to estimate the full impacts of the circular economy transition in Rwanda.

FRAMES, the Framework for Modelling Economies and Sustainability, is an advanced input-output tool. It is designed to enable the assessment of socioeconomic and environmental effects of E3 (energy, environment, and economy) policies.

The key features of FRAMES are:

- An economic accounting framework based on the system of national accounts.
- Integrated treatment of the economy, energy, and the environment.
- Detailed sectoral disaggregation, and a national level input-output table, reflecting the specific structure of the economy.

FRAMES was built using the structure and principles of the E3ME model. E3ME is a global, macro-econometric model of the world's economic and energy systems and the environment. FRAMES, as a single-country framework, was designed to minimise data requirements, to enable modelling work for regions where time series data are limited. The data requirements are substantially lower than more complex macroeconomic models like E3ME. Table C-1 summarises the data sources used to construct FRAMES.

Table C-1 Scenario design

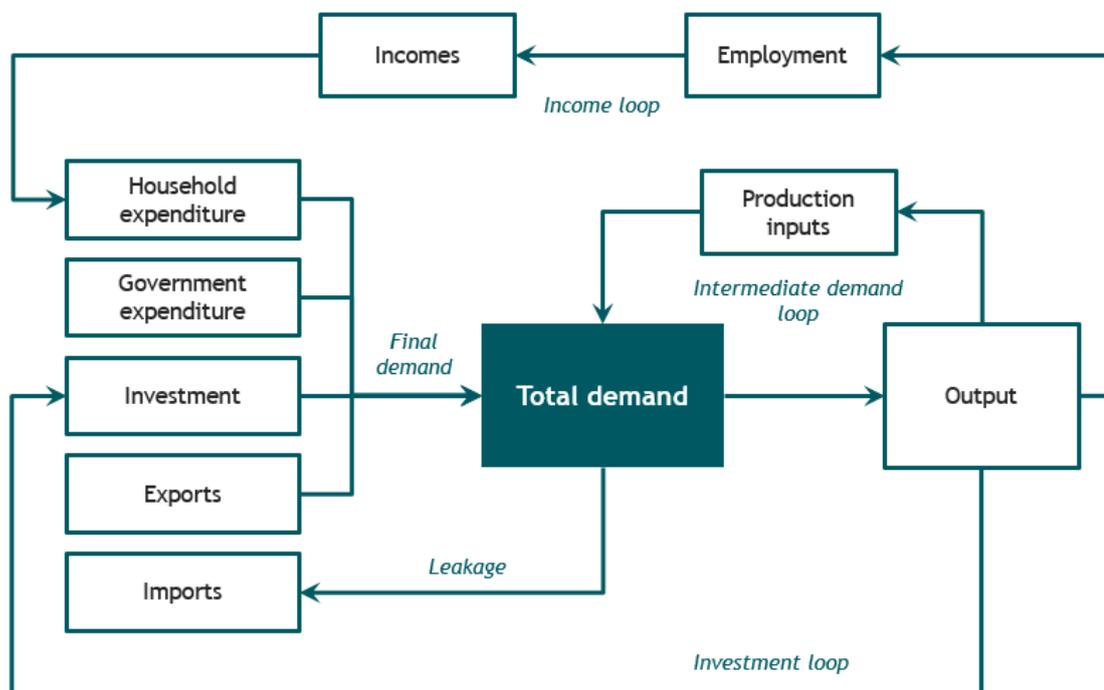
Data	Variables	Source(s)
National accounts	<ul style="list-style-type: none"> • GDP • GVA • Consumption • Investment • Trade • Gross output 	<ul style="list-style-type: none"> • World Bank - World Development Indicators • Eora National IO Tables - Rwanda (2015)
Employment	<ul style="list-style-type: none"> • Employment • Compensation of employees 	<ul style="list-style-type: none"> • International Labour Organisation • Eora National IO Tables - Rwanda (2015)
Population	<ul style="list-style-type: none"> • Current population • Population forecast 	<ul style="list-style-type: none"> • United Nations - Population Division
Energy	<ul style="list-style-type: none"> • Final energy consumption • Primary energy consumption 	<ul style="list-style-type: none"> • National Institute of Statistics Rwanda - Statistical Yearbook 2016 • United Nations - Statistics Division
Environmental	<ul style="list-style-type: none"> • Emission coefficients 	<ul style="list-style-type: none"> • E3ME
Economic forecast	<ul style="list-style-type: none"> • GDP forecast 	<ul style="list-style-type: none"> • International Monetary Fund (2019, 2020)

The input-output table used to model the structure of the Rwandan economy was sourced from the Eora National IO Tables database. The economic sectoral classification follows this source input-output table, which includes the following 26 economic sectors:

1. Agriculture
2. Fishing
3. Mining and Quarrying
4. Food & Beverages
5. Textiles and Wearing Apparel
6. Wood and Paper
7. Petroleum, Chemical and Non-Metallic Mineral Products
8. Metal Products
9. Electrical and Machinery
10. Transport Equipment
11. Other Manufacturing
12. Recycling
13. Electricity, Gas and Water
14. Construction
15. Maintenance and Repair
16. Wholesale Trade
17. Retail Trade
18. Hotels and Restaurants
19. Transport
20. Post and Telecommunications
21. Financial Intermediation and Business Activities
22. Public Administration
23. Education, Health and Other Services
24. Private Households
25. Others
26. Re-export & Re-import

The Figure below illustrates the economic structure and key relationships in FRAMES. Key parameters estimating the magnitude of relationships were taken from E3ME, specifically an aggregate ‘Rest of Africa’ region.

Figure C-1 Economic Structure in FRAMES



Treatment of the informal sector

The informal sector is an important consideration when modelling circular economy activities in Africa, as much economic activity may not be fully recorded in official national statistics. This issue is most relevant to agriculture, given the importance of smallholder agriculture in many African countries.

Our employment results include informal labour, as they are based on International Labour Organisation (ILO) data which estimate informal activity. The economic results in FRAMES are calibrated to World Bank economic aggregate data, which also incorporate estimates of the informal sector. However, the input-output relationships and sectoral shares in FRAMES are drawn from Eora’s National IO Tables, which do not capture informal economic activity. The EORA data therefore required some adjustments to match the ILO and World Bank data, namely by adjusting GVA, wages and household consumption in the agricultural sector to align with World Bank data on GVA shares by sector. The implicit assumption of this adjustment is that the products of informal agriculture are entirely purchased by other households, and the value added from these sales are entirely channelled into labourers’ wages (as opposed to profits or taxes).¹³⁵

Scenario design

FRAMES has been designed to be used for scenario analysis, evaluating the impacts of an input shock to a reference scenario. An input shock may be either a change in policy, a change in economic assumptions or another change to a model variable. By comparing different scenarios - each representing an alternative future with different policies and/or economic assumptions - it is possible to assess the impact of a change in policies and/or economic assumptions. For this report, the following scenarios were

¹³⁵ For smallholder farmers, there is of course little distinction between wages and profits anyway.

modelled: a baseline and a circular economy (CE) scenario with a scale of circularity on top of the level embedded in the baseline, as shown in the Table below.

Table C-2 Scenario design

Scenario	Scenario Description
Baseline	A baseline constructed based on official published economic and energy-sector projections. The modelling baseline does not explicitly assume a certain level of circular economy activities.
Circular Economy	This scenario assumes an ambitious uptake of the circular economy, in addition to the baseline scenario. The base year for the modelling is 2020 and the target year is 2030.

We have adopted an ‘activities’ approach (rather than a ‘policies’ approach) to modelling the CE scenario. This choice means that the analysis does not assess potential impacts of specific policies but instead looks directly at the links between specific changes in an economy and the direct, indirect and induced effects, without making any explicit assumptions about whether these changes are driven by policies, behavioural change or new technology.

The activities approach implies generating modelling inputs from a sectoral perspective. Inputs are formed by studying the plausible circular economy activities that will take place in selected key sectors and their supply chains. This is to reflect that the impact of a transition to a more circular economy will vary between sectors, as sectors differ in the way in which resource flows and relationships with the consumer are organised.

Increased waste collection and recycling are modelled as central circular economy activities. In addition, activities for four additional sectors are modelled, selected based on existing policy priorities, but also on the basis of the anticipated scale of the potential benefits (in consultation with country experts): electronics (e-waste), plastics, agriculture and construction.

The selected activities are translated into modelling inputs and methods, so that the economic, social and environmental impact can be simulated in FRAMES. Together, the selected activities should be broad enough to represent the most important circular economy changes and their potential impacts.

Scenario assumptions

provides a summary of the selected circular economy activities and how the identified circular economy activities were translated to modelling inputs that have been implemented in FRAMES.

Table C-3 Scenario assumptions

Category	Circular activity	economy	Modelling input	Input size
Waste management	Improved collection rate	waste	Increase in waste sector output	Increase from 80% to 95%
E-waste	Improved enforcement of e-waste trade restrictions		Reduction in e-waste (i.e. electronics) imports	n/a

