



**Green Bonds
Programme**
— KENYA —

PREPARED BY:



**Strategic
Business
Advisors
(Africa) Ltd**
Business, Economics & Finance
Consultants

ASSESSMENT OF GREEN INVESTMENT OPPORTUNITIES IN THE MANUFACTURING SECTOR IN KENYA

STUDY SUPPORTED BY:



Climate Bonds INITIATIVE



Contents

LIST OF ACRONYMS	4
LIST OF TABLES AND FIGURES	5
ACKNOWLEDGEMENTS	6
EXECUTIVE SUMMARY	7
1 INTRODUCTION	12
1.1 Background	12
1.2 The Green Investment Opportunity	12
1.3 Objective of the Study	13
1.4 Methodology	14
1.5 Structure of the Report	14
2 MANUFACTURING	15
2.1 Overview of Kenya's Manufacturing Sector	15
2.1.1 Performance of the Manufacturing Sector	15
2.1.2 Comparison of Kenya's Manufacturing Sector Output with Global Economies	16
2.1.3 Key Challenges in the Sector	16
2.2 The Case for Sustainable and Climate Smart and Sustainable Initiatives in Kenya's Manufacturing Sector	17
2.2.1 Greenhouse Gas Emissions in the Manufacturing Sector	17
2.2.2 Rationale for Financing Climate Smart Initiatives in the Manufacturing Sector	18
2.3 The Green Economy Strategy and Implementation Plan and the Manufacturing Sector	19
2.4 Focus Areas for Review under the Manufacturing Sector	21
3 CLIMATE SMART INVESTMENT AND FINANCING OPPORTUNITIES IN THE MANUFACTURING SECTOR	22
3.1 Overview of Investment Potential and Current Financing of Projects.	22
3.2 Renewable Energy	22
3.3 Waste management	24
3.4 Energy Efficiency	25
3.5 Agro-processing	26
3.6 Product Innovation	28
4 CONCLUSIONS AND RECOMMENDATIONS	29
4.1 Summary of Investment Opportunities	29
4.2 Summary Conclusions and Recommendations	30
4.1.1 Immediate and long term financing needs	30
4.1.2 Constraints to the Issuance of Green Bonds in the Manufacturing Sector	32
4.1.3 Recommendations	32
ANNEX I - EXAMPLES OF CLIMATE SMART PROJECTS IN MANUFACTURING	34
ANNEX II - PROJECT PROFILES/ CASE STUDIES	36
ANNEX III - CONCEPT NOTES FOR CONSIDERATION	39
ANNEX IV LIST OF PERSONS MET	42
ANNEX V REFERENCES	44

List of Acronyms

BAU	Business-as-Usual
CEEC	Centre for Energy Efficiency Conservation
CO ₂	Carbon Dioxide
DFI	Development Finance Institution
EAC	East African Community
EE	Energy Efficiency
EVCA	East Africa Venture Capital Association
FIT	Feed-in-Tariff
FMCG	Fast moving Consumer Goods
GDP	Gross Domestic Product
GESIP	Green Economy Strategy and Implementation Plan
GHG	Greenhouse Gas
GIIN	Global Impact Investing Network
GKI	Greening Kenya Initiative
ICT	Information and communication Technology
IFC	International Finance Corporation
INDC	(Kenya's) Intended Nationally Determined Contribution
KAM	Kenya Association of Manufacturers
KCIC	Kenya Climate Innovation Center
KNBS	Kenya National Bureau of Statistics
KNCP	Kenya National Cleaner Production Centre
KSh	Kenya Shillings
LCPDP	Least Cost Power Development Plan
MSME	Micro, Small and medium Sized Enterprises
MTP	Medium Term Plan
PE	Private Equity
PPP	Public Private Partnerships
RE	Resource Efficiency
SME	Small and medium sized enterprises
SUNREF	Sustainable Use of Natural Resources and Energy Finance
USD/\$	United States Dollar
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VC	Venture Capital

List of Tables & Figures

Tables

Table 1: Kenya's Manufacturing Sub-sector Performance	14
Table 2: 2017 Manufacturing Value Added (Current US \$ Billion) for Selected Economies	15
Table 3: Strategies for Sustainable Manufacturing under GESIP	19
Table 4: Investment potential and Current Climate Smart Financing in Renewable Energy applications/ production in the manufacturing sector	22
Table 5: Investment potential and Current Climate Smart Financing in Waste Management	23
Table 6: Investment potential and Current Climate Smart Financing in Energy Efficiency in the manufacturing	24

Sector

Table 7: Investment potential and Current Climate Smart Financing in Agro-processing	25
Table 8: Investment potential and Current Opportunities for Eco-friendly Product Innovation	26
Table 9: Summary of Climate Smart Investment Opportunities in the Manufacturing Sector	27
Table 10: Summary of Immediate and Long-term Financing Needs	28
	29

Figures

Figure 1: Kenya Carbon Dioxide Emissions in the Manufacturing Sector: 1971- 2014	16
Figure 2: Sector Percentage Contribution to Global Emissions	17

Acknowledgements

This report on green and climate smart investment opportunities in the Manufacturing Sector was made possible through the Green Bond Programme - Kenya managed by Kenya Bankers Association with funding from WWF. Many thanks go to the staff of KBA and Green Bond Programme - Kenya that provided guidance to the study team throughout the exercise. In particular; Nuru Mugambi, Cecilia Murai and Roselyne Njino who worked tirelessly to ensure we had all we needed to carry out this engagement. Members of the Project Steering Committee for the Green Bond Programme - Kenya also provided support and guidance throughout the study which was appreciated. Special thanks should also go to WWF for funding the study and providing guidance and support through their key staff Jackson Kiplagat and Sandy Okoth. We would also like to appreciate the cooperation and support of the various stakeholders in the industry in particular, Kenya Association of Manufacturers (KAM) members who provided valuable feedback to the study team that informed both the draft and final reports.

Strategic Business Advisors (Africa) Ltd

Executive Director /Team Leader – John Kashangaki

Consultant – Melissa Mwit

Executive Summary

Assignment Background

Presently at the global level, there are increasing opportunities to invest in green, sustainable and climate smart solutions. The cost of clean technologies has fallen dramatically. Globally, governments are embracing policies that encourage climate investment, and the Paris Agreement has galvanized support for measures that keep global warming under two degrees Celsius. In addition, significant drops in the price of clean technologies and the rise of smart policies are driving businesses to climate-smart investments. Growing economies can now also invest in new, climate-resilient infrastructure and offset higher upfront costs through efficiency gains and fuel savings. Companies are also increasingly investing in sustainability as this has been seen to positively affect the bottom-line. However, despite these increasing opportunities for investment in green financing, there are also barriers that may slow down the green pipeline and investment growth including a lack of policy support at local and international level to support scaled-up development of green pipeline and limited data on investment prospects.

At the local level, the Green Bonds Program - Kenya (GBPK)¹ is expected to accelerate the take-up of green bonds as a tool for Kenya to tap into international and domestic capital markets to finance green projects and assets. Some of the programme's proposed work streams to realize its goals include researching on the potential of green bond issuance in Kenya and developing a pipeline of green investments. In this regard, GBPK in partnership with WWF Kenya commissioned this study which sought to quantify the investment opportunity for green investments in Kenya, to identify barriers to the issuance of green bonds and to propose solutions for creating bankable projects.

The study methodology involved multiple approaches that included: interviews with key informants working in relevant capacities; review of relevant literature to understand performance of the sector as well as to identify global best practice and investment trends for climate smart transport projects; developing list of potential investment opportunities sourced from different sources; identifying the market size of the identified opportunities and growth potential using either direct data sources or proxies and estimating current and future financing potential using an understanding of the sector, the size of investment needs and existing financing available. The consultant also presented the key findings of the study during a stakeholders' workshop on 18th October 2018 to obtain further input on the proposed recommendations and investment/financing opportunities before finalization of the report.

¹ GBPK is brought together by Kenya Bankers Association (KBA), Nairobi Securities Exchange (NSE), Climate Bonds Initiative (CBI), Sustainable Finance Initiative (SFI), UKAid, Financial Sector Deepening Africa (FSD Africa) and FMO, the Dutch Development Bank. The Green Bonds Programme Kenya is endorsed by the Central Bank of Kenya (CBK), Capital Markets Authority (CMA) and the National Treasury.

Key Findings

Overview of the Manufacturing Sector

The Kenya Vision 2030's economic pillar identifies the manufacturing sector as one of the key building blocks or priority sectors for achieving the country's national development agenda and raising the country's gross domestic product (GDP) growth rate to the region of 10%. The sector's importance in the growth of the Kenya's economy is in the following ways, e.g.

- The sector accounted for 8.4% of GDP in 2017 or output value of KSh 648.4 billion (approx. \$ 6.48 billion).
- Manufacturing accounted for 11% of total formal employment.
- The sector received a total of KSh 272.7B in 2017 accounting for about 13% of total bank loans disbursed.
- The sector is a key anchor of the SME industry where Kenya National Bureau of Statistics data shows that the sector accounted for 11 % of licensed establishments.

Kenya's Green Economy Strategy and Implementation Plan (GESIP) that seeks to guide Kenya's rapid transition to a greener economy and higher productivity proposes the following strategies for the country to realize a sustainable manufacturing sector:

- Increase the share of renewable energy in the energy mix
- Increase national energy efficiency
- Manage waste as a resource
- Resource efficient solutions for production facilities
- Solutions for non-recyclable materials
- Development of supportive policy for the various initiatives in the sector

Focus Areas for Green Financing Opportunities in the Manufacturing Sector

From a review of international best practice and interviews with key stakeholders in the sector, the five areas below were identified as providing key investment/ financing opportunities for addressing sustainability and climate change issues in the manufacturing sector:

- Energy Efficiency and Production Process Improvements
- Renewable Energy
- Waste Management
- Agro-processing
- Product Innovation

Climate Smart Investment and Financing Opportunities in the Manufacturing Sector

The table below provides information on the different types of green business opportunities currently available for investment and financing in Kenya's manufacturing sector and also gives an estimate of the current market size and the finance demand/ potential over the short, medium to long term.

Investment category	Sample Investment opportunities/ Types of projects	Market Size	Estimated size of the investment / financing opportunity	
Energy Efficiency	Replacement, upgrading or installation of equipment to ensure energy saving On-site cogeneration of heat and electricity Implementation of energy management systems Cleaner materials, technologies, systems and practices in product value chains.	Market potential of \$ 504 million based on ready for investment pipeline of at least 140 projects from KAM.	Immediate (1-2 years) \$5 million	Medium - long term (5-10 years) \$10 million

Investment category	Sample Investment opportunities/ Types of projects	Market Size	Estimated size of the investment / financing opportunity	
			Immediate (1-2 years)	Medium - long term (5-10 years)
Renewable Energy	Photovoltaic solar systems and equipment.	Market potential of \$ 338 million based on ready for investment pipeline of at least 94 projects from KAM.	\$6 million	\$12 million
	Installation of solar water heaters.			
	Small-scale hydro power plants.	Significant opportunity to address solid waste management for factories and at county level	\$5million	\$15 million
Waste Management	Conversion of large quantities of waste into biomass.	Accounts for over 40% contribution to manufacturing sector and produces large amounts of waste; Government policy for biogas generation in place	\$25 million	\$60 million
	Solid waste management systems			
Agro-processing	Biomass/biogas systems for heat and or power generation.	Huge amounts of urban solid waste, provide abundant sources of raw materials that can be recycled to produce useful products.	\$3 million	\$10 million
	Expansion and upgrading of existing processing lines to enhance efficiency.			
Product Innovation	Various product lines using waste material and or eco-friendly materials for product manufacture and opportunities for reduction, recycling and re-use of waste.	Plastics ban - opportunities for production of non-plastic packaging material using non-plastic materials.		
		Charcoal ban - opportunities biomass fuel technologies.		
Total estimated finance demand			\$ 44 million	\$ 107 million



Constraints to Green Bond Issuance

The following constraints were identified as potential barriers to the issuance and growth of green bonds in the sector.

- Many projects especially in renewable energy and waste management are greenfield and therefore considered risky for investors.
- Long payback period for waste management projects.
- Political interference in implementation of urban waste management projects.
- Limited technical skills and understanding of what constitutes green projects by potential local issuers.
- Fragmented policy and lack of enforcement of regulations, e.g. in waste management and renewable energy projects.
- Lack of comprehensive data for investor consideration on potential green finance projects in the manufacturing sector and related sectors.
- Current non-involvement of tier one banks in financing green projects. Involvement of tier one banks would give investors more confidence in the green bond.

Proposed Recommendations

In conclusion, following are proposed recommendations to ensure successful issuance of green bonds for the manufacturing sector and address some of the constraints.

Viable and quick-win opportunities for financing consideration: -

Quick-win opportunities for green bond issuance in the sector include energy efficiency upgrades, process enhancements, renewable energy solutions and waste to energy systems. The attraction for potential investors would be supported through issuance by more established manufacturers where cash flows for repayment of facilities are more predictable. Consideration of more wholly sustainable projects for financing consideration. This includes: Selection of projects that ensure minimum production and green efficiency gains based on international best practice guidelines, e.g. through significant reduction in emissions and increases in production efficiency.

Consideration of cyclical nature of projects so that proposals are not short term for projects that have secured long term financing.

Proposed projects which includes alternatives to the current scenario (e.g. reduction in use of plastics) should ensure minimal extraction of raw materials and avoid harm to the environment.

Multi-stakeholder partnerships to ensure a robust and viable pipeline of deals.

In order to mitigate risks around greenfield projects, the potential issuers may consider partnerships with early stage financiers where the green bond would provide follow-on funding once projects are ready for growth and expansion. In addition, partnerships with other intermediaries involved in preparing businesses for funding to further support the identification of viable early stage projects. Other partnerships include industry and technical advisers to help inform technical viability of projects and Development finance institutions (DFIs) and/ or development partners donors involved in green financing to further enrich the pipeline.

Creation of a Pooled Fund for Bond Issuance in the Manufacturing Sector

Establishment of a vehicle to allow aggregation of small but potentially viable projects (e.g. in renewable energy and energy efficiency projects) into more substantial bonds.

Policy and Regulations

The KGBP could support advocacy for improved enforcement and regulatory compliance across the board, e.g. in the case of waste management. There is also need to push for development of a harmonized system of environmental guidelines and regulations and additional support to help producers adhere to the regulations.

In addition, support for heavy industries that would ensure real growth in the manufacturing sector requires pushing for relevant laws that support heavy industries (e.g. need for enabling framework on taxation; sustainable legal framework to support the long project tenures; supportive land laws; carbon dioxide emissions policy; etc), development of reliable power and incentives for large ticket investments.

Capacity building across different stakeholder groups. This includes:

Creating a platform that allows partnership between foreign experts and locals to ensure transfer of relevant technical skills and knowledge.

Initiatives to address the skills gap on green lending within financing institutions.

Industry wide standards for minimum of qualification/certification of technical professionals to ensure adequate evaluation of projects and therefore minimize project risks.

Other Recommendations**Regional focus of projects**

Consider financing projects specific to local economic conditions and that would address environmental issues specific to those regions.

Incentives to encourage investment in climate smart initiatives

The KGBP could support advocacy for incentives such as tax rebates, concessions and subsidies to support adoption of climate smart initiatives by producers.

Green bond pricing and structure

To provide an attractive proposition to prospective investors the bond needs to be competitively priced in comparison to other investment opportunities and the bond features made as simple as possible.

Data for decision making

The GBPK could support advocacy for incentives and to support prospective issuers, could partner with the public agencies involved and other stakeholders to help improve collection and dissemination of data that would better inform green financing and investment opportunities in the sector.

Involvement by tier one banks

Possible deterrents for involvement by tier one banks need to be addressed to encourage their participation.



Introduction

1.1 Background

The research project “Assessment of Green Investment Opportunities in Kenya” was carried out in partnership between the Green Bonds Program - Kenya and WWF Kenya. The project was funded by WWF Kenya and the research was conducted by Strategic Business Advisors (SBA) Africa. The Green Bonds Program – Kenya is brought together by Kenya Bankers Association (KBA), Nairobi Securities Exchange (NSE), Climate Bonds Initiative (CBI), Sustainable Finance Initiative (SFI), UKAid, Financial Sector Deepening Africa (FSD Africa) and FMO, the Dutch Development Bank. The Green Bonds Programme - Kenya is endorsed by the Central Bank of Kenya (CBK), Capital Markets Authority (CMA) and the National Treasury. The program aims to facilitate capital flows into green investments to support sustainable economic growth in Kenya through the following work streams:

- Research the potential of green bond issuance in Kenya;
- Develop a pipeline of green investments and engage with investors;
- Support demonstration green bond issuance from leading banks and corporates;
- Promote green Islamic finance;
- Develop a pool of Kenya-based licensed verifiers;
- Develop a pooled bond facility that would allow smaller banks and corporates to also take advantage of wholesale debt capital markets; and
- Develop Kenya’s Green Bond Market and build local capacity to catalyze similar programs across the East African Community (EAC).

The program aspires to contribute to the national agenda by helping achieve Vision 2030, the Kenya Green Economy Strategy and Implementation Plan (GESIP), as well as Kenya’s climate change commitments as outlined in the National Policy on Climate Finance, the National Climate Change Act, the Climate Change Action Plan and the Nationally Determined Contributions under the Paris Climate Agreement. WWF-Global is one of the largest conservation organizations in the world.

WWF-Kenya (WWF-K) implements programs and projects that contribute to providing an enabling environment for the achievement of sustainable natural resource management. It is in light of this that WWF Kenya through this project, supported the Kenya Green Bonds Program to understand the existing and estimated future investment potential and financing demand for green investment projects in Kenya.

1.2 The Green Investment Opportunity

Arguably there has never been a better time to invest in green, sustainable and climate smart solutions. The cost of clean technologies has fallen dramatically, globally governments are embracing policies that encourage climate investment, and the Paris Agreement has galvanized support for measures that keep global warming under two degrees Celsius.

A dramatic drop in the price of clean technologies and the rise of smart policies are driving businesses to climate-smart investments.

² The International Renewable Energy Agency reported that by the end of 2017, the global renewable energy generation capacity had increased by 167 GW to 2,179GW globally.

Global energy-efficiency potential is large and growing – governments and business invest more than \$300 billion each year to improve the efficiency of power grids, transport, industry, and buildings. The global green buildings market continues to double in size every three years. Climate-smart agriculture is also a growing private sector opportunity, as companies seek to increase crop resilience and food productivity, as well as their profits.

The growth in greenhouse-gas emissions is expected to come mainly from emerging markets – which require \$4 trillion per year to build and maintain infrastructure. How rapidly growing middle-income nations respond to their infrastructure needs will directly affect whether we can achieve the promise of the Paris Agreement. The good news is that growing economies can invest in new, climate-resilient infrastructure and offset higher upfront costs through efficiency gains and fuel savings.

Companies are also increasingly recognizing the need to ensure that their operations are resilient against supply chain disruptions and other effects of climate change. As a result, forward-looking businesses are moving quickly to climate-smart investments because it is good for the bottom line. Wall Street firms like Morgan Stanley report that investing in sustainability usually meets, and often exceeds, the performance of comparable traditional investments ³.

However, there are also barriers that may slow down the green pipeline and investment growth. For example, the global annual survey of the clean energy sectors by the International Energy Agency⁴, concludes that transformation towards a clean energy system is not in line with stated international policy goals. Many technology areas suffer from a lack of policy support, and this impedes their scaled-up deployment.

Furthermore, while some sectors—notably renewable energy—have good investment forecasts in a global context, there is no such forecast for Kenya and there are also limited data and forecasts in areas such as climate-smart agriculture and forestry, energy efficiency, transportation and waste.

1.3 Objective of the Study

The overall objective of the study was to quantify the investment opportunity for green investments in Kenya, to identify barriers and to propose solutions for creating bankable projects that can potentially benefit from the Green Bond Initiative. The outcomes of this exercise as will be seen in this report have provided a clear indication of the space for green investments in Kenya. It is important to note that green investments refer to not only investments in opportunities that contribute to mitigation to climate change but also other issues as have been identified under the Sustainable Development Goals as having direct relevance to the Green Bonds Principles. These include; pollution prevention, terrestrial and aquatic biodiversity conservation and food security. As a result of a prioritization exercise conducted in the study, the report has focused on three key sectors: -

Agriculture Livestock and Forestry

1. Transport
2. Manufacturing
3. This report covers the manufacturing sector.

² <http://www.irena.org/newsroom/pressreleases/2018/Apr/Global-Renewable-Generation-Continues-its-Strong-Growth-New-IRENA-Capacity-Data-Shows>

³ Morgan Stanley Institute for Sustainable Investing (2015), Sustainable Reality: Understanding the Performance of Sustainable Investment Strategies, access at <http://www.morganstanley.com/sustainableinvesting/pdf/sustainablereality.pdf> ⁴ International Energy Agency (2017), The Annual Tracking Clean Energy Progress (TCEP) report of the Energy Technology Perspectives 2017 ⁵file:///C:/Users/Ben/Downloads/Green-Bond-Principles---June-2018-140618-WEB.pdf

1.4 Methodology

In order to undertake the study and in particular to identify and seize investment opportunities the SBA team used multiple approaches that included:

- Interviews with key informants working in relevant capacities – commercial bankers, fund managers, development finance institutions, relevant donor funded programmes, private companies in the sector, NGOs and some Government representatives – to understand sector dynamics and opportunities⁶;
- Review of relevant literature – to understand performance of the sector as well as to identify global best practice and investment trends for climate smart projects. Also looked extensively at online sources of data on existing financing of climate smart projects in Kenya by various funds;
- Developing list of potential investment opportunities identified from different sources;
- For each investment identifying the market size of the opportunity and growth potential using either direct data source or proxies e.g. For organic fertiliser estimated size of entire fertiliser market in Kenya using data available; – through interviews, discussions with players in the sector like key buyers able to estimate that organic fertiliser market share is less than 5% of total.
- Based on an estimate of market size and growth estimates, estimate of current and future financing potential using understanding of the sector, the size of investment needs and existing financing available. Each investment is analysed independently using the information available and data available on financing on different sectors⁷. Should be noted that the investment sizes are conservative estimates subject to more detailed market studies for each investment opportunity.
- Key findings were presented to an industry stakeholder group organised by KAM and comments received incorporated into the final report.