	Improved recycling of valuable materials in e-waste	Investment in recycling sector to improve health & safety standards	€410,000
		Share of recycling investment paid for by private and public sectors	50:50
		Exports of materials recovered from e-waste recycling	€2m
Agriculture	Prevention of food loss in agricultural supply chain through improved storage and logistics	Substitution of agricultural imports by domestic agricultural production	€64m
		Investment in storage and logistical capabilities	€21m
		Share of investment paid for by private and public sectors	50:50
Circular production	Increased use of recycled materials in industrial production	Electronics production: shift from virgin metals and plastics inputs to recycled inputs	20% of virgin inputs replaced by recycled inputs
		Plastics production: shift from virgin feedstock to recycled feedstock	25% of virgin inputs replaced by recycled inputs
		Construction: shift from virgin non-metallic minerals (glass, cement, sands, ceramics) to recycled minerals	10% of virgin inputs replaced by recycled inputs
		Agricultural production: shift from mineral fertilisers to organic fertilisers	20% of mineral fertiliser replaced by organic fertiliser

As indicated in the last two columns, the various economic changes associated with the circular economy are modelled through specific input assumptions. They mainly relate to gross output, input-output coefficients, investment and the trade balance.

Gross output

The increase in the waste collection rate is modelled as a change in output in the waste management sector. This increase in gross output can be thought of as resulting from a government mandate, rather than being caused by an increase in a component of demand.

Input-output linkages (intermediate demand between sectors)

We have modelled an increase in the circularity of production for a number of sectors through adjustments to the existing input-output structure of the model. This reflects changes to the supply chain of a sector as a result of higher circular economic activities. For example, if the construction sector uses less primary aggregate material, and substitutes these for recycled materials, this change is entered to FRAMES as an adjustment to the input-output linkages (i.e. coefficients) of the construction sector: it purchases less from the mining and non-metallic mineral sectors and more from the recycling sector.

Investment

Some of the modelled circular economy activities are associated with an increase in investment, such as the investment required to prevent food losses in the agricultural sector, or to increase health and safety in the recycling sector. In these cases, assumptions are also needed regarding the share of the investment costs that will be paid by the private and public (or aid) sectors: we have assumed a 50:50 split in all cases. In practice, this means that 50% of the investment input is represented as a cost to the investing industry; the other 50% is assumed to be funded by deficit spending or official development assistance, and is thus represented as an injection of funds into the economy.

Trade balance changes

In some cases, the modelled changes to the trade balances represent circular economy activities which directly relate to the trade balance, such as the reduction in imports of e-waste. In other cases, changes to the trade balance are a way to represent a change in productivity in a demand-led model. For instance, we have modelled a reduction in food losses in the agricultural supply chain (effectively an increase in agricultural productivity) as a reduction in imports of agricultural products, as domestic supply is better able to meet domestic demand. Similarly, some portion of the materials recovered from e-waste recycling are modelled as an increase in exports, as we do not assume that domestic demand for these materials has necessarily increased.

Mapping inputs to FRAMES sectors

In some cases, the sectors available in FRAMES were too broad to allow for the targeting of inputs at the level described in Table C-3 above. For example, modelling the shift from virgin plastics to recycled plastics as inputs to the production of electronics requires the disaggregation of two FRAMES sectors. Firstly, we must establish the share of electronics output within the broader “Electrical and Machinery” FRAMES sector. Secondly, we must establish what share of this sector’s purchases from the “Petroleum, Chemical and Non-Metallic Mineral Products” FRAMES sector are actually of plastics, as opposed to other petrochemical and mineral products. Once these shares are established, the magnitude of the modelling inputs can be adjusted accordingly.

The Table below provides an overview of how each of the modelled activities corresponded to the sectors available in FRAMES. An estimate of output or intermediate demand shares was required in cases where the activity sector did not correspond directly with the FRAMES sector. These shares were estimated, where possible, using data from the relevant national accounts and other sources. If no data were available, the shares were inferred using data for the “Rest of Africa” region in E3ME.

Table C-4 Mapping to FRAMES sectors

Activity sector	FRAMES Sector	Variables affected by modelling inputs
Waste management	Education, Health and Other Services	Gross output
Recycling	Recycling	IO coefficients, Investment, Exports
Electronics	Electrical and Machinery	IO coefficients, Imports
Plastics	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients
Construction	Construction	IO coefficients
Agriculture	Agriculture	IO coefficients, Investment
Metals	Metal Products	IO coefficients (electronics input)
Chemicals	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients (plastic feedstock, mineral fertilisers)