1.5 Structure of the Report

This report focuses on the manufacturing sector. The structure of the report is informed by the objective and scope of the study. The rest of the report is structured as follows: -

- Review of the Manufacturing Sector
- The case for sustainable and climate smart initiatives in Kenya's manufacturing Sector
- Climate smart investment and financing opportunities in the manufacturing sector
 - Key Investment Areas / Type of Projects
 - Size of the Opportunity / Demand
 - Potential Risks and barriers
 - Financing Demand
- Summary of investment pipeline and market demand
- Conclusions and recommendations
- References

⁶ See list of persons met in Annex 3

⁷ For example, Central Bank publishes data on lending to different sectors in the economy; lending to agriculture is about 5% of gross loans, manufacturing 12% and transport 7%

Manufacturing

2.1 Overview of Kenya's Manufacturing Sector

The Kenya Vision 2030's economic pillar identifies the manufacturing sector as one of the key building blocks (priority sectors) for achieving the country's national development agenda and raising the country's gross domestic product (GDP) growth rate to the region of 10%.

The two main sub-sectors as per classification by the Kenya Bureau of Statistics (KBS) are (1) the manufacture of food, beverages and tobacco and (2) other manufacturing, repair and installation.

The Kenya Association of Manufacturers (KAM) categorizes its members into 14 sectors, 12 of which are in processing and value addition while the other two offer essential services to enhance formal industry. The sectors are:

- Service and consultancy
- Building, mining and construction
- Chemical and allied sector
- Energy, electrical and electronics
- Food and beverage
- Leather and footwear
- Metal and allied
- Motor vehicle and accessories
- Paper and board sector
- Pharmaceutical and medical equipment
- Plastics and rubber
- Fresh produce
- Textile and apparel
- Timber, wood and furniture

2.1.1 Performance of the Manufacturing Sector

The manufacturing sector accounted for 8.4% of GDP in 2017 or output value of KSh 648.4 billion (approx. \$ 6.48 billion⁸).

Source: Economic Survey 2018 (Kenya Bureau of Statistics)

SUB-SECTOR	2013	2014	2015	2013	2013
% of GDP					
Manufacture of food, beverages and tobacco (%)	4.2	3.8	3.7	3.6	3.5
Other manufacturing and repair and installation (%)	6.4	6.1	5.7	5.5	4.9
TOTAL	10.6	9.9	9.4	9.1	8.4
Value of GDP (KSh million)					
Manufacture of food, beverages and tobacco (%)	201,269	207,730	230,909	260,818	270,142
ther manufacturing and repair and installation (%)	305,343	330,269	357,987	393,021	378,255
TOTAL	506,612	537,999	588,896	653,839	648,397

⁸ Kenya National Bureau of Statistics Economic Survey 2018

The manufacturing sector is also a key anchor of the SME industry; a survey done in 2016 by the Kenya National Bureau of Statistics shows that the sector accounted for 11% of licensed establishments. In terms of employment, the manufacturing sector is one of the largest employers; the sector's formal employment rose to about 303,000 people in 2017 and accounted for about 11.4% of the total formal employment, which represents 1 in 9 people.

A review of credit available from the banking sector shows that the sector is a significant beneficiary of banking sector loans where the manufacturing sector received a total of KSh. 272.7 billion in 2017 accounting for 12.6% of total loans disbursed⁹.

2.1.2 Comparison of Kenya's Manufacturing Sector Output with Global Economies

Data on global economies shows that on average manufacturing as a percentage of GDP in most industrialized nations is between 19-30%¹⁰. Kenya has not performed well by comparison, ranging between 8-10% and declining over the past few years as seen in the table above.

Table 2: 2017 Manufacturing Value Added (Current US \$ Billion) for Selected Economies

Country	China	Germany	India	Italy	UK	Brazil	SA	Nigeria	Kenya
Output \$	3,591	760	390	284	241	209	41	33	6

2.1.3 Key Challenges in the Sector

The sector's share of GDP shrank by more than 2% from almost 11% in 2013 to 8.4% in 2017. In 2016, manufacturing contributed 9.1% to GDP, a drop from the previous year's 9.4% and 10% in 2014. The sector also posted a marginal growth of 0.2% in 2017 compared to a revised growth of 2.7% in 2016.

The World Bank Kenya Economic Outlook report suggests that the stagnation in the sector is partly due to low overall productivity and large efficiency differences in firms across subsectors, which allows uncompetitive companies to remain in business. The 2018 Economic Survey indicates that the sector's slow growth in 2017 was partly attributable to uncertainties related to the 2017 general elections, high cost of inputs and stiff competition from cheap imports. In addition, decline in output in 2017 was mainly on account of reduced production of food products, beverages and tobacco, leather and related products, rubber and plastics and non-metallic minerals sub sectors. The effect of the agro-processing on manufacturing is apparent where in 2017 the segment contributed 42% to the sector as seen in the table below. KNBS reveals that Agro-processing declined by 10.8 % in 2017 mainly due to low availability of raw materials for some key agro-based industries resulting from unfavourable weather conditions in the year.

Other challenges specific to manufacturing include high energy costs; poor infrastructure which presents a challenge on the availability of raw materials; weak and fragmented policy coordination; unreliable power supply and distribution and weak management and technical skills, especially for SME manufacturers.

⁹ Bank Supervision Annual Report 2017 (Central Bank of Kenya).

¹⁰ International Comparisons of Manufacturing (House of Commons, 2018)

¹¹ The current Presidential Initiative to achieve high economic growth levels in Kenya

Despite these challenges, the manufacturing sector remains a significant contributor to Kenya's economy and various initiatives are underway to strengthen its productivity and competitiveness. Under the Big Four agenda⁴ for instance, the government lays out a number of strategies aimed at increasing the sector's contribution to GDP from current levels to 20% by 2022. This includes specific initiatives for the following manufacturing sub-sectors: agro-processing, leather, textiles/apparels, oil, mining and gas, and iron and steel, fish processing and ICT as well as production of construction materials.

2.2 The Case for Sustainable and Climate Smart and Sustainable Initiatives in Kenya's Manufacturing Sector

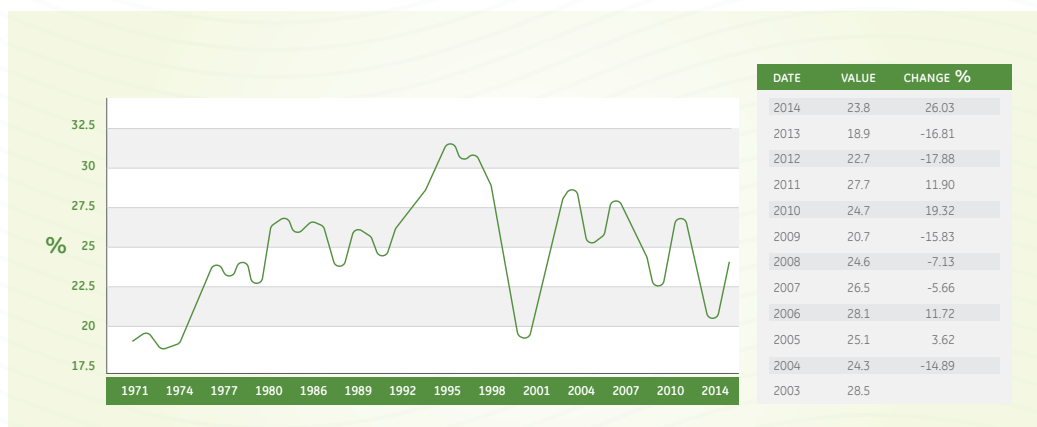
2.2.1 Greenhouse Gas Emissions in the Manufacturing Sector

A report by USAID (2013) shows that Kenya's greenhouse gas (GHG) emissions in 2013 were 60.2 million metric tons of carbon dioxide equivalent (MtCO₂e), totalling 0.13% of global GHG emissions. The agriculture sector emitted 62.8% of total emissions, followed by the energy sector (31.2%), industrial processes sector (4.6%), and waste sector (1.4%)¹².

In 2014, carbon dioxide (CO₂) emission from manufacturing industries in Kenya was estimated at 23.8%¹³. CO₂ emissions, largely by-products of energy production and use, account for the largest share of GHG which are associated with global warming. Co₂ emissions from 1971 to 2014 from the country's manufacturing sector are shown in figure 1 below.

Projections of the baseline emissions to 2030 for selected sectors show that total GHG emissions are expected to increase to 142 million MtCO₂e in 2030 with electricity generation expected to emit about 29.6%, energy demand 7%, industrial processes 4.2% and waste sector 2.8%¹⁴.

Figure 1: Kenya Carbon Dioxide Emissions in the Manufacturing Sector: 1971- 2014.

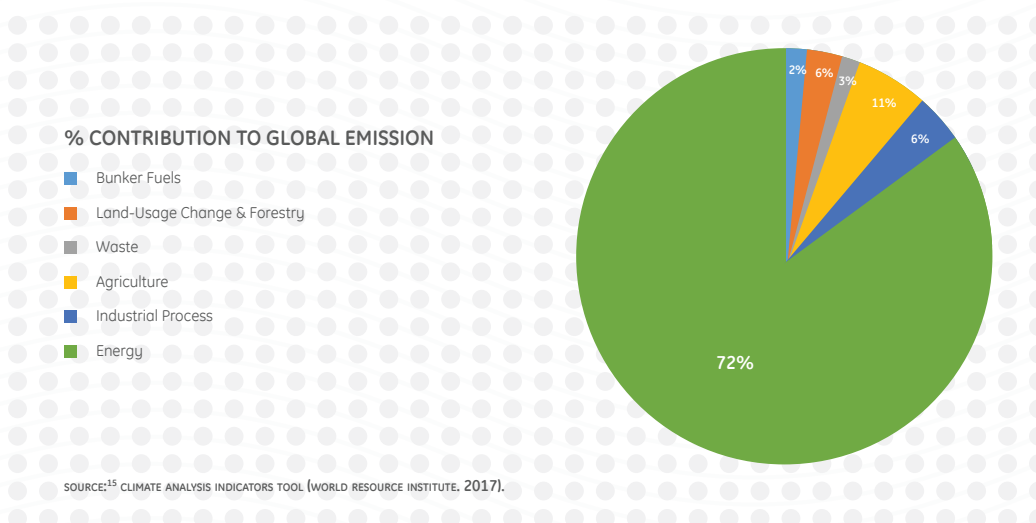


Source: International Energy Agency

¹² USAID, 2013

¹³ IEA Statistics (OECD/IEA 2014)

¹⁴ Kenya Second National Communication to the United Nations Framework Convention on Climate Change (2015)

Figure 2: Sector Percentage Contribution to Global Emissions

2.2.2 Rationale for Financing Climate Smart Initiatives in the Manufacturing Sector

The Kenya Vision 2030 seeks to transform the country into a newly industrialized, middle-income country, providing a high quality of life to all its citizens in a clean and secure environment by 2030. (See also section 2.2 above on the manufacturing sector as a priority under the Big Four Agenda which is in line with the goals of the Vision 2030).

Pursuant to this blueprint, a number of strategies have been developed to support the transition of the economy from a business-as-usual (BAU) scenario, to realizing the benefits of working towards a green economy. It is projected for instance, that under a green economy scenario, the country's real per capita income in Kenya is expected to nearly double by 2030, outpacing income growth under a BAU scenario (UNEP, 2014). The report estimates that by 2030, the level of GDP under green economy is expected to exceed that under the BAU investment scenario by 12 % and carbon dioxide emissions are projected to be 15 % lower than the BAU scenario.

Kenya's Intended Nationally Determined Contribution (INDC) commits to reducing GHG emissions by 30% (143 MtCO₂e) relative to business as usual levels by 2030. Under the manufacturing sector, specific activities that have been identified to support the realization of these objectives include:

- Expansion of renewable energy production,
- Enhancement of energy and resource efficiency,
- Increased use of clean energy technologies to reduce over reliance on wood fuels and
- Improved waste management initiatives (e.g., waste recycling).

These initiatives call for availability of adequate and appropriate funding resources to ensure their successful implementation. Various quantitative analyses undertaken to assess the economy-wide impact of green investments, under different scenarios, shows that significant positive returns can be realized after only seven to ten years¹⁶.

¹⁵ <https://www.c2es.org/content/international-emissions/>

¹⁶ UNEP Green Economy Assessment Report

2.3 The Green Economy Strategy and Implementation Plan and the Manufacturing Sector

The Green Economy Strategy and Implementation Plan (GESIP)

In order to create an enabling environment for green economy transition, the country's Green Economy Strategy Implementation Plan (GESIP), has identified sustainable financing as one of the key enabling conditions necessary for a rapid transition to a green economy. This requires developing appropriate financing mechanisms and ensuring that funding resources available are adequate to meet the needs of prospective green investments. The GESIP has singled out green bonds and eco-taxes as viable instruments in this regard that would facilitate access to local and international capital.

GESIP identifies five thematic areas to guide Kenya's transition to higher green growth, cleaner environment and higher productivity. These are: -

- **Sustainable Infrastructure** – Relates to designing, building and operating of the energy and infrastructure elements.
- **Building Resilience** – Seeks to strengthen the resilience of economic, social and environmental systems to the adverse effects of external shock.
- **Sustainable Natural Resources Management** – Looks at identifying drivers of natural resources, change and provide support from green and eco-friendly technologies, related research and innovation activities.
- **Resource Efficiency** – Aim is to achieve the realization of higher outputs with less natural resources whereby the economic value will be increased through high Total Factor Productivity (TFP).
- **Social Inclusion and Sustainable Livelihood** – Entails education and training to inculcate the Green Economy at all levels of education. Emphasis for GESIP is on re-orientation, education and training.

In view of the five thematic areas, sustainable infrastructure and resource efficiency stand out with regard to promoting sustainability in the manufacturing sector and the related study areas proposed in this report.

The following table shows specific strategies for the sector under the two thematic areas where the proposed strategies point to types of projects to be considered under the sector. These include:

- Renewable energy – grid and off-grid generation of energy and covering geothermal, wind solar and biogas.
- Energy efficiency solutions and technologies
- Resource efficient solutions for production facilities
- Recycling solutions to support waste management
- Waste to energy solutions
- Solutions for non-recyclable materials

Table 2: 2017 Manufacturing Value Added (Current US \$ Billion) for Selected Economies

Thematic Area	Objectives	Strategies
Sustainable infrastructure	Increase the share of renewable energy in the energy mix	<ul style="list-style-type: none"> • Increase the share of renewable energy (geothermal, wind and solar) in the national grid to at least 70 % • Review Feed-in-Tariff (FiT) policy to include more off- grid generation and net-metering; • Promote use of bio energy at household, public institutions and commercial enterprises.
Resource Efficiency	Increase national energy efficiency	<ul style="list-style-type: none"> • Develop sector-specific energy efficiency indicators and benchmarks • Roll out demand-side energy efficiency programmes in urban residential, commercial and industrial establishments; • Roll out supply side energy efficiency programmes through system reinforcement, efficient transformers, grid extension projects; • Adopt minimum energy efficiency performance standards for lighting and industrial products; • Develop technical and infrastructural capacity for energy efficient audits, equipment testing and certification; • Continually review national and county policies and legal frameworks to respond to new technology and innovation; • Enhance application of voluntary management approaches to energy efficiency, clean and renewable energy.
	Manage waste as a resource	<ul style="list-style-type: none"> • Promote voluntary resource efficient and cleaner production instruments for source reduction of waste and industrial symbiosis; • Develop and implement a landfill policy that eliminates land-filling of all recyclable waste • Provide financial incentives to limit waste energy recovery to non-recyclable materials; • Build infrastructure and technical capacity for waste prevention, segregation, recycling and industrial symbiosis; • Develop functional markets for secondary raw materials and recycled products through end-of-waste criteria and recycled content; • Develop and implement legislation on extended producer responsibility for sustainable management of emerging waste streams including e-waste and plastics.

Source: Green Economy Strategy and Implementation Plan (2016-2030)

Apart from the strategies, the GESIP proposes that public policy development is also required in the following areas to support the manufacturing sector's shift to a green economy:

- Eco-labelling
- Recycling and reuse
- The production of eco-friendly materials
- Resource efficient and clean production processes and
- Mandatory energy-efficiency audits for large manufacturers.

The expected outcomes from employing these strategies include increased production efficiencies, reduction of waste, reduction in toxic waste emissions/ pollutants and promotion of energy conservation.

2.4 Focus Areas for Review under the Manufacturing Sector

From a review of international experience and interviews with key stakeholders in the sector, the first four areas below were seen as significantly affecting the manufacturing sector with regard to opportunities for addressing climate change gaps. Renewable energy and waste management are indeed separate sectors but have been considered under manufacturing given their impact on energy efficiency in production and potential to create new products (waste management). The fifth area, product innovation, looks at the manufacture of eco-friendly outputs. Thus the proposed areas are:

- **Energy Efficiency and Production Process Improvements**

Energy efficient processes, products and appliances provide significant opportunities for improving production efficiency and conserving energy resources for manufacturers.

- **Renewable Energy - also called clean energy**

Analysis of various initiatives in the manufacturing sector shows that manufacturers are increasingly adopting renewable energy as a source of energy to augment grid options.

- **Waste Management**

This covers climate smart initiatives for urban waste management including waste to energy solutions through disposal and recycling.

- **Agro-processing.**

This was selected because food production under the manufacturing sector produces large amounts of waste and presents significant opportunities for recycling and bio-fuel energy.

- **Product Innovation**

This looks at the manufacture of products as a viable solution to the huge amounts of waste available in the environment and use of eco-friendly materials to produce different types of products.

Climate Smart Investment & Financing Opportunities in the Manufacturing Sector

This section provides information on the different types of green business opportunities currently available for investment and financing in Kenya's manufacturing sector and examples from other countries. The section also provides an estimate of the current market size and demand potential over the short, medium to long term, as well as key demand drivers for the respective segments.

3.1 Overview of Investment Potential and Current Financing of Projects.

The various sources of funding for current climate smart projects in the sector include:

- Development Finance Institution (DFI) Investments
- Multi-lateral agency facilities
- Banking sector loans (credit lines)
- Impact Fund, Venture Capital and Private Equity Funds
- Public Private Partnerships (PPPs)

The largest source of funding for climate smart projects in manufacturing has come through a project called Sustainable Use of Natural Resources and Energy Finance (SUNREF). The project is a partnership between KAM and the French Development Agency AFD that works in partnership with local banks by providing credit lines to finance green energy projects and/ or energy management solutions. Annex II gives information on two projects financed under the SUNREF facility through Co-operative Bank of Kenya. A workshop held in 2017 by Agence Française de Développement (AFD) in partnership with KAM revealed that KAM has through partnerships with institutions like AFD and DANIDA, built a project portfolio of over 250 projects in hydro, solar, biogas, biomass, energy efficiency and energy service companies. Out of these, 16 projects had been financed to the tune of \$ 58 million over a number of years¹⁷. This project is ongoing and is a good barometer for future financing of climate smart projects in the country. Other financial institutions and funds are also becoming more involved in financing new ventures as demand increases, pricing becomes more competitive and capacity for assessing risk increases.

3.2 Renewable Energy

Kenya has promising potential for additional power generation from renewable energy sources and manufacturers stand to enjoy significant gains from investing in various opportunities in renewable energy such as solar, hydro and biomass energy to augment their energy/ power needs. The government is also at the forefront in supporting renewable energy generation through various initiatives including:

- Creation of the Rural Electrification Program, promoting off grid renewable energy generation for households and income-generating activities through the Energy Act 2006.
- Subsequent to the enactment of the Energy Act, Ministry of Energy in 2008 adopted a Feed-in Tariff (FiT) based on the realization that renewable energy sources, including solar, wind, small-hydro, biogas and urban solid waste energy, have the potential for income and employment generation, while also contributing to the energy supply and diversification of electricity-generation sources.

¹⁷ <http://kam.co.ke/afd-kam-provide-green-energy-financing-in-east-africa/>

In 2015, Kenya introduced new renewable energy tax incentives and now offers an exemption from Value Added Tax (VAT) to several components of renewable energy sources, including solar technology.

3.2.1 Key Investment Areas / Type of Projects

The table below provides an analysis of the types of projects, size of opportunity/ demand; potential risks/ barriers and finance demand for the following categories of projects as highlighted above:

Table 4: Investment potential and Current Climate Smart Financing in Renewable Energy applications/production in the manufacturing sector

Types of Project	Size of Opportunity/ Demand	Potential Risks /barriers	Finance Demand
<ul style="list-style-type: none"> Thermal photovoltaic solar systems Photovoltaic Equipment Installation of solar water heaters Small-scale hydro power plants 	<ul style="list-style-type: none"> Assuming 40% of the 234 (250-16) projects from the KAM pipeline indicated above are in the renewable energy segment, this works out to about 94 potential projects as ready for investment. At an average of \$ 3.6 million per project as seen above gives a market size opportunity of \$ 338 million. 	<ul style="list-style-type: none"> Capital requirements quite high for many enterprises Financiers lack technical knowhow to appraise projects so approvals are slow. Many of the projects especially in renewable energy have a high risk profile given they are in the start-up and early stage phases; The projects may therefore be better candidates for patient capital type of financing and for follow-on funding once they are ready to scale and cash flows more predictable. Lack of policy and regulation around net metering for solar power producers. 	<ul style="list-style-type: none"> The need for sustainable power sources will continue to drive demand for renewable sources in manufacturing as an alternative. In the long term once Kenya is providing reliable cost effective power to individuals and industry demand will decline. Increasing awareness of the various sources of renewable energy for use by manufacturers and education on climate smart initiatives that reduce pollution and make efficient use of natural resources will support increased use of renewable energy. Data from KAM shows 16 projects financed a total of \$58 million over a number of years (assume 7-year period as per SUNREF facility) gives an average of \$ 8.2 million per year; at 40% for renewable energy gives \$ 3.2 Million. Considering other current projects under financing, e.g. through IFC and other development partners current financing demand is estimated at at least \$ 6 million per year. Given the current potential, as technical capacity and awareness of the benefits grow finance demand is likely to grow to \$12-14 million per year in five years.