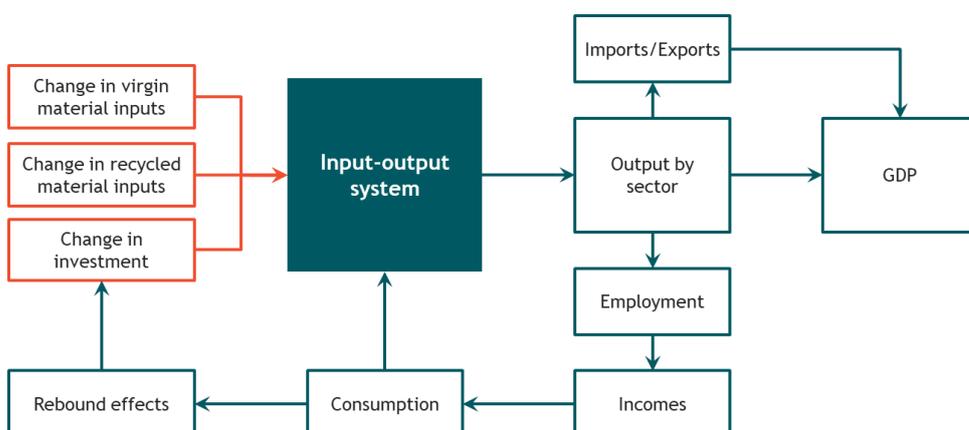
Mining of non-metallic minerals	Mining and Quarrying	IO coefficients (construction materials)
Production of non-metallic minerals	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients (construction materials)

Model linkages and feedbacks

The impact of circular economy activities will not be linear. A change in investment or material consumption may have feedback effects that may in turn alter investment and consumption levels. An advanced input-output model like FRAMES is able to capture these complex interactions, enabling a deeper analysis of the trade-offs inherent in a circular economy transition, as limits are placed on certain economic activities while demand for others increases.

The Figure below illustrates the key linkages in modelling material demand substitution in FRAMES. The modelling inputs adjust input-output coefficients in select sectors, substituting demand away from extractive sectors, towards the recycling sector. This shift in the value of supply-chains affects intermediate demand across sectors, and as a result, levels of gross output across sectors. Differences in output levels result in employment changes by sector; variation in labour intensities across sectors affects net employment change. Output changes across sectors also affect levels of trade and investment activity. Induced effects result from changes in employment, which affect incomes, and therefore consumption.

Figure C-2 E3ME linkages - flow diagram



The net environmental impacts of circular economy activities are not certain, a priori. For instance, the shift towards recycled materials will decrease the share of material use in the economy met by virgin material. On the other hand, the shift towards recycled materials may also be associated with increased employment, increasing disposable incomes and consumption (see Figure 4). The additional investment required by the transition would also filter through the economy, increasing demand in the financial and construction industries, among others.

The overall consumption of raw materials is determined by these trade-offs within the economy. If the rebound effects from the additional demand are strong, the impact of circular economy activities may be to increase the extraction of raw materials more than ever, with improved resource efficiency offset by higher consumption overall. As the relative importance of sectors with different labour and carbon intensities changes as a result of the circular economy, we may expect to see similar dynamics in terms of employment and carbon emissions in aggregate, with employment and carbon emissions being added in certain areas of the economy while employment and emissions potentially being reduced in other areas of the economy. Through its model linkages and feedbacks, FRAMES captures these various effects and estimates the net impacts.

Part 2 - Detailed modelling results

Table C-5 Detailed employment results by sector

Sector	Baseline scenario employment, 2030 (000s)	CE scenario employment, 2030 (000s)	Absolute difference from baseline scenario in 2030 (000s)	Relative difference from baseline scenario in 2030 (%)
1. Agriculture	5154.6	5169.6	14.98	0.29%
2. Fishing	492.1	492.3	0.23	0.05%
3. Mining and Quarrying	91.8	91.8	0.00	0.00%
4. Food & Beverages	12.5	12.5	0.00	0.00%
5. Textiles and Wearing Apparel	7.0	7.0	0.01	0.10%
6. Wood and Paper	15.9	15.9	0.00	0.00%
7. Petroleum, Chemical and Non-Metallic Mineral Products	32.2	32.2	-0.01	-0.02%
8. Metal Products	19.5	19.5	-0.04	-0.21%
9. Electrical and Machinery	59.2	59.2	0.05	0.09%
10. Transport Equipment	17.4	17.4	0.01	0.06%
11. Other Manufacturing	8.6	8.6	0.00	0.00%
12. Recycling	0.9	0.9	0.03	3.32%
13. Electricity, Gas and Water	18.3	18.3	0.00	0.00%
14. Construction	492.8	493.7	0.90	0.18%
15. Maintenance and Repair	30.0	30.0	0.00	0.00%
16. Wholesale Trade	565.6	565.6	0.00	0.00%
17. Retail Trade	539.1	539.1	0.00	0.00%
18. Hotels and Restaurants	61.7	61.7	0.00	0.00%
19. Transport	109.9	109.9	0.04	0.03%
20. Post and Telecommunications	140.6	141.0	0.43	0.31%
21. Financial Intermediation and Business Activities	233.6	234.1	0.46	0.20%
22. Public Administration	61.6	61.6	0.00	0.00%
23. Education, Health and Other Services	183.0	183.2	0.23	0.12%
24. Private Households	393.1	393.1	0.00	0.00%
25. Others	187.4	187.4	0.00	0.00%
TOTAL	8928.2	8945.5	17.32	0.19%

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