3.3 Waste management

This segment covers management of solid waste including urban waste and waste from factories. As indicated, waste management is a separate sector that may be considered more broadly under infrastructure but has been considered under manufacturing given its impact on energy efficiency in production and potential to create new products.

3.3.1 Key Investment Areas / Type of Projects

Potential types of projects under waste management in the manufacturing sector include:

- Conversion of large quantities of waste into biomass - there are huge amounts of solid waste and sewerage that need to be directed to biogas digesters. Thus, business opportunities exist for:
- Energy recovery – waste to energy anaerobic digestion; biogas to heat and energy; and biomass combustion systems for heat and energy
- Solid waste management systems to manage large amounts of waste in the urban centers through:
- Collection, separation and processing – e.g. through: Recycling, composting, treatment, landfills, incineration, sale of recycles and refuse derived fuel (RDF).

Annex II provides details of the Rebbie Thernal Plant in Ethiopia and how the project is helping to address solid waste at Ethiopia's largest dump in the capital city. Annex III provides details of ready investment opportunities looking at waste-to-energy projects including: conversion of plastics to furnace oil and another on production of briquettes from sewerage sludge as one of the raw materials.

The table below provides an analysis of the size of opportunity/ demand; potential risks/ barriers and finance demand of waste management in Kenya.

Table 4: Investment potential and Current Climate Smart Financing in Renewable Energy applications/production in the manufacturing sector

Size of Opportunity/Demand	Potential Risks /barriers	Finance Demand
<ul style="list-style-type: none"> • Significant opportunity to address solid waste management for factories and at county level to help address solid waste management and sanitation – e.g. some counties have up to 40% uncollected waste 	<ul style="list-style-type: none"> • Lack of political goodwill to support initiatives in solid waste management and ensure enforcement of regulations. This has resulted in delayed or no progress in waste management initiatives. Waste management has also been devolved to the counties and political interference and governance issues may affect implementation of projects/ initiatives. 	<ul style="list-style-type: none"> • Need by some manufacturers to use alternative fuel sources, e.g. briquettes etc. This has significant potential for growth but current supply is limited - PPPs with counties could yield significant growth potential. • Enhanced policy and regulatory framework that supports/ demands effective treatment of waste and enforceability will encourage more players.

Continues to the next page...

Table 4: Investment potential and Current Climate Smart Financing in Renewable Energy applications/production in the manufacturing sector

Size of Opportunity/Demand	Potential Risks /barriers	Finance Demand
<ul style="list-style-type: none"> The lack of functioning waste management at County level, may potentially increase this opportunity further for the manufacturing sector. 	<ul style="list-style-type: none"> Land use conflicts which affect development of initiatives in renewable energy and waste management by delaying implementation of projects. Limited technical competencies in waste management across the board: - at county level where waste management has been devolved and by factories. Investment opportunities for waste management at county-level may require significant capital outlay with a long term horizon thus a deterrent for investors. Slow implementation of PPP projects which is not attractive for investors. 	<ul style="list-style-type: none"> Enhanced policy and regulatory framework that supports/ demands effective treatment of waste and enforceability will encourage more players. The total project cost for the solid waste management case in Ethiopia (annex II) of \$ 118.5 million shows urban solid waste management demands significant investment. There are however much smaller scale projects that are viable (briquette production, biogas etc). but access to consistent supply is critical. Considering a conservative estimate, financing demand forecast for the waste management sub-sector is likely to grow slowly from a low base of \$5-\$10 million per year over the next five years unless barriers are removed

3.4 Energy Efficiency

A number of successful initiatives have been implemented to promote the adoption of energy efficiency practices, which has resulted in increased demand for relevant solutions. The Kenya Association of Manufacturers (KAM) in conjunction with the Ministry of Energy and Petroleum established the CEEC in 2006. The centre based at KAM, runs energy efficiency and conservation programs designed to help companies identify energy wastage, determine saving potential and give recommendation on measures to be implemented. The country also seeks to promote the use of cleaner and resource-efficient production through the Kenya National Cleaner Production Centre (KNCPC).

3.4.1 Key Investment Areas / Type of Projects

Climate smart business opportunities for energy efficiency projects include:

- Replacement or upgrading of energy-intensive equipment
- On-site cogeneration of heat and electricity or tri-generation (heat, refrigeration, electricity)
- Replacement of boilers (higher quality control systems, energy saving systems, improved insulation, etc.)
- Installation of a heat recovery unit
- Thermal insulation of premises
- Upgrading of existing ventilation / air conditioning systems
- Implementation of energy management systems or building management systems
- Replacement of old coolers and compressors
- Modernization of the lighting system
- Cleaner materials, technologies, systems and practices in product value chains

The table below provides an analysis of the size of opportunity/ demand; potential risks/ barriers and finance demand for the proposed investment projects.

Table 6: Investment potential and Current Climate Smart Financing in Energy Efficiency in the manufacturing sector

Size of Opportunity/Demand	Potential Risks /barriers	Finance Demand
<ul style="list-style-type: none"> Using data from KAM of 250 potential projects for funding and assuming 60% of them yet to be funded 234 (250-16) projects are in the energy efficiency segment which works out to about 140 potential projects as ready for investment. At an average of \$ 3.6 million per project gives a market potential of \$ 504 million. 	<ul style="list-style-type: none"> General lack of awareness of the benefits and need to adopt green technologies by households and industries High upfront costs for manufacturers resulting in delayed technology adoption and adaptation. In addition, many SME clients lack security to support debt financing. Inadequate incentives for enterprises investing in green technology. Assessments conducted by the KNCPC in sectors such as tea, textile, sugar, dairy, manufacturing and the fish industry indicate that some of the challenges in the transition to a clean and resource-efficient production include: lack of knowledge and awareness; and investment costs. 	<ul style="list-style-type: none"> Efficiency enhancing technologies for large and medium sized manufacturers – manufacturers will continue to upgrade operations through bank and internal financing. Establishment of regulatory requirements for energy audits will increase the demand for appropriate solutions. Also increased awareness of the potential savings through adoption of energy efficiency solutions. Over past seven years average investment per year in this segment has been about \$5 million. As technical capacity in banks and awareness of the benefits increases the investment demand is estimated to grow to \$10 million per year over the next five years

3.5 Agro-processing

The agro-processing subsector consists of manufacturing of food and beverages products such as dairy products, sugar, beer, processed tea, semi processed coffee, grain milling, fruit preservation and juice, vegetable oils and fats, fish processing, bakery products such as bread and biscuits, soft drinks; production of mineral waters and other bottled waters, cocoa, chocolate and sugar confectionery and so on¹⁸. These subsectors have been growing at above average rates due to increased urbanisation, income levels and high demand for food products. The dairy sector for example has been expanding at over 7% per year¹⁹. In addition, global demand for organic products is creating opportunities for agro-processing ventures in Kenya and other African countries²⁰.

Agro-processing produces large amounts of agricultural waste and this can be used to produce electricity by implementing biogas and biomass technologies. Biogas is also considered a viable energy solution by a number of agricultural producers. The 2014 National Energy Policy Draft also sets out biogas expansion targets of 10,000 small and medium-sized digesters by 2030.

¹⁸ Although not all agro-processing can be considered climate smart, many ventures that add value to agricultural produce and reduce post harvest wasted can be considered climate smart ventures.

¹⁹ Central bureau of Statistics Economic survey various years.

²⁰ As part of the study we talked to one of the partners of a new banana processing venture targeting consumers in Europe keen on organic products.

Agro-processing Case: Olivado

Olivado a company based in Muranga, Kenya produces avocado oil for the overseas market. Due to the dire need for sustainable energy supply, Olivado ventured into biogas production using the avocado waste to produce biogas. The biogas plant saves the earth landfill and curtails further environmental degradation.

Olivado has installed 2 digesters worth US\$ 1.7 million financed by SUNREF East Africa to produce 300 KW of renewable energy, which is used to power the entire factory. The Green energy generated is approximately 460 MWh/y and the emissions savings - 1031 t eq CO₂/y.

Business opportunities/ types of projects, estimated opportunity, potential risks and demand drivers are shown in the table below.

3.5.1 Key Investment Areas / Type of Projects

Table 7: Investment potential and Current Climate Smart Financing in Agro-processing

Types of Project	Size of Opportunity/ Demand	Potential Risks /barriers	Finance Demand
<ul style="list-style-type: none"> Expansion and upgrading of existing processing lines to enhance efficiency; new greenfield projects targeting domestic and export markets Grid-connected and/ or stand-alone captive power plants for industry. Biomass combustion systems for heat and / or power generation Heat and / or electricity generating systems by use of a biogas source 	<ul style="list-style-type: none"> Statistics from KNBS show that food production/ agro-processing accounted for 42% of manufacturing output in 2017. These subsectors have been growing at above average rates (8-10%) due to increased urbanisation, income levels and high demand for food products. Agro-processing produces large amounts of agricultural waste and this can be used to produce electricity by implementing biogas and biomass technologies. The 2014 National Energy Policy Draft also sets out biogas expansion targets of 10,000 small and medium-sized digesters by 2030. 	<ul style="list-style-type: none"> For new ventures critical is sufficient supply of raw material. Engaging with smallholder farmers for supply can be expensive and time consuming. Infrastructure from farm to fork is expensive making many projects uncompetitive Many enterprises are lacking in technical skills around biomass combustion and biogas generation are still new more many enterprises Biomass digesters require a significant cost of investment which is a deterrent for producers. 	<ul style="list-style-type: none"> New agro-processing ventures or expansions – due to increasing growth in regional markets – financing largely through banks, private equity or shareholder funds Growth in demand for organic products including fertilizer and seed. Transfer of value addition/ agro-processing skills will encourage participation of more local enterprises. Based on a review of financing of agribusiness projects and discussions with key informants we estimate that current annual financing of agro-processing projects ranges from \$20-\$30 million per year. Due to increased demand for food both in the region and globally we anticipate that this will expand to \$50-\$60 million per year in the next five years.

3.6 Product Innovation

This section looks at product manufacture as a viable solution for finding uses for the huge amounts of waste available from post-harvest agricultural waste, waste from agro-processing, other manufacturing process and urban solid waste.

Table II in Annex I, gives examples of companies involved in manufacture of eco-friendly products and opportunities for plastic waste reduction in the environment through recycling and subsequent manufacture of products for a wide range of uses.

Business opportunities/ types of projects, estimated opportunity, potential risks and demand drivers are shown in the table below.

3.6.1 Key Investment Areas / Type of Projects

Table 8: Investment potential and Current Opportunities for Eco-friendly Product Innovation

Types of Project	Size of Opportunity/ Demand	Potential Risks /barriers	Finance Demand
<ul style="list-style-type: none"> Various product lines using waste material and/ or eco-friendly materials for product manufacture and opportunities for reduction, recycling and re-use of waste. 	<ul style="list-style-type: none"> Huge amounts of urban solid waste, waste from factories and waste from agro-processing provides abundant sources of raw materials that can be recycled to produce useful products. The countrywide plastics ban has opened up opportunities for production of packaging material using non-plastic materials. The charcoal ban has also increased opportunities for fuel using biomass technologies. 	<ul style="list-style-type: none"> Limited local technical skills in recycling and associated product manufacture. Equipment required, e.g. for recycling and product manufacture processes is expensive and therefore prohibitive especially for SMEs. Regulation on the production of eco-friendly products and associated enforcement of standards in the country is in its nascent stages. 	<ul style="list-style-type: none"> Conservative estimates are in the range of \$ 3 million to grow to \$ 10 million over the next 5 years²¹.

²¹ Estimated total finance facilities for expansions and new investments (not working capital) through bank loans, institutional funds (impact, VC and PE) and Saccos for the manufacturing sector is approximately \$ 1.4 billion.

3.6.1 Key Investment Areas / Type of Projects

Table 8: Investment potential and Current Opportunities for Eco-friendly Product Innovation

Investment category	Market Size	Estimated size of the investment / financing opportunity	Key challenges	Impact on Climate chang
Renewable Energy	Market potential of \$ 338 million based on ready for investment pipeline of at least 94 projects from KAM.	\$ 6 million per year to \$ 12-14 million over the next 5 years	Many projects are greenfield therefore risky for investors.	All are significant if scale is achieved ²²
Waste Management	Significant opportunity to address solid waste management for factories and at county level.	\$5 million to \$15 - \$20 million over per year the next 10 years ²³	Long payback period; Political interference in implementation of projects; Limited technical skills across the board High capital costs required for urban solid management solutions. Lack of enforcement of regulations.	
Energy Efficiency	Market potential of \$ 504 million based on ready for investment pipeline of at least 140 projects from KAM.	Estimate \$ 5 million - \$ 15-\$20million per year over the next 5 years	General lack of awareness on need for EE technologies; high upfront costs for adoption are a deterrent for many manufacturers.	
Agro-processing	Accounts for over 40% contribution to manufacturing sector and produces large amounts of waste; Government policy for biogas generation in place.	Finance demand estimate of \$ 25 million ²⁴ . Forecast is that this can grow to \$ 60million over the next 10 years.	Consistent supply chains Competitive supply chains – due to poor infrastructure in rural areas Significant upfront costs of digesters Lack of technical skills/ capacity by manufacturers.	

²² Energy use, Industrial processes and waste contribute about 20% to Kenya's GHG's emissions (see USAID 2013) for example. Efforts to improve efficiencies in all these areas will have a significant impact on climate change in Kenya especially if scale is achieved.

²³ Potential for this to be much higher if access to public sector waste is better facilitated.

²⁴ Based on discussions with financial players in the market in Kenya.

4.2 Summary Conclusions and Recommendations

Based on the market opportunities identified, the short- term investment opportunities are approximately \$62.4 million dollars per year growing to over \$480 million dollars per year within 5-10 years across the five sub-sectors in manufacturing.

4.2.1 Immediate and long term financing needs

The table below presents summary projections of the immediate and medium to long term financing needs that may provide opportunities for green bond issuance. In most of the areas there are significant opportunities for SMEs as highlighted below.

Table 10: Summary of Immediate and Long-term Financing Needs

Segment ²⁵	Immediate (Next 1-2 years) Annual Requirement	Medium to long term (5-10 years) Annual Requirement	Opportunities for SME's
Renewable Energy	\$6 million	\$12 million	Opportunities for investment in renewable sources including: <ul style="list-style-type: none"> • Solar (photovoltaic solar systems and equipment) • Small scale hydro power plants, and • Installation of systems to produce biomass/ biofuel energy
Waste Management	\$5million	\$15 million	<ul style="list-style-type: none"> • Opportunities in biomass systems for energy recovery – waste to energy anaerobic digestion; biogas to heat and energy; and biomass combustion systems for heat and energy • Urban solid waste management systems to provide collection, separation and processing services through Recycling, composting, treatment, landfills, incineration, sale of recycles and refuse derived fuel.
Agro-processing	\$25 million	\$60 million	Opportunities for implementation of biogas and biomass technologies for heat and / or power generation for agro-processors and households.
Product Innovation	\$3 million	\$10 million	Manufacture of products using waste materials and raw material alternatives that help protect the environment.

²⁵ Renewable energy and waste management are actually separate sectors but as indicated in other sections of this report, have been considered in the context of their application in the manufacturing sector, e.g. in view of energy efficiency and product innovation.

Segment ²⁶	Immediate (Next 1-2 years) Annual Requirement	Medium to long term (5-10 years) Annual Requirement	Opportunities for SME's
Energy Efficiency	\$5million	\$10 million	<ul style="list-style-type: none"> Supply of energy efficient equipment and systems, e.g. energy saving, improved insulation systems, heat recovery units, plant/ production process modifications, lighting systems and appliances. Installation of modern energy efficient systems e.g. to support on-site cogeneration of heat and electricity or tri-generation (heat, refrigeration, electricity). Consultancy services for improved energy management systems; facility design and renovations focused on energy-efficient systems and construction. Modernization of the lighting system Provision of cleaner materials, technologies and systems, e.g. production of modern energy solutions such as clean cook stoves for households or for use in product value chains.
Total	\$44 million	\$107 million	

Overall, the manufacturing sector through the various segments proposed presents viable business opportunities for climate smart financing and the green bond has significant potential to address current financing gaps in the sector. In the short term estimated financing demand is approximately \$44 million per year growing to over \$100 million per year in the next five years. Various options for issuance of green bonds in the sector may be considered including:

- Direct/ Stand-alone issuance by the manufacturing companies
- Creation of a pooled fund for the sector as the values of some of the proposed projects may be too small for individual issuance
- Issuance through banks to fund green bond projects for their clients

²⁶ Renewable energy and waste management are actually separate sectors but as indicated in other sections of this report, have been considered in the context of their application in the manufacturing sector, e.g. in view of energy efficiency and product innovation.

4.2.2 Constraints to the Issuance of Green Bonds in the Manufacturing Sector

- Many projects especially in renewable energy and waste management are greenfield therefore considered risky for investors
- Many of the projects identified are relatively small (\$3 million - \$6 million) making it more difficult/costly for single issuance;
- Long payback period for waste management projects
- Political interference in implementation of urban waste management projects
- Limited technical skills and understanding of what constitutes green projects by potential local issuers
- Fragmented policy and lack of enforcement of regulations, e.g. in waste management and renewable energy projects
- Lack of comprehensive data for investor consideration on potential green finance projects in the manufacturing sector and related sectors.
- Current limited involvement of some of the larger tier one banks in financing green projects. Involvement of tier one banks would give investors more confidence in the green bond.

4.2.3 Recommendations

Presented below are proposed recommendations to support the development of a pipeline of viable climate smart projects, address some of the constraints raised and thereby ensure successful issuance of green bonds for the manufacturing sector. The recommendations also take into account participant comments at the validation workshop held on 18th October 2018.

Viable and quick-win opportunities for financing consideration: -

There are quick-win opportunities for manufacturing companies to issue green bonds for climate smart solutions such as energy efficiency upgrades, process enhancements, renewable energy solutions and waste to energy systems. The attraction for potential investors would be supported through issuance by more established manufacturers where cash flows for repayment of facilities are more predictable.

Consider more wholly sustainable projects for financing consideration.

This includes:

- Selection of projects that ensure minimum production and green efficiency gains based on international best practice guidelines, e.g. through significant reduction in emissions and increases in production efficiency.
- Consideration of cyclical nature of projects so that proposals are not short term for projects that have secured long term financing.
- Projects should support minimal extraction of raw materials (e.g. for alternatives to plastics) and there is need to assess the calorific value/ waste coming out of bio-digesters to avoid harm to the environment (for bio-fuel technology).

Multi-stakeholder partnerships to ensure a robust and viable pipeline of deals.

These include:

- In order to mitigate risks around greenfield projects, the potential issuers may consider partnerships with early stage financiers where the green bond would provide follow-on funding once projects are ready for growth and expansion. In addition, partnerships with other intermediaries involved in preparing businesses for funding to further support the identification of viable early stage projects.

- Partnerships with industry and technical advisers, e.g. the Kenya Association of Manufacturers and SUNREF to help inform technical viability of projects.
- Partnerships with DFIs and donors involved in green financing to further enrich the pipeline.

Creation of a Pooled Fund for Bond Issuance in the Manufacturing Sector

Establishment of a vehicle to allow aggregation of small but potentially viable projects (e.g. in renewable energy and energy efficiency projects) into more substantial bonds.

Policy and Regulations

The KGBP could support advocacy for improved enforcement and regulatory compliance across the board, e.g. in the case of waste management. There is also need to push for development of a harmonized system of environmental guidelines and regulations and additional support to help producers adhere to the regulations.

In addition, current and many proposed green projects revolve around the SME sector. There is need to support heavy industries to support real growth in the manufacturing sector. This requires pushing for relevant laws that support heavy industries (e.g. need for enabling framework on taxation; sustainable legal framework to support the long project tenures; supportive land laws; carbon dioxide emissions policy; etc), development of reliable power and incentives for large ticket investments.

Capacity building across different stakeholder groups. This includes:

- Creating a platform that allows partnership between foreign experts and locals to ensure transfer of relevant technical skills and knowledge.
- Initiatives to address the skills gap on green lending within financing institutions.
- Industry wide standards for minimum of qualification/ certification of technical professionals such as environment, impact and assessment (EIA). This will ensure adequate evaluation of projects and therefore minimize project risks.

Other Recommendations

- Regional focus of projects – consider financing projects specific to local economic conditions and that would address environmental issues specific to those regions.
- Incentives to encourage investment in climate smart initiatives – the KGBP could support advocacy for tax rebates, concessions and subsidies to support adoption of climate smart initiatives by producers.
- Green bond pricing and structure – to provide an attractive proposition to prospective investors the bond needs to be competitively priced in comparison to other investment opportunities and the bond features made as simple as possible.
- Data for decision making – to support prospective issuers, KGBP could partner with the public agencies involved and other stakeholders, e.g. KAM to help improve collection and dissemination of data that would better inform green financing and investment opportunities in the sector.
- Involvement by tier one banks – possible deterrents for involvement by tier one banks need to be addressed to encourage their participation.

Annex I

Examples Of Climate Smart Projects In Manufacturing

The case studies below are compiled from various online resources (Table II on innovative products) as well as education field visits organized by KAM through the Centre for Energy Efficiency (CEECE) in Table I.

The CEECE coordinates exchange visits to enable company engineers, energy managers and consultants learn about application of various EE/RE technologies and enable technology transfer across different industries. The projects shown below include solar powered farms, mini-hydro projects, biogas generation sites and energy efficiency projects.

Table I: Case on Energy Efficiency and Renewable Energy

	Name of Company	Segment	Name of Company
1.	Redlands Roses	RE	Renewable energy project on solar PV
2.	Kaysalt, Malindi	RE	991kW solar PV system
3.	Nampak Kenya, Thika	EE	Shift of tariff from C11 to C12 Cost was KSh i6 Million with a payback period of 3 years Power factor correction Installation of solar tubes Variable speed drives Replacement of bulbs with LED bulbs.
4.	Kenya Breweries	EE	Energy conservation measures successfully implemented: Utilities (Fuel efficiency in Boilers, compressed air systems, Chillers etc.), Energy efficient lighting systems, Motors, Variable speed drives (VSDs), PLC controls
5.	Mombasa Cement Ltd Athi River	EE	Energy efficiency measures implemented: Installation of local motor capacitors, use of variable frequency drives, voltage optimization at the transformers and enhanced controls for street lighting. Energy policy and an energy management committee with clear guidelines on the energy function. Energy management program with objectives and targets.
6.	Tropical Power, Naivasha	RE	<ul style="list-style-type: none"> 2.2 MW anaerobic digester producing 18,000MWh of electricity each year 50,000 tonnes of organic waste used each year to produce clean energy 35,000 tons of liquid and solid output of natural fertilizer back to local farms 7,000 tons of CO2 reduction each year from an equivalent of 5M liters of diesel if it were burnt in thermal plants
7.	Brookside Dairy, Ruiru	EE	Application of variable speed drives on pumps/fans and adoption of high efficiency motors Application of air curtains in cold rooms and efficient refrigeration units Utilization of natural lighting and efficient lighting systems.

8.	Rukuriri Tea Factory, Embu	EE	<ul style="list-style-type: none"> Fuel switch - the factory switched from using HFO to biomass briquettes from sawdust. Proper maintenance of steam system by lagging and having efficient steam traps. Placement of translucent sheets. Installation of online capacitor banks for power factor improvement. <p>Load Scheduling</p>
9.	Embu Water and Sanitation Company	RE	Small hydro power generated from passing intake water at a head through a turbine as it goes to the treatment tank. The electricity is used for water treatment process.
10.	Bamburi Cement (Nairobi Grinding Plant)	EE	Recirculation of hot air in the combustion chamber and fuel preparation which improves the air fuel ratio efficiency. Fuel switch from HFO to rice husks and burnt tires Vector graph software which monitors power quality (black outs and dips). Capacitor bank to control power factor Load scheduling and load matching.

Source: KAM Centre for Energy Efficiency and Conservation

Table I: Case on Energy Efficiency and Renewable Energy

	Name of Company	Segment	Detail
1.	Safi Organics	Product Innovation	Low cost organic fertilizer from farm waste. Safi Organics combines rice husks, maize combs and other agricultural waste from a local network of rice processors and mixes with minced limestone and other vegetal (botanical) ingredients to create a sort of charcoal, which is used as fertilizer. He sells the fertilizer back to local farmers for \$15 per 50-kg earning the company up to \$200 for each processed ton. (The company buys the waste for approximately \$30 per ton)
2.	Kencoco	Product Innovation	Produces charcoal briquettes from recycled agricultural coconut waste. The company produces about 20 tons of briquettes every month from coconut shells, husks and other biomass materials which are abundantly available in the coastal region. The coconut waste briquettes serve the community with a source of clean energy and reduce deforestation. Compared to wood charcoal, the briquettes have a similar price, but higher heat intensity and a longer burning time, saving households money.
3.	Icoseed	Product Innovation	Converts banana stems leftover from harvesting into fiber that can be used to make fabrics for bags, purses or table mats. The enterprise buys banana stems, a by-product of harvesting, from farmers, processes it into balls of fiber and uses them to make marketable products. The products target middle-class women, including tourists. Slurry from fiber extraction is given back to farmers to make manure or use it for biogas.
4.	Crown Paints	Product Innovation	First company in the region to manufacture the eco-friendly zero VOC (Volatile Organic Compounds) paints. Zero VOC Paints have a nonthreatening environmental impact due to their high bio-degradability and are also ideal for people who are particularly sensitive to paint fumes. They will also be beneficial for painters and people who work with paint for extended periods by avoiding the chemicals that can impact respiratory health in the long term.

Table I: Case on Energy Efficiency and Renewable Energy

	Name of Company	Segment	Detail
5.	EcoPost	Product Innovation	EcoPost uses 100% recycled plastics to make aesthetic, durable and environmentally friendly plastic lumber for use in applications ranging from fencing to landscaping. Features of EcoPost® Plastic lumber: Made from 100% recycled waste plastic. Available in a variety of lengths and sizes. (2 to 4.5 inches cross-section (square/round) & 15 ft length. Available in Black Grey Brown color and can be painted to any preferred color. No chemical treatment
6.	ACME Containers	Product Innovation	ACME is a supplier of plastic injection molded industrial products to organizations such as The Coca Cola Company Ltd, East African Breweries Ltd, and Bata Shoe Company (K) Ltd. Besides supplying industrial plastic products, the company produces a wide range of plastic injection molded domestic products such as chairs, tables, basins, buckets & more. All of ACME's products are available in all major supermarkets and wholesalers. The company also supplies products to UNICEF, ICRC & IOM.

Source: Various Online Sources

Annex II

Project Profiles/ Case Studies

KTDA:**Enhancing tea processing efficiency through energy self-sufficiency**

The Kenya Tea Development Agency is a quasi-private entity charged with the management of tea factories and marketing of processed tea. Biomass and grid energy have been the main sources of power for factory operations. To improve energy supply to four tea factories in central Kenya, Kenya Tea Development Agency benefited from an AFD / Co-operative Bank SUNREF credit facility in 2014 of US \$ 10.8 million (Total amount was 15.5 million with the balance being used for to technical assistance). The objective was to build a hydro power plant to reduce costs in processing tea and running factory operations. The hydro plant was installed in Gura River and helped generate supply of 5.6 MW of electric power to the 4 adjacent tea factories. Hydro projects have a typical payback period in excess of 8 years and no commercial loan in the country could provide a tenor adapted to that need. The facility helped bridge that gap by providing a 12-year loan.

Impact:

- Completion of the project enabled the factories to reduce energy costs by 30%,
- Improve the power supply of the factories while selling surplus power to the Kenya Power and Lighting Company (KPLC)
- Through the credit line, the 4 Kenyan Tea Development Agency factories have adequate supply of hydro-electric power to run operations. It both increased the use and quality of renewable energy and contributed to reduce energy costs. Kenya Tea Development Agency therefore decided to go for several other hydro projects to provide similar benefits to other factories.
- Green Energy generated: 25.32 GWh/y; Emission Savings: 16 t eq CO₂/y.

Other benefits for KTDA:

Affordable financing, quick turnaround time to access loans and friendly terms.

Lessons:

- Need for technical assistance interventions to make projects more bankable for consideration by commercial financiers.
- Consideration of longer term tenures given the long term nature (pay-back period) of the projects.
- Innovative solutions that impact more than one beneficiary – the project addressed energy needs for four factories.
- Climate smart initiatives specific to local economic activities.

Meru Co-operative:

Overhauling milk processing equipment to reduce energy costs and enhance quality

Meru Central Farmers' Cooperative Society Limited is a farmers' milk buying, processing and marketing establishment, which produces chilled and ambient (long life) dairy products.

In order to improve milk productivity and processing efficiency, the Co-operative secured an AFD / Co-operative Bank SUNREF credit facility whose objective was to reduce energy costs and minimize milk losses.

Prior to the project, the Co-operative was powered by grid energy and a stand-by diesel generator. The SUNREF technical assistance team reviewed the conclusion of an energy audit carried out in the facility, validated the new proposed equipment and designed the new workshop layout. The Co-operative benefited from a USD 2.3 million loan through Cooperative Bank to enable it replace its old inefficient equipment with a new set of energy efficient ones, thus significantly reducing energy consumption and costs. Total project amount was \$ 3.3 million. As part of the project, Meru Central Farmers' Cooperative installed a biomass steam boiler, a pasteurizer, a homogenizer, and a sterilizer kit leading to improved energy efficiency. The loan was provided at favourable terms, enabling Meru Cooperative to demonstrate an acceptable pay-back period to the bank.

Impact:

- Energy consumption went down 20% (including 60% on diesel) leading to significant financial gains.
- In addition, this energy efficiency project entailed a series of positive effects leading to higher productivity and increased quality: milk loss was reduced by 10%, water loss by 15%, chemicals reduced by 15% and milk quality improved due to a new UHT line. The improved quality of milk also allowed them to start new product lines. Due to the development of new products and the reliability of energy sources, sales increased dramatically.
- Thus through the credit line, Meru Central Farmers' Cooperative not only benefited from a great improvement of its energy consumption, but also from important other financial gains due to the higher quality of products.
- Energy savings: 1,54 GWh/y; Emissions savings: 532 t eq CO₂/y

Lessons:

Involvement of a technical partner to determine energy needs, carry out energy audits and advise on most appropriate/ suitable solutions.

The impact of the credit line went beyond the initial goal of reduced energy consumption through energy efficiency interventions to include higher productivity, increased product quality and higher sales.

International Case Study:

The Rebbie Thermal Plant - Ethiopia's Waste to Energy Plant²⁷

A new waste-to-energy plant installed at Addis Ababa's Koshe dump site begun operations in 2018. The plant is expected to incinerate 1,400 tons of solid waste every day (about 350,000 tonnes annually), representing 80 % of the city's rubbish and supply the city with 30 % of its household electricity needs.

The project is the result of a public-private-partnership between the Government of Ethiopia and a consortium of international companies: Cambridge Industries Limited (Singapore), China National Electric Engineering and Ramboll, a Danish engineering firm. Total project cost is \$ 118.5 million.

In waste-to-energy incineration plants, rubbish is burned in a combustion chamber. The resulting heat is used to boil water until it turns to steam, which drives a turbine generator that produces electricity. The Rebbie plant will generate approximately 185 giga watt hours (GWh) per year through two 25 megawatt (MW) steam turbines. Through the combustion process, it will also sort valuable and finite metals for recycling. In cities where land is in short supply, "waste-to-energy" incineration has a number of advantages including: making use of limited space, generates electricity, prevents the release of toxic chemicals into groundwater, and reduces the release of methane into the atmosphere. Methane is a potent greenhouse gas generated in landfills that is 25 times more climate change potent than carbon dioxide. The Rebbie plant operates within the strict emission limits of the European Union. The plant adopts modern back-end flue gas treatment technology to drastically reduce the release of heavy metals and dioxins produced from the burning.

Waste incineration is popular in Europe, where nearly one quarter of all municipal solid waste is incinerated. France has 126 waste-to-energy plants, while Germany has 121 and Italy 40.

The Rebbie project is a significant first for the African region, where waste management is an immense problem. Usually, waste ends up in vast landfill sites or is dumped releasing huge amounts of plastic and chemicals into the ecosystems.

²⁷ Sources:

UNEP: <https://www.unenvironment.org/news-and-stories/story/ethiopias-waste-energy-plant-first-africa>
Construction 21 International: <https://www.construction21.org/articles/h/africa-s-first-waste-to-energy-plant-to-be-commissioned-in-ethiopia.html>
<https://static1.squarespace.com/static/57c7f80620099eafefefe77a/t/57d6c6401b631b0c62c6d886/1473693259763/Rebbie+Brochure+Final.pdf>

Annex III

This section provides project summaries for ventures seeking finance and that may be considered as candidates for funding through the KGBP.

Waste to Energy: Conversion of Plastics to Furnace Oil

Item	Description/ Details
Project Title	Waste to energy
Overview of project and opportunity	Conversion of plastics to furnace oil (Diesel) with by-product of carbon
Location of project (County)	Thika
Institutional capacity: (No of years in business, team capability, etc)	One year in operation
Total funding required	\$ 1 million
Company contribution	\$ 1.8 million + \$ 2.4 million funding from ICDC
Proposed application of funds	\$ 700,000 for expansion and \$ 300,000 for pre-processing of waste
Potential risks and proposed mitigation	Market does not buy products. There is a huge target market expected to absorb the products. The project targets industries which need the furnace oil for their fuel requirements. The carbon by-product will be sold as carbon black for use in colouring items and sold to cement production companies.
Potential benefits/ cost savings for beneficiaries/ clients	Partnering with manufacturers to recycle their waste.
Comment on potential GHG emission reduction/ effect on the environment	Provides an alternative to the need to extract of fossil fuels. Furnace oil also emits less smoke and fumes than fossil fuels.
Overall assessment of project sustainability/ Opportunity for green bond	Management of plastic waste; can be replicated in other counties

Source: Kenya Climate Ventures

Waste to Energy: Faecal Sludge to Briquettes

Item	Description/ Details
Project Title	Briquettes Production Venture
Overview of project and opportunity	The product is carbonised round shaped briquettes made from faecal matter and sawdust with molasses as the binder. The biomass fuel seeks to provides] an environmentally sustainable, hygienic/ clean and potentially more affordable alternative to fire wood or charcoal and targeting both domestic and industrial usage.
Location of project (County)	Nakuru
Institutional capacity: (No of years in business, team capability, etc)	Has completed a successful pilot phase and company will retain the production and marketing team involved in the pilot phase.
Total funding required	\$ 77,000
Company contribution	Company received grant funding to carry out the required research/ develop and test product and acquire key machines and equipment that will support realization of projected output. It also expected that part of the operations will be supported by projected sales of \$ 90,000 over the two years.
Proposed application of funds	Production and operations costs for first two years of operation before break even
Potential risks and proposed mitigation	Risk that the business does not achieve its output/ sales growth targets – conservative growth estimates; focus on robust distribution strategy; acquisition of key production machines which has been completed. Competition – first mover advantage benefits; Maintaining consistency in production of quality briquettes at affordable prices and gaining competitive advantage through streamlining the production process and saving on costs to be able to compete on price.
Potential benefits/ cost savings for beneficiaries/ clients	Addresses issue of faecal sludge management in the county and especially low income/ unsewered areas
Comment on potential GHG emission reduction/ effect on the environment	As above
Overall assessment of scalability and growth	The business is expected to achieve break even in year three.
Overall assessment of project sustainability/ Opportunity for green bond	There is increasing demand for biomass fuels as a preferred source of energy in the country. The proposed venture also helps to address the issue of sanitation in the target low income areas of Nakuru county by using the faecal sludge collected from these areas as a key raw material for the production of the briquettes. The project Can be implemented in other counties and help address sanitation issues

Source: Nakuru Water and Sanitation Company/ SNV

Energy Efficiency Solutions

Item	Description/ Details
Project Title	Energy Efficiency
Overview of project and opportunity	Energy Efficiency Solutions Targeting Manufacturers and Commercial Enterprises
Location of project (County)	Headquartered in Nairobi with countrywide operations
Institutional capacity: (No of years in business, team capability, etc)	One year in Operation
Total funding required	\$ 200,000
Company contribution	Internal capacity building to prepare company for scale-up
Proposed application of funds	Slow take-up of solution by prospective clients; Strong marketing initiative and partnerships with institutions like KAM.
Potential risks and proposed mitigation	Up to 30% savings in energy costs.
Potential benefits/ cost savings for beneficiaries/ clients	Efficient use of resources – reduced energy consumption
Comment on potential GHG emission reduction/ effect on the environment	Demand for energy efficiency solutions is growing across different sectors
Overall assessment of scalability and growth	As above. Also target clients are stable manufacturers and commercial enterprises with significant energy needs such as shopping malls.
Overall assessment of project sustainability/ Opportunity for green bond	The green bond funds could facilitate take-up of the energy solutions through loan facilities to target clients to help them offset the high upfront fees. Repayment can then be structured around monthly repayments which provides predictable cash flows on the facilities. The target clients have the capacity to repay.

Source: Kenya Climate Ventures

ANNEX IV LIST OF PERSONS MET

Name /Position	Organisation
1. Anjali Saini- Independent Energy and climate change consultant	consultant KPMG and formerly AECF;
2. Peter Kinyanjui – General manager, Group Business Development	ABC Bank
3. Lee Gachomba – Head of SME Banking	
4. Philip Wambua - General Manager Treasury and Financial Institutions	
5. Martin Mureithi, Senior Dealer - Markets	Barclays Bank of Kenya
6. Dr. L. Murei, Switch Africa Green project manager	UNDP/Africa Agricultural Trade and Investment Fund
7. Sheila Karue - Consultant	
8. Kamala Ernest – Programme Management Officer	
9. Elijah Isabu, SUNREF program coordinator	KAM
10. Joyce Njugu, Head of consulting	
11. Grace Kibuthu Ogola, Financial Sector Specialist	International Finance Corporation
12. Mr. Eric Kimani Managing Director	Palmhouse Dairy
13. Wangui Muna Consultant	Climate Focus ;
14. Joshua Anampi	National Environmental Trust Fund
15. Almut van Castaren Director	Equator Kenya;
16. Rishi Kubchandani, Investment Manager	GROFIN;
17. Mr. A. Njagi	Operations Director, KTD
18. Masood Mahmoud	Financial Advisor to KCVDF, World Bank
19. Marion Moon	Proprietor Wanda Organic
20. Titus Gitau	MEA Ltd., Director
21. Kamau Kuria	MD Coffee Management Services Ltd.
22. Florence Kariuki	Adviser SNV Smart Water for Agriculture ;
23. Helene Carlson Rex	Program Leader Sustainable Development World Bank;
24. James Mutonyi, Managing Director	AgMark ;
25. Catherine Watson, Chief of Program Development	World Agroforestry Center;
26. Mr. George Nesbitt, Managing Director	TEA Warehouses Ltd.
27. Richard Muli, Trade Manager	AIMS Project muli@globalcommunities.org
28. Viola Maina, Director	Smart Farmer Africa, viola@smartfarmerkenya.com
29. Hanna Dohrenbusch, Head Corporate Affairs	Sunculture, Small scale irrigation
30. Mr. Nicholas Nesbitt , Regional Manager	IBM Africa
31. Francis Miano, General Manager- Technical Services	Kenya Tea Development Agency (KTD)
32. Doreen Mutoro	China Road and Bridge Corporation
33. Joan Karani, Operations and HR Manager	Shengli Construction Company
34. Michael Kariuki, Chairman	Mt Kenya Matatu Owners Association
35. Anthony Weru, Senior Public Private Dialogue (PPD) Officer	Kenya Private Sector Alliance (KEPSA)
36. Doris Abaya	National Transport and Safety Authority (NTSA)
37. Geoffrey Gangla, CEO	Genghis Capital
38. Alfonse Iregi, Corporate Finance	
39. Ms Aliya Khanbai, Head Industrial Sector	Stanbic Bank
40. Susan Njuguna, Corporate and Investment Banking	
41. Angela Muga , Corporate Banking	Cooperative Bank
42. Paul Ohaga, Chief Investment Officer	Kenya Climate Ventures

ANNEX - REFERENCES

- African Guarantee Fund. 2017. Green Guarantee Facility.
-
- Agence Française de Développement (AFD). May, 2017. Success Stories: Sunref East Africa Projects
-
- Central Bank of Kenya. 2016. Bank Supervision Annual Report
-
- Centre for Energy Efficiency and Conservation. 2017. At the forefront of Green Growth Sustainability in Kenya.
-
- Daily Nation. June 6, 2018. Kenya Ranked High for Renewable Energy. <https://www.nation.co.ke/news/Kenya-ranked-high-for-renewable-energy/1056-4597554-30vswa/index.html>
-
- Government of Kenya. 2016. Green Economy Strategy and Implementation Plan – Kenya 2016-2030
-
- Green Economy Strategy and Implementation Plan – Kenya 2016-2030.
-
- IFC and UNEP Inquiry. 2015. Aligning Kenya’s Financial System with Inclusive Green Growth.
-
- IFC (2016). Climate Smart Investment Opportunities in Emerging Markets.
-
- Kenya Association of Manufacturers and Ministry of Energy. 2017. Centre for Energy Efficiency and Conservation: At the Forefront of Green Growth Sustainability in Kenya.
-
- Kenya National Bureau of Statistics. (2017). Economic Survey 2017.
-
- Kenya National Bureau of Statistics. (2018). Economic Survey 2018.
-
- KPMG and EAVCA. 2017. Private Equity Sector Survey of East Africa for the Period 2015 to 2016.
-
- National Environment Management Authority. 2015. Kenya Second National Communication to the United Nations Framework Convention On Climate Change. Executive Summary.
-
- Republic of Kenya. Ministry of Environment and Natural Resources. Kenya National Adaptation Plan 2015-2030: Enhanced climate resilience towards the attainment of Vision 2030 and beyond.
-
- The Global Impact Investing Network & Open Capital Advisors. (2015). The Landscape for Impact Investing in East Africa.
-
- United Nations Environment Programme (UNEP). 2014. The Green Economy Assessment Report – Kenya.
-
- USAID. 2017. Greenhouse Gas Emissions in Kenya: Fact Sheet.



**Green Bonds
Programme**
— KENYA —

STUDY SUPPORTED BY:



PREPARED BY:

