



THE REPUBLIC OF UGANDA

MINISTRY OF TRADE, INDUSTRY AND COOPERATIVES

GREEN MANUFACTURING STRATEGY

Enhancing Development and Adoption of Green Manufacturing Strategies and Practices for Improved Resource Productivity, Environmental Sustainable Performance and Competitiveness.

2020/2021 – 2024/2025

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HON. AMELIA ANNE KYAMBADDE (MP)
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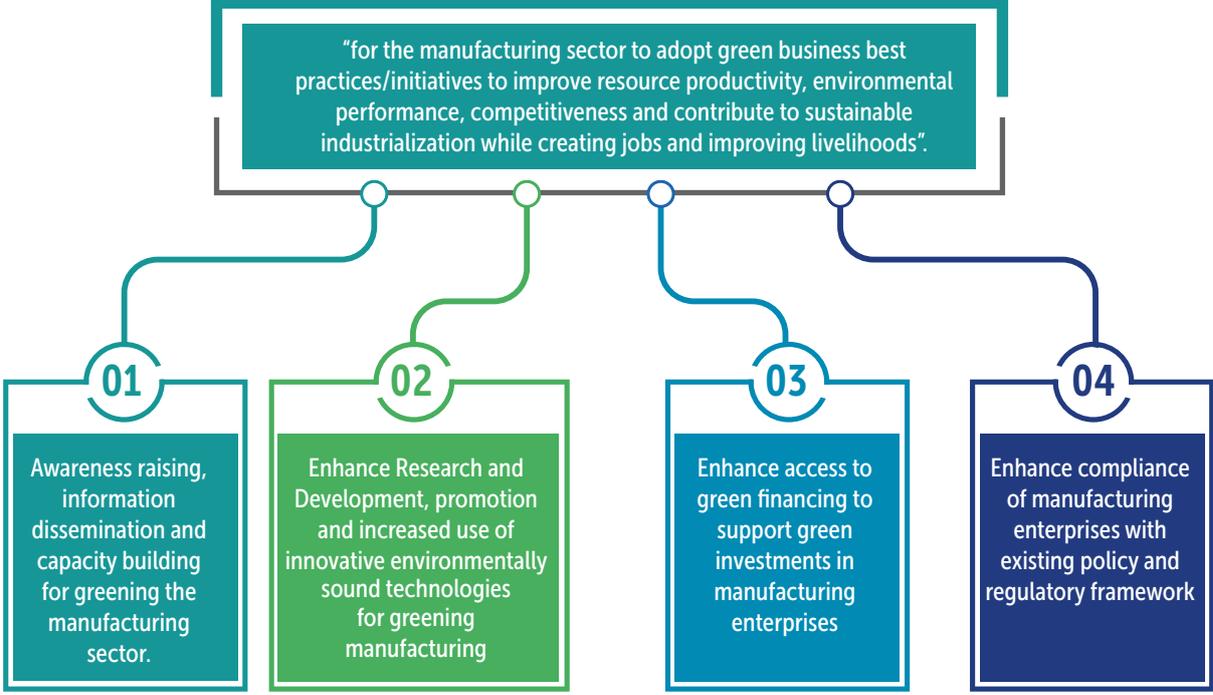
FOREWORD

Unsustainable consumption and production patterns globally, have resulted into resource depletion and severe environmental degradation due to high demand which out-competes the renewal capacity of natural resources. Therefore, there is an urgent need to adequately manage the use of these resources and develop alternatives that involve transformation of industrial processes and practices into sustainable development and poverty eradication.

As the mandate of Ministry of Trade, Industry and Cooperatives is to “formulate, review and support policies, strategies, plans and programs that promote and ensure expansion and diversification of trade, cooperatives, environmentally sustainable industrialization, appropriate technology development and transfer to generate wealth for poverty eradication and benefit the country socially and economically”, Green Manufacturing Strategy has been developed following the National Green Growth Development Strategy and the successful implementation of the Switch Africa Green (SAG) programme in the manufacturing MSMEs in Uganda from the year 2015 to 2018. During the implementation of the SAG Programme, industrialists including Micro, Small and Medium Enterprises (MSMEs) were sensitized to adopt the “three Rs” strategies; namely, reducing consumption of raw materials in production processes; switching to renewable sources of energy and materials; and redesigning products to contain fewer materials and consume less energy, water, etc. during use.

The Government aspires to have a sustainable manufacturing sector, and to increase their performance in domestic and international trade, while simultaneously safeguarding the environment as highlighted in NDPIII 2020-2025. My Ministry, therefore launches this highly consultative developed Green Manufacturing Strategy 2020/21-2025 in order to provide the public and the private sector with a platform for fostering their efficiency in manufacturing operations contributing to higher productivity, competitiveness and achieving sustainable development. This is in line with the Uganda Vision 2040, the National Development Plan III, the Uganda Green Growth Development Strategy (2017), the Uganda Integrated Sustainable Development Goals (iSDG) model, and United Nations Framework Convention on Climate Change (UNFCCC) which Uganda signed in April 2016 and ratified in September 2016.

The Strategy’s vision aims at creating a resource efficient, competitive and sustainable manufacturing sector that contributes to prosperity for all. The overall objective is “for the manufacturing sector to adopt green business best practices/initiatives to improve resource productivity, environmental performance, competitiveness and contribute to sustainable industrialization while creating jobs and improving livelihoods”. The strategic objectives and interventions based on best practices to achieve the above vision and the overall objective have been outlined below.



I urge all the industrialists to use this Green Manufacturing Strategy as a technical guideline for adopting the green business practices for not only long term cost savings benefits but also equally importantly for brand enhancement, better regulatory traction and greater ability to attract talents. It is my conviction that this strategy document will provide a solid basis for greening manufacturing enterprises and economic recovery.

Let me take this opportunity to thank especially, the European Union for the financial support and United Nations Environment Programme, United Nations Development Programme for the technical support provided towards the completion of this strategy. I further acknowledge the contributions of all those policymakers, the private sector, the academia and civil society partners that participated in the formulation and the validation process of this strategy which is line with NDP III.

I thank you all.

For God and My Country

HON. AMELIA ANNE KYAMBADDE (MP)
MINISTER OF TRADE, INDUSTRY AND COOPERATIVES

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ACRONYMS

| | | | |
|-------------------------|--|----------------|--|
| BOD | Biological Oxygen Demand | NEAP | National Environment Action Plan |
| BUBU | Buy Uganda Build Uganda | NEMA | National Environment Management Authority |
| CDM | Clean Development Mechanism | NIP | National Industrial Policy |
| CO₂eq | Carbon dioxide Equivalent | NPA, | National Planning Authority |
| COD | Chemical Oxygen Demand | NSPSD | National Strategy for Private Sector Development |
| CP | Cleaner Production | NSQP | National Standard and Quality Policy |
| DfE | Design for Environment | NTP | National Trade Policy |
| EAC | East African Community | PWD | People With Disabilities |
| EIA | Environment Impact Assessment | R&D | Research and development |
| EnMS | Energy Management Systems | RECP | Resource Efficient and Cleaner production |
| ERA | Electricity Regulatory Authority | SAG | Switch Africa Green |
| ESO | Energy System Optimisation | SCP | Sustainable Consumption and Production |
| EU | European Union | SDGs | Sustainable Development Goals |
| GHG | Green House Gases | STI | Science Technology and Innovation |
| IEE | Industrial Energy Efficiency | UBOS | Uganda Bureau of Statistics |
| IS | Industrial Symbiosis | UCPC | Uganda Cleaner Production Centre |
| ISO | International Standard Organisation | UDC | Uganda Development Corporation |
| kWh | Kilowatt hour | UFZA | Uganda Free Zones Authority |
| M&E | Monitoring and Evaluation | UGGDS | Uganda Green Growth development Strategy |
| MEMD | Ministry of Energy and Mineral Development | UIA | Uganda Investment Authority |
| MES | Ministry of Education and Sports | UNBS | Uganda National Bureau of Standards |
| MFPED | Ministry Finance Planning and Economic Development | UNEP | United Nations Environment Programme |
| MLGSD | Ministry of Labour Gender and Social Development | UNDP | United Nations Development Programme |
| MSMEs | Micro, Small and Medium Enterprises | UNIDO | United Nations Industrial Development Organisation |
| MSTI | Ministry of Science Technology and Innovation | UNOPS | United Nations Office of Project Services |
| MTIC | Ministry of Trade Industry and Cooperatives | | |
| MWE | Ministry of Water and Environment | | |
| NDPs | National Development Plans | | |

EXECUTIVE SUMMARY

The Green Manufacturing Strategy 2020/2021- 2024/2025 has been developed through a consultative process to provide interventions that focus on strengthening the application of environmentally and socially sensitive practices to reduce the negative impact of industrial processes and product use (IPPU) while, striving for economic benefits.

The United Nations Conference on Sustainable Development Rio +20 (2012), as stated in “**the Future We Want**” document chapter II, recognizes that the transition to green economy has a greater potential to foster economic growth, employment creation, and the reduction of poverty and inequalities. Agenda 2063 “**the Africa We want**” recognizes sustainable and inclusive economic growth through a Science, Technology and Innovation (STI) driven manufacturing-based industrialization as one of the key priority areas to achieve sustainable development in Africa.

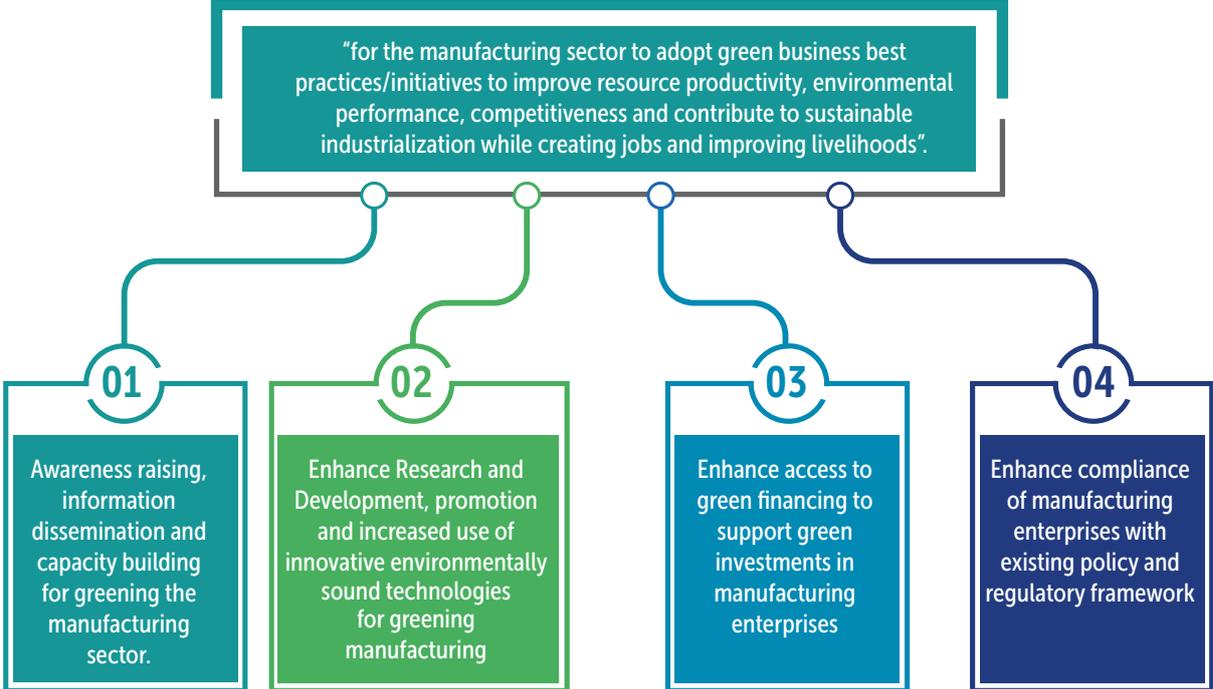
Uganda’s Vision 2040 aspires to pursue economic development and socioeconomic transformation premised on the principles of a green economy such as equity, environment sustainability, resource efficiency, and inclusiveness. The Vision 2040 further recognises sustainable industrialization as one of the pathways to lead Uganda to the middle-income status. However, the manufacturing sector is dominated by Micro, Small and Medium-sized Enterprises which are low resource efficient and high polluters due to use of inefficient technologies in their operations, poor operating practices, inadequately skilled labour force and low awareness of the benefits of green practices. This impedes the capacity of manufacturing enterprises to compete in regional and international markets and contributes to environment degradation.

Greening the manufacturing sector is one of the pathways that will enable Uganda change its growth model towards an inclusive economic development while protecting natural capital, addressing climate change, creating jobs and accelerating economic growth.

The Green Manufacturing Strategy aims at supporting development and adoption of green business strategies and use of Sustainable Consumption and Production practices in enterprises within the manufacturing sector in order to improve resource productivity, environmental performance, competitiveness and contribute to sustainable industrialization while creating jobs and improving livelihoods. Green Manufacturing focuses on making business entities environmentally friendly and entails investments in resource-saving technologies. It calls for a culture of environmental awareness and promotion of resource conservation. It means firms need to control pollution, improve energy efficiency or use alternative energy sources, minimize waste, use biodegradable waste materials, and adoption of green technologies.

The Strategy is in line with the Uganda Vision 2040, the third National Development Plan (NDP III) 2020-2025 as well as the National Green Growth Development Strategy and the Uganda Integrated Sustainable Development Goals (iSDG) model.

This Strategy's overall objective will be achieved through the following specific objectives:



▲ Enhancing environmental and waste management concerns in iron and steel industry

A summary of the strategic interventions is indicated as below.

- i) Facilitate and or strengthen a consultative mechanism among public sector, academic and research institutions, service providers, manufacturers and civil society at national and international levels for sharing of experience, skills and knowledge on green manufacturing practices, technologies and products.
- ii) Support promotion and implementation of resource efficient and pollution prevention programmes in manufacturing enterprises for improved productivity, safety and health and environment protection.
- iii) Support capacity building of technical institutions as service providers to enterprises to facilitate adoption of green technologies and practices.
- iv) Develop a communication strategy (mechanism for disseminating information) to enhance awareness and knowledge towards attainment of green technologies, products and the economic, environmental, and social benefits that accrue from green manufacturing industries
- v) Support the necessary collaborative research and development programs, and strengthen linkages among R&D institutions, government and manufacturing enterprises to foster green innovation, green jobs and transfer of green technologies.
- vi) Support and advance R&D for greening existing manufacturing methods or processes, machines or systems, creating new processes and products
- vii) Develop R&D supporting infrastructure for greening manufacturing such as incubation centres, research grants, common user facilities, STI parks,
- viii) Enhance provision of fiscal incentives for triggering and prospering green investments by enterprises in the manufacturing sector.
- ix) Encourage Financial support institutions to provide green finance to manufacturing enterprises.
- x) Organize national forums and capacity building events to facilitate exchange of information, enhance cooperation and harmonize goals and priorities, and establish a coordinated approach among relevant ministries, departments and agencies
- xi) Support establishment of a portal of best practices, tools and methodologies and implementation of Compliance Assistance Programmes to help enterprises improve resource efficiency; reduce pollution while meeting regulatory and certification requirements.
- xii) Enhance the capacity of regulatory agencies to enforce laws and regulations relevant to operations of enterprises in the manufacturing sector

The Green Manufacturing Strategy development which was supported by the European Union through the Switch Africa Green Program, after learning from the success stories, the challenges and lessons, presents the introduction and Background, Review of National Policies, Strategies and Legal Frameworks; International best practices for greening the manufacturing sector; Vision, Mission and Objectives; Implementation Plan Matrix; Resource Mobilization and Funding of the Strategy; Monitoring and Evaluation, Risk Management and Communication and Dissemination Plan.

The Strategy has been phased in short, medium and long term implementation time frame. The total cost of implementation estimated is UGX90,381,299,700 (2020/21-2024/25); UGX129,469,103,800, (2025/26-2029/30) ; UGX 210,332,500,000, (2030/31-2034/2035)

The Green Manufacturing Strategy will be spearheaded by Ministry of Trade, Industry and Cooperatives and implemented within the existing institutional framework, through integrated planning and budgeting of MDAs, private sector organizations, civil society and Development Partners, and will be reviewed after five years or earlier.

1. INTRODUCTION

The United Nations Environment Programme (UNEP), with financial support from European Union (EU), worked with United Nations Development Programme (UNDP) and United Nations Office for Project Services (UNOPS) to implement Switch Africa Green (SAG) project in six countries in Africa since 2015. The SAG project had a broad objective to support countries in Africa to achieve sustainable development by engaging in transition towards an inclusive green economy, based on Sustainable Consumption and Production (SCP) patterns, while generating growth, creating decent jobs and reducing poverty.

Under the framework of the SAG project, UNEP worked with government of Uganda through the Ministry of Trade, Industry and Cooperatives to develop a green manufacturing strategy for Uganda.



Steam generation by a boiler fired by measured firewood ▲

2. BACKGROUND

The United Nations Conference on Sustainable Development Rio +20 (2012), as stated in “the Future We Want” document chapter II, recognizes that the transition to green economy has a greater potential to foster economic growth, employment creation, and the reduction of poverty and inequalities.¹ Sustainable Development Goals (SDGs), especially SDG 12 on Sustainable Consumption and Production, SDG 9 on Industrialization, Innovation and Infrastructure, recognize principles of sustainable/green manufacturing as significant action measures in contributing to achieving goals of the 2030 Agenda for Sustainable Development².

At African region level, African Agenda 2063 “the Africa We want” recognizes sustainable and inclusive economic growth through a Science, Technology and Innovation (STI) driven manufacturing-based industrialization as one of the key priority areas to achieve sustainable development in Africa³. The African road map on Sustainable Consumption and Production for 10-YFP implementation (2018-2023) identifies greening of business as one of the key cross cutting issues to achieve SCP. It further calls for application of Cleaner Production (CP), developing Integrated Solid Waste Management (ISWM) plans, building capacity for addressing specific waste streams and promoting efficient use of resources (materials, energy, and water) in order to decouple economic development from environmental degradation.

The East African Industrialization Strategy (2012-2032) recommends East African Community (EAC) Partner States to promote sustainable industrialization through adoption of Resource Efficient and Cleaner Production (RECP) which is among the key action measures for greening manufacturing enterprises.⁴

At the national level, the Uganda Vision 2040 aspires to pursue economic development and socioeconomic transformation premised on the principles of a green economy such as equity, environment sustainability, resource efficiency, and inclusiveness. The Vision 2040 further recognises sustainable industrialization as one of the pathways to lead Uganda to the middle-income status and has identified a number of supportive interventions which include;

- i) Pursuing policies aimed at leapfrogging especially in the areas of Science, Technology and innovation (STI),
- ii) Developing and implementing a National science technology and engineering system that will help in initiating, importing, modifying and diffusing new technologies,
- iii) Accelerating industrialization through upgrading and diversification to effectively harness local resources, offshoring industries and develop industrial clusters along value chains to achieve sustainable industrial development.

In the NDPII it was noted that Industrial development remains functionally inefficient, costs of production were high, resources are wasted and potential synergies that could lead to increased output were not realized. Environment and natural resources are under threat from both natural and man made drivers of change including improvement of life of the population, rapid population growth, unplanned urbanization, expansion of informal settlements and industrialization. Pollution levels are on the increase arising from e-waste, unsound use of chemicals and oil and gas development.

There is therefore a need to maintain a sustainable environment and natural resource base that is resilient to natural and man made threats as the demand for natural resources, food items and manufactured goods surges.

1 United Nations 2012, The future we want: resolution adopted by the General Assembly on 27 July 2012

2 United Nations 2015, Transforming our world: the 2030 agenda for sustainable development

3 African Union Commission (AUC), 2015, Agenda 2063: The Africa We Want

4 East Africa Commission 2012, The East Africa Industrialization strategy 2012-2032

2.1 THE MANUFACTURING SECTOR IN UGANDA

2.1.1 Description of the manufacturing sector

The manufacturing sector in Uganda is dominated by Small and Medium-sized Enterprises, which account for over 90% of the enterprises and generating over 80% of the manufactured output. The average contribution of manufacturing to GDP has been ranging from 7.5% in 2007/8 to 8.4% in 2017/18 respectively⁵. Uganda's manufacturing exports as a percentage of total exports stood at 22.5% in 2018/19 against a 30 year vision target of 50%. Although the sector has been affected by COVID-19 in terms of exports, it is largely engaged in the production of low-value added products.

The sector comprises mainly manufacture of food products, beverages, tobacco products, textiles and clothing apparel, leather and leather products, wood and wood products, paper and paper products, chemicals and chemical products, pharmaceuticals, medicinal chemicals and botanical products, rubber and plastics products, basic metals and fabricated metal products, cement and bricks. Most manufacturing enterprises are located in major towns such as Kampala, Wakiso, Mukono, Mbarara, Masaka, Mbale and Jinja which are within Lake Victoria basin and near the banks of River Nile. Both water bodies and their water balance are crucial to Uganda and therefore pollution of the water bodies by industrial activities is a cause of great concern and need for sustained action.

SMEs generate
OVER 80%
of Uganda's
manufactured
output

Manufacturing
exports 2018/19
22.5%

30 year vision
target
50%



Fruit processing and drying using solar driers ▲

5 Uganda Bureau of Statistics 2017 and 2018, Statistical Abstract report

Like in many developing countries, manufacturing enterprises in Uganda are low resource efficient and high polluters (*table1*) due to use of inefficient technologies in their operations, poor operating practices, un-skilled labour force, low awareness of the benefits of green practices, inadequate preventive maintenance, competing priorities and pressure for short term profits. Furthermore, most of the Micro Small and Medium Enterprises (MSMEs) lack the internal capacity to assess, identify and implement measures to improve resource efficiency and reduce environmental pollution. The above situation is exacerbated by escalating resource prices and scarcity making it very difficult for MSMEs to sustain the high cost of material resources, energy and water for production while remaining competitive in the market. The above highlighted constraints among other factors have greatly contributed to low levels of competitiveness of Ugandan manufacturing enterprises to compete in regional and international markets. This is likely to affect the attainment of Uganda Vision 2040 target of 50% of total exports being locally manufactured goods if such innovative practices are not adopted.

Table 1: Showing industrial pollution loading for selected sectors⁶

| SECTORS | DAIRY | TEXTILE | BREWERY | FISH | PAPER & PULP | SOFT DRINKS | CHEMICALS | OTHERS |
|--|-------|---------|---------|-------|--------------|-------------|-----------|--------|
| POLLUTION LOAD (KG/YEAR) * 10⁵ | 93.8 | 5.3 | 2,336.8 | 375.3 | 2.8 | 1,240 | 72.3 | 531.5 |
| PERCENTAGE | 2.01 | 0.11 | 50.17 | 8.06 | 0.06 | 26.62 | 1.55 | 11.41 |

Source: Ministry of Water and Environment, Uganda.

2.1.2 Adverse impacts of manufacturing activities on the Environment

Like many developing countries, Uganda is currently pursuing a policy of rapid industrialization, that is likely to have significant adverse impacts on the environment and businesses if no mitigation measures are taken into consideration. As it was highlighted already, Most manufacturing enterprises are low resource efficient and often high polluters due to use of inefficient technologies and poor manufacturing practices. As such, pollution of air, land and water is one of the major environmental problems associated with the manufacturing sector. Other negative impacts on environment are use of toxic materials, greenhouse gas emissions (GHGs), energy efficiency, product impact.

Pollution from manufacturing processes can contribute to climate change as well as negative health to humans and wildlife. Some of the specific environmental, social and economic impacts due to manufacturing processes in Uganda include;

- i) Over exploitation of resources due to low productivity caused by inefficient manufacturing processes that lead to excess use of materials, water and energy;
- ii) Pollution of surface water and destruction of aquatic life from untreated or partially treated waste water discharged directly or indirectly into the water bodies;
- iii) Increased air pollution due to release of Oxides of Sulphur (SO_x) and oxides of Nitrate (NO_x), and greenhouse gases (GHGs) from manufacturing processes;
- iv) Health and safety impacts due to poor working environments affecting health and safety of workers and communities in the neighborhoods of manufacturing plants;
- v) Pollution of land, soil and underground water caused by dumping of solid waste from manufacturing enterprises and poorly designed and managed landfills; and
- vi) Damage to environment and Health concerns due to product use and pollutants such as heavy metals discharged from manufacturing enterprises into surrounding environment and or sold in public for use in case of manufactured products.

⁶ Ministry of Water and Environment (2010), Industrial pollution loading into Lake Victoria Central and Eastern Uganda. Pilot study report

2.2 GREEN MANUFACTURING

2.2.1 Definition of Green Manufacturing

Different researchers and organizations define green manufacturing in different ways based on their discipline and training. According to Cortellini (2001), green manufacturing is a method of manufacturing that minimizes waste and pollution, slows the depletion of natural resources while lowering the extensive amounts of trash that enter landfills.⁷

According to Atlas and Florida (1998), green manufacturing involves efficient production processes that encompasses resource reduction, recycling and green design.⁸ The Confederation of Indian Industry (CII) defines green manufacturing as sustainable industrial activity which involves transformation of industrial operations in three ways: (1) using Green energy, (2) developing and selling Green products and (3) employing Green processes in business operations. Hicks and Dietmar (2007) stresses on design improvement, utilization of clean energy and raw materials, the implementation of advanced processes, technologies and equipment⁹.

From the above definitions, in this strategy, Green Manufacturing (GM) has been defined as a *“the application of environmentally and socially sensitive practices to reduce the negative impact of production processes and product use (PPPU) while, striving for economic benefits”*.

Green Manufacturing (GM) therefore, reflects a new manufacturing paradigm that incorporates various green strategies (objectives and principles), drivers (motivators and critical success factors) and techniques (technology and innovations) to become more eco-efficient. GM includes designing and producing green products or processes that consume less materials, less energy, substituting input materials (non-toxic for toxic, renewable for non-renewable) reducing unwanted outputs, wastes, carbon emissions and reuse and recycling of materials.

2.2.2 Benefits of Green Manufacturing

Green manufacturing has a very high potential of benefiting both public and private sectors of Uganda. There are three core benefits that the government will gain from adopting and implementing a green manufacturing strategy. These are; economic, environmental and social (job creation and poverty eradication) benefits, based on the idea that business performance should be monitored according to three perspectives, namely, economic development, environmental protection and social well-being.

Economic benefits include; efficient use of resources through employing tools such as re-use, recover and recycling. By using the resources efficiently and effectively, the overall demand for energy, water and other virgin resources is reduced thus reducing government expenditure on investment into additional sources of energy and water supply due to growing demand. For instance it has been estimated globally that every USD \$1 invested on the demand-side of management of electricity can save approximately USD \$3 invested in the power sector in developing countries¹⁰.

Furthermore, efficiency in production processes and systems leads to reduction in costs, increased savings and improved compliance with international standards hence resulting into increase in investment, production and productivity and consequently improved competitiveness in the domestic and export markets that brings in foreign exchange and revenues into the economy.¹¹

7 Cortellini, R. (2001) 'Green manufacturing', Operations and Information Systems Management OISM, 470 W

8 Atlas, M. and Florida, R. (1998) 'Green manufacturing', Handbook of Technology Management,

9 Hicks, C. and Dietmar, R. (2007) 'Improving cleaner production through the application of environmental tools in China', JO Cleaner Production, Vol. 15, No. 5, pp.395–408.

10 UNIDO Green Industry: Policies for Supporting Green Industry, United Nations Industrial Development Organization (UNIDO), 2011.

11 Ibid

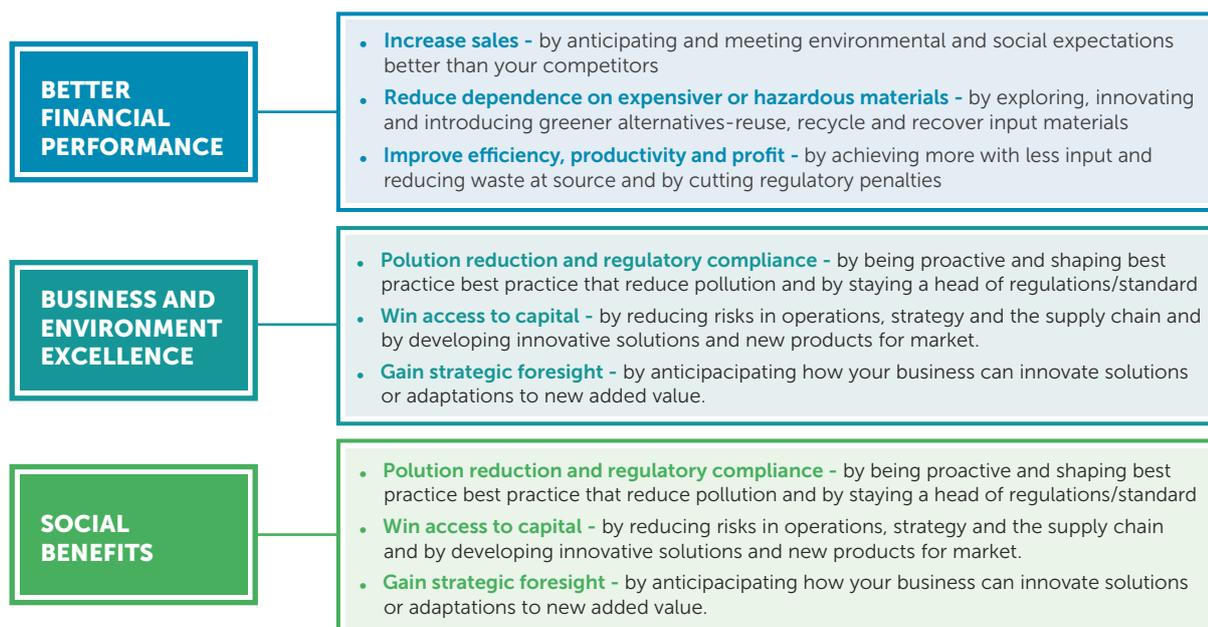
World-wide unsustainable consumption and production patterns have resulted into resource depletion and severe environmental degradation due to high demand which out-competes the renewal capacity of natural resources. Therefore adoption and implementation of a national green manufacturing strategy will provide a framework for government to effectively plan for sustainable management and use of resources.

From the social perspective, greening of manufacturing enterprises promotes energy security, health and safety, innovation, creates jobs and increases income generation due to reduction in costs and increased productivity¹². Greater efficiency in resource use over the life cycle of goods and services reduces production cost and this can lead to lower consumer prices. Green manufacturing can improve health conditions through access to clean water (resulting from reduced industrial pollution), clean energy (from renewable energy sources), and improved nutrition (availability of quality and affordable food products) and reduced direct and indirect harmful exposure to pollutants.

At enterprise level, several economic, environmental and social benefits potentially arise from green manufacturing including: reduced resource use and production costs, reduced waste, improved regulatory compliance, improved sales and enterprise image/ reputation, improved access to financing , and improved working conditions for the employees (increased efficiency and productivity).

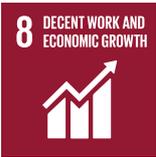
During the Switch Africa Green Program, some of the green interventions piloted in selected manufacturing enterprises in Uganda resulted in significant economic, environmental and social benefits. For example, water consumption in the beverage industry reduced from 4.5 to 3.18hl of water/hl of product; Water consumption in dairy, sugar and leather processing reduced by 17%, 36% and 66.6% respectively; energy consumption in fish processing reduced from 120kWh to 45 kWh per ton of fish which is equivalent to 62.5% energy consumption reduction. Wood fuel consumption in tea processing improved from 358kg to 680 kg of made tea per cubic metre of wood consumed. Furthermore the interventions improved the environmental performance of MSMEs for example; the Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) levels reduced by 77% and 79% in sugar sector and by 73% and 71% in the leather sector

Figure 2: Summary of the Key benefits from green manufacturing at enterprise level



12 UNIDO Green Industry: Policies for Supporting Green Industry, United Nations Industrial Development Organization (UNIDO), 2011

2.2.3 Potential contribution of Green Manufacturing to Sustainable Development Goals (SDGs)

| | | | |
|--|--|--|--|
|  <p>1 NO POVERTY</p> <p>End Poverty in all its forms everywhere</p> | <p>Transformation associated with green manufacturing strengthens the sector and plays an important role in increasing the ability of the sector to generate new and dynamic activities based on upgrading to higher levels of value addition, resource productivity thus providing decent jobs and growing the income of the population</p> |  <p>5 GENDER EQUALITY</p> <p>Achieve gender equality and empower all women and girls</p> | <p>Through the greening initiatives, an enabling and conducive environment is created for women and youth to engage in green entrepreneurial and industrial activities, hence green jobs created.</p> |
|  <p>2 ZERO HUNGER</p> <p>End hunger, achieve food security, and improve nutrition and promote Sustainable agriculture</p> | <p>Working along the supply chain, green manufacturing provides a stable market for sustainably produced farm products, enhances supply chain efficiency and reduces post-harvest losses through efficient processing, preservation and distribution. This motivates farmers to produce more to meet their food and nutritional requirements as well as meeting steady demand from agro-processors</p> |  <p>6 CLEAN WATER AND SANITATION</p> <p>Ensure availability and sustainable management of water for all</p> | <p>Green manufacturing increases water use efficiency that contributes to increased water resource productivity, prevents pollution and contamination of both surface and underground water by manufacturing enterprises and contributes to sustainable water resources management</p> |
|  <p>3 GOOD HEALTH AND WELL-BEING</p> <p>Ensure healthy lives and promote well-being for all at all stages</p> | <p>Ensuring occupation Safety and health (OSH) is one of the interventions to achieving green manufacturing. OSH interventions are aimed at promoting health and conducive working environment that is free of risky activities that can lead to accidents, noise, use of hazardous chemicals and elimination air, water and soil pollution.</p> |  <p>7 AFFORDABLE AND CLEAN ENERGY</p> <p>Ensure access to affordable, reliable, sustainable and modern energy for all</p> | <p>Green manufacturing involves application of energy efficient production process and technologies, along with enhanced utilization of renewable energy sources, provides an opportunity to low-carbon and low-emission growth path, powered by innovative, smart and locally relevant energy solutions</p> |
|  <p>4 QUALITY EDUCATION</p> <p>Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.</p> | <p>Greening manufacturing requires knowledgeable and skilled personnel that understand the concept and are capable of identifying and utilising green technologies and practices in order to produce green products and services. Greening therefore involves equipping personnel with relevant technical skills and knowledge.</p> |  <p>8 DECENT WORK AND ECONOMIC GROWTH</p> <p>Promote sustained inclusive and sustainable economic growth, full and productive employment and decent work for all</p> | <p>Green manufacturing contributes to target 8.4 on global resource efficiency that aims to de-couple economic growth from environmental degradation, in accordance with 10YFP on SCP</p> |



Industry, Innovation and Infrastructure: Build a resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Building infrastructure for greening manufacturing enterprises to make them more sustainable with increased resource (e.g. materials, water and energy) use and greater adoption of clean and environmentally sound technologies and manufacturing processes



Reduce inequality within and among countries

Green Manufacturing supports the provision of equitable and decent employment opportunities through substantial increases in industrial output, value-addition, and transition to higher-tech production



Make cities and human settlement inclusive safe, resilient and sustainable

Green Manufacturing aims at reducing pollution from manufacturing enterprises and providing sustainable waste management solutions based on the 3Rs reduce, reuse, and recycle



Ensure sustainable consumption and production partners

Green manufacturing encourages efficient use of resources and discourages waste generation. Therefore it ensures a balance between production input and output



Take urgent action to combat climate change and its impact

Application of green manufacturing principles such as energy efficiency, utilization of renewable energy sources, provides an opportunity to low-carbon and low-emission growth pathways hence combating climate change



Conserve and sustainably use the ocean, seas and marine resources for sustainable development

Green manufacturing reduces detrimental impact on the environment and protects national and trans-boundary water bodies from industrial pollution that would eventually end up in the seas and oceans.



Protect, restore and promote sustainable use of terrestrial, ecosystems, sustainably manage forests, combat desertification and halt and reserve land degradation and halt biodiversity loss

GM promotes use of clean fuels that do not degrade the environment including reduction or elimination of use of firewood in manufacturing enterprises, such as tea factories, and promote use of other forms of biomass such as bagasse, rice husks, coffee husks as alternative source of energy

16 PEACE, JUSTICE
AND STRONG
INSTITUTIONS



Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Green manufacturing promotes compliance to national and international laws and regulations. Compliance requires strong institutions and policies that ensure transparency, professionalism, and independence from political interference.

17 PARTNERSHIPS
FOR THE GOALS



Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Reinforce business partnerships; global trade national capacities, as well as technology exchange mechanisms, technology policy coordination measures and related investment opportunities



Discourage Processing using Open fire cooking leading to energy waste ▲

2.2.4 Challenges of Greening the Manufacturing Sector in Uganda

i) **Poorly coordinated and/or Limited Enforcement of national environmental regulations/ standards**

Uganda has several environmental laws and regulations such as National Environment Act, Cap 153, Water Act, Environmental, Cap 152, National Environment (Impact Assessment) regulations 1998, The National Environment (Waste Management) regulations 1999, and National Environment (Audits) regulations 2006, National Environment (Standards for Discharge of Effluent into Water or Land) regulations Waste water Discharge standards 1999, to prevent and control pollution. However, the level of coordination and enforcement is minimal and has been constrained by several factors including:

- a) Limited monitoring and inspection regarding employee health and safety at the workplace, including working conditions and environment;
- b) Inadequate infrastructural facilities (laboratories, analytical equipment and reagents);
- c) Limited public awareness and participation and
- d) Limited institutional capacity to carry out inspections, enforce regulations and guide organizations toward effective environmental planning and management.
- e) Limited resources to facilitate enforcement of the national regulations

ii) **Limited expertise and technical support within industry and research organizations to guide implementation of green innovations by enterprises**

There is limited technical capacity and expertise that can provide technical support regarding green manufacturing. The Uganda Cleaner Production Centre that was established in 2002 through a joint venture between United Nations Industrial Development Organization and the Ministry of Trade, Industry and Cooperatives has been implementing Resource Efficient and Cleaner Production technologies and related concepts such as industrial symbiosis, eco-innovation, low carbon production that result into greening of manufacturing enterprises however the centre is understaffed and lacks a consistent flow of financial resources to sustain the the impressive economic, social and economic benefits.

iii) **Lack of a framework/platform for interaction between the manufacturing enterprises and the private and public support institutions**

Currently there is no formal platform that brings together; academia, research institutions, the relevant MDAs and manufacturing enterprises to share and dialogue on research information and data on efficient and green technologies, successful initiatives or innovations. Hence coordination and information flow is broken which leads to limited knowledge and awareness about new developments in green manufacturing initiatives and poor implementation of government policies and strategies that support green manufacturing such as the National Industrial Policy 2008..

iv) **Limited Capacity of manufacturing enterprises to implement Environmental and Social Protection practices/tools**

Most of the manufacturing enterprises are faced with a number of constraints that lead to low levels of implementation of GM initiatives and these include:

- a) Limited resources: most manufacturing firms lack knowledge on green manufacturing as a concept and skilled human resource to initiate and implement programs that result into greening the enterprises` activities;
- b) Poor and negative attitudes: some manufacturing firms are resistant to change and have a culture characterized by inconsistent top management support for implementation of the

environmental protection practices/tools such as RECP, Environment Management System (EMS) and social responsibility standards such as ISO 26000 as well as general resistance to change;

- c) Inadequate knowledge and information about the GM concept: low awareness of environmental protection tools and lack of knowledge of the requirements for implementing the tools; and
- d) Implementation problems: difficulty in dealing with environmental aspects, such as evaluating and determining the significance of impact, and uncertainty about how to maintain continuous improvements.

(v) Low awareness of environmental issues and lack of access to information and expertise

Despite the considerable potential of green manufacturing to improve productivity and competitiveness, in many instances enterprises are incapable of exploiting such opportunities because of low awareness, lack of access to information and limited expertise. Manufacturing enterprises especially, MSMEs suffer from lack of information expertise and skills to devote to implementing green technologies and practices. Most MSMEs, particularly those of micro nature, have difficulty in understanding the concept and terminology associated with the notion of green manufacturing. Accessing, evaluating and utilizing information on green technologies and practices is thus still a big challenge for both large firms and most MSMEs.

v) Organizational systems and management capacity which fail to capture environmental costs and benefits

Most Organizations' management and financial accounting systems fail to factor in environmental benefits, costs and liabilities in their operations, yet this is very important to inform policy and financial decisions particularly in private and corporate public sectors. Once not measured and reflected in financial accounting systems, environmental benefits, costs and liabilities cannot be made transparent to planners and decision makers within and outside enterprises and consequently such enterprises are much less likely to integrate green manufacturing principles within wider business strategies.

vii) Uncertainty and risk on financial and technical for new technologies and products

Establishing a functional green manufacturing system in any enterprise requires investment into green technologies, Research and Development, employee training among others yet the returns/benefits are usually realised in the long term. On the contrary most manufacturing firms prefer short-term quick gains as opposed to long term which may inhibit the adoption of green manufacturing technologies and practices.

viii) Limited access to affordable finance;

Despite the potential for green manufacturing to generate substantial cost-savings and reduce pollution at source in enterprises, MSMEs are still facing an obstacle of accessing affordable finance to acquire to invest in greening interventions. This is further worsened by the fact that MSMEs have no proper records and information management systems which can provide baseline data for carrying out cost evaluations and cost-benefit analysis so as to make informed investment decisions

ix) Resistance to change and limited involvement of all players

Most manufacturing firms are suffering from the business as usual syndrome where by there is a culture of resistance to change even when the change is for the good of the institution. This is a big challenge when it comes to the adoption of green manufacturing technologies and implementation of practices because they always require full commitment, involvement, and participation of all players in the enterprises; that is from top level management, middle level management, shop floor staff and support staff. The concept is also recommended to be extended to the suppliers of raw materials and all the other service providers in order to achieve optimal results.

3. REVIEW OF NATIONAL POLICIES, STRATEGIES AND LEGAL FRAMEWORKS

3.1 REVIEW OF NATIONAL POLICIES AND STRATEGIES

Uganda is committed to following a clean green growth development pathway hinged on social equity, resource use efficiency, accelerated economic growth, low carbon emissions, climate change response and environmental sustainability. This has been through being a signatory to international agreements and protocols such as the Paris Agreement of 2015, Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) adopted in 1997 in Japan aimed at fighting global warming, The 2030 Agenda for Sustainable Development, the African Agenda 2063, the Uganda Vision 2040, and the National Development Plans, Sector Policies and Strategies as well as putting in place institutional structures to oversee the implementation of the agreements and protocols..

3.1.1 National Environment Action Plan (NEAP) and the National Environment Management Policy (NEMP)

The Government of Uganda developed a National Environment Action Plan (NEAP) from 1991 to 1994.¹³ The NEAP provided a framework for addressing gaps in environment management as well as a strategy for integrating environment into the national socio-economic development.¹⁴ One of the outcomes of the NEAP was the formulation of the National Environment Management Policy (NEMP) of 1994. The overall goal of the NEMP is sustainable social and economic development which maintains or enhances environmental quality and resource productivity on a long term-basis and meets the needs of the present generations without compromising the ability of future generations to meet their own needs.

The NEMP goal informed subsequent policies such as the Poverty Eradication Action Plan (PEAP) 2004/5-2007/8 which was replaced by National Development Plans (NDPs) in 2010/11-2014/15. The NEAP provided strategies to guide and assist decision makers and resource users in determining priorities in the national context and also at the sectoral, private sector and individual level. It provides for integration of environmental concerns in national socioeconomic development planning process, avenues for inter-sectoral cooperation, and comprehensive and coordinated environmental management.

As a result, environmental management is now a key criterion for national socioeconomic development decisions. The policy also recognized the need for sectoral policies in addressing the specific concerns of the identified environmental sectors. It therefore provided a framework under which several sectoral policies were developed. These include the 1995 Water Policy, the 1996 National Wetlands Management Policy, the 1996 Wildlife Policy, the 2000 Fisheries Policy, the 2001 Forestry Policy and several district environment management policies from 2000 onwards. In addition, the policy provided a basis for the formulation of a comprehensive environmental legal framework under the 1995 Constitution and the National Environment Act, Cap 153.¹⁵

13 The National Environment Act, Cap. 153, section 17(1), Laws of Uganda-2000 (Uganda Law Reform Commission)

14 See National Environment Act, Cap 153 section 18 (2)(a).

15 Ibid

NEMP also provided a framework for multi-sectoral approaches to resource planning and management of natural resources. These approaches found expression in the various environmental and development policies and legislations such as the Uganda Wildlife Act, the Water Act, the Land Act, the National Forestry and Tree Planting Act, among others.

It's important to note, however, that the NEMP has been reviewed and that the review process took into account the current national initiatives like the Vision 2040, the NDPs, regional effort such as EAC initiatives and protocols on cross-border natural resources and environmental management, climate change and social economic aspects, the global effects like the Rio+20 outcome and commitments, Sustainable Development Goals (SDGs) and the green economy concepts in the context of sustainable development.

3.1.2 The Uganda Vision 2040

The Uganda's Vision 2040 aims at transforming Uganda's society from a peasant to a modern prosperous country within thirty years. In order to achieve this aim, the vision has some key strategies and policy reforms including those aimed at leapfrogging especially in areas of science, technology and innovation, engineering, human resource development public sector management and private sector development.

The aspirations of the Vision 2040 are pursued through 5-year National Development Plans (NDPs) as the overarching progressive policy development framework for medium-term planning, prioritizing government interventions and mobilizing resources. The second NDP II (2015/16-2019/20) aimed at strengthening Uganda's competitiveness for sustainable wealth creation, employment and inclusive growth in order to achieve middle income status by 2020. Under chapter 10 sub-section 10.2 the NDPII focused on promoting green industry and climate smart industrial initiatives through

- i) Popularizing and encouraging efficient and zero waste technologies and practices
- ii) Establishing and supporting climate innovation centres to support investment in industries producing and adopting green technologies
- iii) Developing decentralized village-based agricultural processing centres that incorporate low-carbon sources of energy, such as biogas-digesters and solar driers; and
- iv) Building carbon trading capacity within the private sector to harness innovative funding opportunities provided by Clean Development Mechanisms (CDM) and voluntary carbon markets

However, in the NDPII, it was noted that Industrial development remains functionally inefficient, costs of production were high, resources are wasted and potential synergies that could lead to increased output were not realized. Environment and natural resources are under threat from both natural and man made drivers of change including improvement of life of the population, rapid population growth, unplanned urbanization, expansion of informal settlements and industrialization. In addition, mitigating the climate change orchestrated by the impacts of droughts, famine, floods, storms, heat waves (wild fires) and landslides, destructively affecting investments in agriculture production, food security, health status and the livelihood of vulnerable population is critical for reducing income inequality. Pollution levels are on the increase arising from e-waste, unsound use of chemicals and oil and gas development.

The third NDPIII 2020-2025 overall theme of Sustainable Industrialization for inclusive growth, employment and sustainable wealth creation lays down the strategic direction which the Green Manufacturing Strategy contributes to the achievements. Specifically, it contributes to the Strategic objectives highlighted as to:

- i) Enhance value addition in key growth opportunities;
- ii) Strengthen the private sector capacity to drive growth and create jobs; and
- iii) Enhance the productivity and social well-being of the population; and

3.1.3 Uganda Green Growth Development Strategy (UGGDS)

The Uganda Green Growth Development Strategy (UGGDS) intends to operationalize the broad green growth principles highlighted in Agenda 2030, the Uganda Vision 2040 and the NDP II (2015/16-2019/20) to support Uganda's accelerated transition to a middle-income status.

The UGGDS has five focus areas namely; sustainable agriculture, natural capital management, planned urbanisation and development of green cities, sustainable transportation, and energy for green growth. The UGGDS does not identify manufacturing as priority area, the priority areas and intervention seem to be more focused on supply side management rather than demand side management.

3.1.4 The National Strategy for Private Sector Development (NSPSD)

The National Strategy for Private Sector Development (NSPSD) takes into account key lessons from the design and implementation of previous strategies and has been formulated for a five-year period (2017/18-2021/22) in accordance with priority of NDP II.

The Strategy aims at: Increasing competitiveness of Uganda's business environment and speeding up the process of strengthening the links between Agriculture and Industry. The NSPSD approaches industrialization from a holistic perspective taking into account the entire production chain and facilitating business linkages and integration.

The NSPSD identifies the manufacturing sector as a priority sector that would enable Uganda achieve the Vision 2040. The key issues in manufacturing sector under the NSPSD include; low attraction of investors and capital, limited skilled labour, poor standards for agro products, limited research in high quality and yielding varieties, high prevalence of informality, stiff competition from cheap imports, use of expensive imported raw materials and high energy costs.

Green manufacturing issues like, high pollution load, heavy dependence on fossil fuels, air pollution, occupation health and safety, absence of use of eco-label and eco-marks, use of absolute technologies are not identified in the strategy as key issues in the manufacturing sector. The strategy focuses on expanding and growing the manufacturing sector but with less attention to sustainability aspects.

3.1.5 Other Policies

The Buy Uganda Build Uganda (BUBU) Policy (2014) was formulated within the framework of several national development policies and strategies particularly the National Trade Policy (NTP), the National Industrial Policy (NIP), the National Standards and Quality Policy (NSQP), the National Cooperatives Policy, the National Textile Policy, the National Sugar Policy, the Public Procurement and Disposal of Assets Act (PPDA) and the Development Strategic Investment Program (DSIP).

The BUBU policy is intended to support and encourage the consumption of locally produced goods and services and improve the local business environment. The policy provides for making deliberate interventions in areas such as Public procurement preference schemes; promoting the use and conformity to standards; enhancing the capacity of MSMEs in meeting supermarket supply-chain requirements; and assisting private sector in the development of the "Proudly Uganda" brand.

Although the policy provides for public procurement preference schemes and conformity to standards, it doesn't clearly capture the need for promoting procurement of green products and services and development of standards to facilitate certification of green products with eco-marks and eco-labels.

The Micro, Small and Medium Enterprises (MSMEs) Policy 2015 aims at stimulating growth of sustainable MSMEs through enhanced business support service provision, access to finance, technical and business skills, and the creation of a conducive policy, legal and institutional framework.

The policy strategies include promotion of the transfer of sustainable, consumption and production technologies to all areas including upgrading existing technologies for manufacture of value added products and operationalization of Industrial and Innovation fund to spur industrialization. Much as the MSMEs policy has greening elements, it emphasizes on research and development, enhancing access to finance, however, it doesn't explicitly focus on green finance or research. Critical greening element such as use of renewable energy, extended produce responsibility, use of eco-marks/labels/standard that facilitate the greening process don't explicitly come out in strategic actions.

The goal of the Energy Policy (2002) in the energy sector is to meet the energy needs of the Ugandan population for social and economic development in an environmentally sustainable manner. Specific objectives of the energy policy include assessing the availability and demand of energy resources in the country, improving energy service access to reduce poverty, improve governance in the energy sector and institute improved administrative procedures, and stimulate the economic development of the energy sector, whilst minimizing environmental impacts. The policy emphasizes increasing access to modern and reliable energy services which provides an opportunity for the manufacturing firms. to switch to low carbon cleaner sources of energy.

The Renewable Energy Policy underpins the Government's overall policy on energy set out in the Energy Policy for Uganda 2002, in which Government committed to the development and use of renewable energy resources for both small- and large-scale applications. The Renewable Energy Policy objectives are: i) develop, implement, maintain and continuously improve the legal and institutional framework that responds to the prevailing conditions, in order to maintain interest in renewable energy investments. ii) Establish an appropriate financing and fiscal policy framework that will attract more investments in Renewable Energy Technologies (RETs), iii) disseminate information and raise public awareness on the benefits and opportunities of renewable energy technologies and build capacities in appropriate institutions, iv) Promote Research and Development, technology transfer, international cooperation and adoption of standards in RETs, v) Manage the biomass resource base in a sustainable manner, vii) Promote the use of biofuels and viii) Promote the conversion of municipal and industrial wastes to energy.

The goal of the Climate Change Policy (2015) is to ensure a harmonised approach towards a climate-resilient and low carbon development path for sustainable development in Uganda. It aims at ensuring that all stakeholders address climate impacts and their cause through actions that promote green economy and sustainable development.

The Climate Change Policy highlights adaptation measures including promotion of water harvesting and efficient water use, integrated water resources management, promote efficient biomass energy production and use technologies to reduce biomass use, diversify energy sources by promoting the use of alternative renewable energy resources such as solar, geothermal, mini-hydro that are less sensitive to climate change, provide tax incentives to energy companies who invest in cleaner energy generation, promote use of energy efficient technologies, promote waste to energy programmes to reduce Greenhouse gas (GHG) emission and increase energy generation and access, promote cleaner production in the industrial sector.

The National Standards and Quality Policy aims at contributing to achieving socio-economic transformation, sustainable productivity improvement, fair trade, job creation, consumer and environmental protection as well as prosperity for all. The policy focuses at developing and sustaining National Standards Development, Metrology, Conformity Assessment and Accreditation system, which is robust and able to achieve the requirements for high quality goods and services. The policy also strengthens the national technical regulation regime to protect the people and the environment from unsafe products without restricting trade.

3.2 REVIEW OF SUB - SECTORAL LEVEL POLICIES

The National Textile Policy provides a framework for the textile sub-sector transformation, competitiveness and prosperity. The policy aims at creating a strong and vibrant textile and clothing industry with sustainable capacity utilization and enhanced investment through the textile value chain. It is also to stimulate and support sustainable value addition through the textile value chain with the ultimate objective of creating employment, enhancing human resource skills and capabilities, product up-grading and diversification through research and development (R&D), increasing exports and contributing to the economic growth and prosperity of the country. The policy specific objectives include;

- a) To reduce the cost of doing textile business in Uganda by benchmarking against Regional and International best practices, and enhancing the up-gradation and modernization of equipment,
- b) Focus at improving the quality and quantity of products from the textile sub-sector by developing textile industrial parks that attract garmenting as well as developing a strong multi-fibre raw material base for the sector given the labour intensiveness of the activity and therefore relevance to the economic emancipation of especially women and the youth in Uganda.
- c) Make ICT an integral part of the entire value chain of textile production and thereby facilitate the sector to achieve international standards in terms of quality, design and marketing.
- d) Focus at increasing downstream linkages within the cotton and textile sector especially on cottage industrial production enhancement for ancillary products associated with cotton and textiles like thread making, garment accessories, food oils extraction and animal feeds making.

The policy interventions and objectives could be strengthened by incorporating aspects of Resource Efficiency and Cleaner Production, Occupational Health and Safety and chemicals and hazardous waste management in order to reduce the adverse impacts of the sector onto the environment and human health.

The National Leather and Leather Products Policy aims at attracting and encouraging investments in value addition to produce finished leather and leather products. The policy also focuses on enhancing measures geared towards preserving the environment, upgrade of technology and development of requisite skills. The policy promotes both vertical and horizontal collaborative research and development information sharing and market access aimed at optimization of the available resources along the value chain. The policy provides for promotion of more efficient, environmentally friendly production techniques along the value chain, through a number of action measures that include

- i) Ensure that best practices in environmental management are adopted and implemented such as implementation of EMS and adoption of cleaner technologies
- ii) Promote establishment of common effluent treatment plants to encourage industrial clustering that provides benefits from economies of scale in waste management.
- iii) Train and equip managers and technicians in appropriate waste management techniques and skills
- iv) Promote recycling and re-use of waste products into new products
- (v) Develop, review and enforce the relevant laws, regulations, guidelines standards and codes of practice pertaining to environmental protection and compliance

The policy therefore holistically addresses and promotes preventive approaches to curb environmental degradation and pollution hence calling for urgent need for its implementation so as to realise tangible outcomes.

3.3 REVIEW OF THE LEGAL AND REGULATORY FRAMEWORKS

The 1995 Constitution of the Republic of Uganda deliberately enshrined the right to a decent environment and provided for sustainable development, in addition to the principle that natural resources are held in trust for the people and should be responsibly managed for their benefit. Following the constitution, a number of environment legislations were enacted and others were revised to take into account environmental cardinal principles and considerations, including embedding in them environmental regulatory provisions.

The National Environment Act 1995, provides for sustainable management of the environment and establishment of the National Environment Management Authority (NEMA) as the principal government agency for the management of the environment. NEMA is mandated to coordinate, monitor and supervise all activities in the field of the environment.

The framework law had the impact of triggering amendment, enactment and harmonization of sectoral laws on environment. These include; the National Forestry and Tree Planting Act with a provision on Environment Impact Assessment; the Land Act, Cap 227 under which all owners and occupiers of land are to manage it in accordance with the National Forestry and Tree Planting Act, the Mining Act, 2003, the Water Act, Cap 152, the Uganda Wildlife Act, Cap 200, the Investment Code section 19(1)(d) of which makes it an implied term and condition of every holder of an investment license to take necessary steps to ensure that the operation of their business enterprise does not cause any injury to the ecology or the environment.

The Uganda Wildlife Act sections 15 and 16 which provide for EIA, audits and monitoring of projects that may have an impact on wildlife; the Mining Act 2003, sections 108 to 112 of which require EIA, environmental audit, environmental protection standards, environmental restoration plans and environmental performance bonds in accordance with the National Environment Act; and the Local Government Act, the second schedule of which outlines environmental management areas for which district councils are responsible.

The National Environment Act 2019 (the “**NEA 2019**”) repeals and replaces the the National Environment Act (Cap. 153) (the “**NEA**”). It primarily addresses emerging environmental issues including climate change, the management of hazardous chemicals, the environmental concerns arising out of petroleum activities and the management of plastics. It also establishes a specialised unit, the Environmental Protection Force, to handle enforcement. The NEA 2019 creates new offences and greatly enhances the penalties both in monetary fines and custodial sentences.

The NEA 2019 maintains the framework approach from the old law, with few prescriptive provisions on environmental protection, leaving the details to be laid out in statutory instruments. Unfortunately, under the old law, relatively few instruments were published. Notably, no statutory instrument was ever published on air quality standards, making it difficult to address air pollution concerns. Other provisions of note include extensive requirements for the management of chemicals and product control, a comprehensive list of projects requiring environmental and social impact assessments, and the introduction of an express penalty scheme for offences under the NEA 2019.

The NEA 2019 also prohibits the use of plastics under 30 microns and prescribes a list of the permitted uses of plastics and plastic products. Hopefully, the new provisions on extended producer liability will make producers of bottled water responsible for collection and proper disposal of all their empty plastic bottles.

The Act requires NEMA, in consultations with lead agencies, to establish environment standards/regulations. The environmental standards include; air quality standards, water quality standards, standards for the discharge of effluent into water or land, standards for control of noxious smells, standards for the control of noise and vibration pollution, standards for subsonic vibrations, management of soil quality standards, and standards for minimization of radiation

Uganda Investment Code, Cap 92: Since 1992, the manufacturing enterprises have been subjected to the provisions of the Uganda Investment Code, Cap 92. Under Section 19s (2) (d), for every investment licensee to take necessary steps to ensure that the operations of their business units do not cause injury to the ecology or environment. The Investment Code 2019 replaced the Investment Code, Cap 92. The Investment Code 2019 provides incentives and preference for advance and efficient technologies. It also calls for investment in upgrading of the indigenous technologies to advance their performance. The Investment Code 2019 requires investors to comply with provisions of The National Environment Act and empowers Uganda Investment Authority to withdraw investment licenses from investors who fail to comply with its provision.

The Electricity Act, 1999, provides guidelines that support development of Electrification Renewable energy generation projects that support enterprises to adopt green energy alternatives. The Act also provides for the establishment of the Electricity Regulatory Authority (ERA) whose functions include: issuing licenses for the generation, transmission, distribution or sale of electricity, controlling activities in the electricity sector, liberalizing and bringing competition in the electricity sector.

The Occupational Safety and Health Act, 2006 makes provisions for the health, safety, welfare and appropriate training of persons employed in work places. The Act provides for the prevention and protection of persons at all workplaces from injuries, diseases, death and damage to property. Section 13 states that: it is the duty of an employer to take, as far as is reasonably practicable, all measures for the protection of his or her workers and the general public from the dangerous aspects of the employer's undertaking at his or her own cost.

The Employment Act, 2006 mandates Labour officers to regularly inspect the working conditions of workers to ascertain that the rights of workers and basic provisions are provided and workers' welfare is attended to.

Public Health Act, Cap 281: Section 105 of the Public Health Act, Cap 281 imposes duty on the local authority to take measures to prevent any pollution that is dangerous to health from entering any water supply that the public has a right to use for drinking or domestic purposes. The Act further details the location of waste disposal facilities such as solid waste skips and septic tanks in relation to settlements and food points.

The National Environment (Waste Management) Regulations, 1999 requires owner of manufacturing enterprises to adopt cleaner production methods that include: improvement of production processes through conserving raw materials and energy, eliminating the use of toxic raw materials, reducing toxic emissions and waste, monitoring the product cycle from beginning to end by identifying and eliminating potential negative impacts of the product, enabling the recovery and reuse of old products, where possible recycling of used products; and incorporating environmental concerns in the design and disposal of products.

From the review of policies and regulations above, Uganda has in place an enabling policy and legal framework that provide guidelines to monitor and regulate activities of the manufacturing sector. However, the framework doesn't explicitly define action measures for greening the manufacturing sector. Furthermore, the existing policy, legal and regulatory framework highlighted above is not effectively implemented due to weak enforcement mechanisms and limited resources.

3.4 INSTITUTIONAL FRAMEWORK

Uganda's institutional framework provides support in implementation of the policy, legal and planning frameworks. Already, the country has a number of requisite institutions which are in position to facilitate the implementation of green manufacturing strategy. These include among others:

- i) The Office of the President which takes overall leadership and oversight of implementation and is charged with the responsibility to mobilize the citizens to embrace the national development agenda;
- ii) The Cabinet which is charged with providing policy direction for the development agenda;
- iii) The Parliament which oversees implementation of the development agenda, appropriates resources for financing development, ensures the national budget is aligned to the NDPs and enacts enabling legislation to support development;
- iv) The Office of the Prime Minister which is responsible for coordinating implementation of all development programs and monitoring, and reporting progress of implementation of all government policies, strategies and programme;
- v) The Ministry of Trade, Industry and Cooperatives which is mandated to formulate, review and support policies, strategies, plans and programs that promote and ensure expansion and diversification of trade, cooperatives, environmentally sustainable industrialization, appropriate technology development and transfer to generate wealth for poverty eradication and benefit economically and socially;
- vi) The Ministry of Water and Environment whose mandate include monitoring and regulating environmental performance of manufacturing enterprises;
- vii) Ministry of Gender, Labour and Social Development that is responsible for the social aspects including the safety, health and welfare of workers in manufacturing enterprises;

As the manufacturing sub-sector is an interdisciplinary sphere within the industrial sector, implementation of industrial policy actions and strategic interventions cuts across various other Ministries, Departments and Agencies (MDAs) including Ministry Finance Planning and Economic Development, Ministry of Energy and Mineral Development, Ministry of Science Technology and Innovation, Ministry of Information and Communications Technology, Ministry of Agriculture, Animal Industry and Fisheries, National Planning Authority, National Environment Management Authority, Uganda Investment Authority, Uganda Free Zones Authority, Uganda National Council of Science and Technology, Uganda National Bureau of Standards, Uganda Bureau of Statistics as well as technical institutions such as Uganda Cleaner Production Centre, etc.

Although there is a well-established institutional framework for implementation of the green manufacturing strategy, the concept of green manufacturing is new and the existing institutions need to be re-oriented with the green manufacturing principles and objectives.

3.5 SWOT ANALYSIS OF THE MANUFACTURING SECTOR IN UGANDA

STRENGTHS

- Steadily growing manufacturing sector
- Supportive policy and regulatory framework to facilitate adoption of green manufacturing initiatives.
- Willingness of manufacturing enterprises to invest in green technologies.
- Existence of institutions mandated to promote green manufacturing initiatives
- Existence of Successfully piloted green manufacturing initiatives for bench-marking.
- Existence of a trainable labour force
- Abundant renewable energy resource base across the country

OPPORTUNITIES

- Strong political will and conducive enabling environment
- Existence of potential Market for green products and services at national regional and international market
- Existence of global agendas, frameworks, commitments that support green manufacturing initiatives
- Existence of success stories on benefits of adopting and implementing Green manufacturing initiatives have been successfully implemented in many countries which provide success stories
- Existence of a trainable labour force and expertise on green manufacturing
- Existence of green technologies for easy adoption

WEAKNESSES

- Low levels of R&D in the area of green manufacturing
- Inadequate implementation and enforcement of policies and regulatory instruments
- Weak organization structures and systems at enterprise level
- Limited infrastructure to support, recovery, recycling, and reuse of materials.
- Low awareness of existing green manufacturing initiatives.
- Insufficient data and information on available green technologies.
- Inadequate capacity of institutions mandated to promote adoption of green manufacturing initiatives.
- Lack of incentives to promote adoption of green manufacturing for example tax waivers, subsidies, awards and recognition, prioritization of public procurement of green products eco-labelling standards, etc
- Limited expertise at the enterprise level to support enterprise in adopting green manufacturing initiatives
- Low levels of participation of women, youth and Persons with Disabilities (PWD) in manufacturing activities.
- Limited access to affordable financial credit to support adoption of green initiatives

THREATS

- Failure to meet the required standards for national, regional and international markets for green products.
- Unfair competition from imported cheap, sub-standard, and counterfeit products.
- Unaffordability of the High initial acquisition cost for green technologies
- Resistance to change due to wrong perceptions and attitude

4. INTERNATIONAL BEST PRACTICES FOR GREENING THE MANUFACTURING SECTOR

| COUNTRIES | INCENTIVES (CARROT APPROACH) | REGULATORY INSTRUMENTS (STICK APPROACH) | STATUS OF GREEN MANUFACTURING |
|-----------|---|--|--|
| DENMARK | <p>The Danish Government has used a number of incentives to promote green manufacturing including</p> <ul style="list-style-type: none"> i) Green "public procurement of goods and services. The public procurement in Denmark amounts to 160 billion DKK/year. The Danish government uses this large shopping muscle to promote the production and marketing of environmentally less harmful products throughout the product chain.¹⁶ ii) Established and operationalized green investment fund. (this focuses on eco-innovation, Resource Efficiency and reduction in carbon emission) ¹⁷[Henry Varga 2014] iii) Supporting networks and partnership, by creating clusters and science-technology parks e.g. Green Tech Park, Lean energy cluster and Nationalt Vandtestcenter. The platform identifies needs, opportunities and challenges for Danish research, innovation and technology development which later transferred to SMEs | <p>Denmark has a number of regulatory instruments to support RECP, eco-innovation industrial symbiosis these include;</p> <ul style="list-style-type: none"> i) Fees and labels on recyclable materials. ii) Performance standards, labeling, certification a good example is eco-label Denmark iii) Established an act on technology transfer on Public Research Institutions. The act allows for universities and sectorial research institutes to establish a limited company responsible for the transfer of knowledge/technology to the private sector | <p>Denmark takes the top position on the EU28 Eco-Innovation Scoreboard for 2015; it is ranked before Finland and Ireland on second and third position respectively. In 2010, green production in Denmark provided a turnover of more than DKK 250 billion. This is 9.2% of total turnover of Danish enterprises with at least one full-time employee. (Danish EPA, 2012)</p> <ul style="list-style-type: none"> • Almost 106,000 people were employed in green production in 2010. This means that 8.5% of employees in Danish enterprises are involved in green production.¹⁸ (Danish EPA, 2012) |

16 <http://mst.dk/virksomhed-myndighed/groen-strategi/groenneindkoeb/om-baeredygtige-indkoeb/>

17 Henry Varga 2014, Eco-innovation in Denmark, Eco-Innovation Observatory Country Profile 2014-2015: Denmark

18 Danish Energy Agency / Ministry of Climate, Energy and Building Danish Business Authority / Ministry of Business and Growth /Danish EPA / Ministry of the Environment November 2012 Green production in Denmark and its significance for the Danish economy.

| COUNTRIES | INCENTIVES (CARROT APPROACH) | REGULATORY INSTRUMENTS (STICK APPROACH) | STATUS OF GREEN MANUFACTURING |
|-----------|--|---|---|
| GERMANY | <p>German provides a number of incentives to attract enterprise to go green. These include:</p> <ul style="list-style-type: none"> i) Use of loans: German established Renewable Energies Loan Programme which is a long-term loan (up 20yrs) from KfW aimed at easing funding constraints for all types of renewable energy investment ii) Encourages companies to join energy efficiency networks so as to learn from one another as they set up energy efficiency and carbon emissions reduction goals iii) Runs a National program to facilitate adoption of industrial symbiosis models in chemical industries. iv) Implements adoption of EU Carbon trading scheme. Emissions trading has been the main multi-sectoral measure for reducing CO2 emissions in Germany since 2005. Emissions trading requires operators of power generation plants, energy-intensive industries, aviation and aluminium and adipic acid manufacturers to surrender CO2 allowances for their CO2 emissions during the previous year | <p>German is shifting from Industrial policy to green industrial policy. This has been supplemented with The Energy Transition as a Green Industrial Development Agenda ¹⁹(GDI, 2014). A number of stick approaches have been used to transit to green industrial policy including</p> <ul style="list-style-type: none"> i) Transposed Eco-design Directive 2009/125/EC into German law. Eco-design Directive 2009/125/EC is the legal framework that specifies minimum efficiency standards for energy-related products in the European internal market(BMUB, 2017)²⁰ ii) Amendment of energy act (Energy Industry Act (2005, amended 2012). This federal law regulates grid management and expansion with special provisions for integrating renewable energy sources, including electricity labeling. The 2012 amendment addresses primarily grid planning issues for offshore wind management. iii) Put in place the Renewable Energy Sources Act 2012 ((Erneuerbare Energien Gesetz [EEG]) that emphasizes Grid connection, transmission and distribution priority for electricity supplied from decentralized renewable energy sources and Guaranteed FiT levels covering a 20-year time horizon for unlimited volume | <ul style="list-style-type: none"> • Germany aims to raise the share of renewables from 17% today to more than 80% in 2050, while completely phasing out electricity production from nuclear power plants by 2022. Greenhouse gas (GHG) emissions would be cut by 40% by 2020 and at least 80% by 2050. In the field of energy efficiency, Germany intends to reduce primary energy consumption by 20% by 2020 and 50% by 2050 compared with 2008. • Emissions reduction achieved in German in the industry sector • Carbon dioxide (CO2), Methane (CH4), and Nitrous oxide (N2O) emissions in the industrial processes and product use sector fall to about 40 Mt CO2e. Emissions in this sector had already fallen by 44 % in the past, from 83.2 Mt CO2e in 1990 to 46.4 Mt CO2e in 2014(BMUM 2017) |

19 WilfriedLütkenhorst, Anna Pegels, German Development Institute, 2014 Germany's Green Industrial Policy Stable Policies – Turbulent Markets: The costs and benefits of promoting solar PV and wind energy

20 Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), 2017 Germany's Third Biennial Report under the United Nations Framework Convention on Climate Change

| COUNTRIES | INCENTIVES (CARROT APPROACH) | REGULATORY INSTRUMENTS (STICK APPROACH) | STATUS OF GREEN MANUFACTURING |
|---------------------|--|--|---|
| <p>CHINA</p> | <p>The Made in China 2025 initiative has the goal of establishing China as a global manufacturing power by 2025. One of the objectives is to be among the world's leaders in terms of reducing (1) energy and resources consumed and (2) pollutants emissions released per unit of industrial added value by 2025²¹(OCED and DRC 2017)</p> <p>i) China is investing heavily in green infrastructures in sustainable development zones, for example, it is making transformation changes to facilitate transition of existing industrial parks into eco-industrial parks. These infrastructures include the energy recovery infrastructure from sewage treatment, waste utilization, ecological restoration, and artificial intelligence to solve issues of resource management and pollution</p> <p>ii) China introduced a national emission trading system based on regional pilot projects²²(Lo,2012) to address existing barriers and explore various system designs. China's carbon trade scheme (cap and trade) was motivated by the generally positive experience with the Clean Development Mechanism (CDM).²³(The Climate Group 2011)</p> | <p>China has taken significant steps in strengthening environmental legislation and policy making. The objectives of these laws and regulations have been given further clarity through the elaboration and implementation of the 11th, 12th and 13th Five-Year Plans, which also helps raise awareness of the wider public and unite forces on all fronts to reallocate resources and achieve specific environmental targets.</p> <p>i) China has been enforcing use of EMS's, based on ISO14001 to move existing Industrial parks towards Eco-industrial parks²⁴ (Geng & Côté 2003)</p> <p>ii) The Chinese government announced the start of what could become the world's largest carbon emissions trading program. The targeted quantity will make the trading program bigger than any other market in the world, including the European Union²⁵</p> | <p>As compared to OECD countries, China has achieved the decoupling of SO2 and NOx emissions from economic growth at an earlier stage of development (measured in GDP per capita). The key for next step is how to sustain the green development. ²⁶(OCED, 2014)</p> |

21 OCED, Development Research Centre of the State Council of China (DRC) 2017 Industrial upgrading for green growth in China Pg 15

22 Lo Alex 2012, Nature Climate Change, Carbon emissions trading in China

23 The Climate Group 2011Policy Briefing, Prospects for Carbon Trading in China

24 Geng, Y. &Côté, R. 2003. Environmental management systems at the industrial park level in China. Environmental Management 31 (6), 784 – 794.

25 <https://cen.acs.org/articles/95/web/2017/12/China-creates-worlds-largest-carbon.html>

26 https://www.oecd.org/greengrowth/Industrial_Upgrading_China_June_2017.pdf

| COUNTRIES | INCENTIVES (CARROT APPROACH) | REGULATORY INSTRUMENTS (STICK APPROACH) | STATUS OF GREEN MANUFACTURING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|--|---|--|--------|------------------------|------------------------------|--------------------|----------------|-----------------|--------------------------|----------------|-----------------|------------------------|-----------------|-----------------|----------------------------|------------------|----------------|---------------|-----------------|-----------------|-------------|--------------------|----------------|------------------|--------------------|----------------|------|--------|--|--------------------|-----|--|
| UNITED KINGDOM (UK) | <p>The National Industrial Symbiosis Programme:</p> <p>The UK National Industrial Symbiosis Programme (NISP) is the first national industrial symbiosis (IS) programme. This unique voluntary programme applies and facilitates industrial symbiosis at national level for the first time. Seeking substantial resource efficiency improvements, NISP impacts the UK's economy and environmental performance.</p> | <ul style="list-style-type: none"> The National Industrial Symbiosis Programme (NISP) was developed in 2005 as an 'independent facilitator' to help businesses in various sectors and of various sizes come together to find uses for unwanted materials, aiming to divert significant waste loads from landfill and produce bottom line benefits for companies through reduced disposal costs and new commercial opportunities, by sharing assets, resources, logistics and expertise. NISP is regionally based, facilitating material exchange over a given geographic area. The twelve UK regions have output targets and all results are externally verified. A national executive oversees regional activity, coordinates synergies between regions and provides for the exchange of best practices and mutual benefits. | <table border="1"> <thead> <tr> <th data-bbox="205 640 272 992">METRIC</th> <th data-bbox="205 412 272 640">BENEFITS IN FIRST YEAR</th> <th data-bbox="205 154 272 412">IMPACT AT END OF THE PROJECT</th> </tr> </thead> <tbody> <tr> <td data-bbox="279 640 304 992">Landfill diversion</td> <td data-bbox="279 412 304 640">9 Million tons</td> <td data-bbox="279 154 304 412">45 Million tons</td> </tr> <tr> <td data-bbox="311 640 336 992">Carbon dioxide reduction</td> <td data-bbox="311 412 336 640">8 Million tons</td> <td data-bbox="311 154 336 412">39 Million tons</td> </tr> <tr> <td data-bbox="343 640 368 992">Virgin material saving</td> <td data-bbox="343 412 368 640">12 Million tons</td> <td data-bbox="343 154 368 412">58 Million tons</td> </tr> <tr> <td data-bbox="375 640 400 992">Hazardous waste eliminated</td> <td data-bbox="375 412 400 640">0.4 Million tons</td> <td data-bbox="375 154 400 412">2 Million tons</td> </tr> <tr> <td data-bbox="406 640 432 992">Water savings</td> <td data-bbox="406 412 432 640">14 Million tons</td> <td data-bbox="406 154 432 412">71 Million tons</td> </tr> <tr> <td data-bbox="438 640 464 992">Cost saving</td> <td data-bbox="438 412 464 640">€ 243 Million tons</td> <td data-bbox="438 154 464 412">€ 1.21 billion</td> </tr> <tr> <td data-bbox="470 640 496 992">Additional sales</td> <td data-bbox="470 412 496 640">€ 234 Million tons</td> <td data-bbox="470 154 496 412">€ 1.71 billion</td> </tr> <tr> <td data-bbox="502 640 528 992">Jobs</td> <td data-bbox="502 412 528 640">10000+</td> <td data-bbox="502 154 528 412"></td> </tr> <tr> <td data-bbox="534 640 560 992">Private investment</td> <td data-bbox="534 412 560 640">374</td> <td data-bbox="534 154 560 412"></td> </tr> </tbody> </table> | METRIC | BENEFITS IN FIRST YEAR | IMPACT AT END OF THE PROJECT | Landfill diversion | 9 Million tons | 45 Million tons | Carbon dioxide reduction | 8 Million tons | 39 Million tons | Virgin material saving | 12 Million tons | 58 Million tons | Hazardous waste eliminated | 0.4 Million tons | 2 Million tons | Water savings | 14 Million tons | 71 Million tons | Cost saving | € 243 Million tons | € 1.21 billion | Additional sales | € 234 Million tons | € 1.71 billion | Jobs | 10000+ | | Private investment | 374 | |
| METRIC | BENEFITS IN FIRST YEAR | IMPACT AT END OF THE PROJECT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Landfill diversion | 9 Million tons | 45 Million tons | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Carbon dioxide reduction | 8 Million tons | 39 Million tons | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Virgin material saving | 12 Million tons | 58 Million tons | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hazardous waste eliminated | 0.4 Million tons | 2 Million tons | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water savings | 14 Million tons | 71 Million tons | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cost saving | € 243 Million tons | € 1.21 billion | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Additional sales | € 234 Million tons | € 1.71 billion | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Jobs | 10000+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Private investment | 374 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <p>Success factors to NISP include;</p> <ol style="list-style-type: none"> Working with the regulator and technology provider's, Well-built industrial expertise with a Long term relationship at enterprise level. Use of Information technology to share information and data on possible IS synergies. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| COUNTRIES | INCENTIVES (CARROT APPROACH) | REGULATORY INSTRUMENTS (STICK APPROACH) | STATUS OF GREEN MANUFACTURING |
|----------------------------|--|---|--|
| <p>SOUTH AFRICA</p> | <p>The Industrial Energy Efficiency (IEE) Project: Industrial Energy Efficiency project was a five year programme aimed at improving industrial energy efficiency in South Africa and contribute to energy security while ensuring that economic growth is not constrained by energy shortages and rising energy prices’.</p> | <p>To achieve this, the project employed a holistic approach based on a number of key elements, or components:</p> <ul style="list-style-type: none"> i) Encouraging the creation of an enabling policy environment – the IEE Project played an active role in creating awareness and supporting the development and implementation of the South African National Energy Efficiency Strategy (NEES). ii) Supporting the adoption and promotion of energy management standards – the Project supported the South African authorities in the development, adoption and promotion of the ISO 50001 group of standards and in the development of the auditing criteria and training necessary for certification. iii) Building local capacity to implement EnMS and ESO in industrial enterprises, through specialised training courses and extensive in-plant implementation support. iv) Demonstrating the potential and impact of IEE on the bottom line and sustainability of a business through case studies, demonstration plants and awareness-raising | <p>The key benefits include total energy savings of 3.8 terawatt hours, reduction in carbon emission of 3.7 Million tonnes CO₂eq and monetary saving of 3.1 Billion Rands²⁷.</p> |

4.1 LESSONS FROM INTERNATIONAL BEST PRACTICES FOR GREEN MANUFACTURING

- i) The government plays a significant role in transition to green manufacturing and should establish a supportive enabling environment and kick start the process through pilots and demonstration projects
- ii) Experimentation or piloting is paramount in identifying novel solutions to address industrial sustainability challenges and spaces for experimentation should be provided continuously, including institutional innovation, technological development and business models;
- iii) Social embeddedness or localizing foreign innovations into local context is key in adopting innovative solutions and it should be fostered to strengthen regional competitiveness.
- iv) A mix of carrot and stick approach is an effective approach which creates a win-win situations
- v) Market based instrument e.g. carbon trading schemes have been successful in fostering transitional to green manufacturing in most countries where they have been applied.

There are many possible benefits of green manufacturing if the practices are adopted, including saving money, improving products, making operations more efficient and increasing sales. These are manifested mainly in the following areas as good practices:



Biogas Plant generating Methane Gas used for firing Boilers in a distillery



Recommended Insulation for steam Flanges to reduce Heat loss

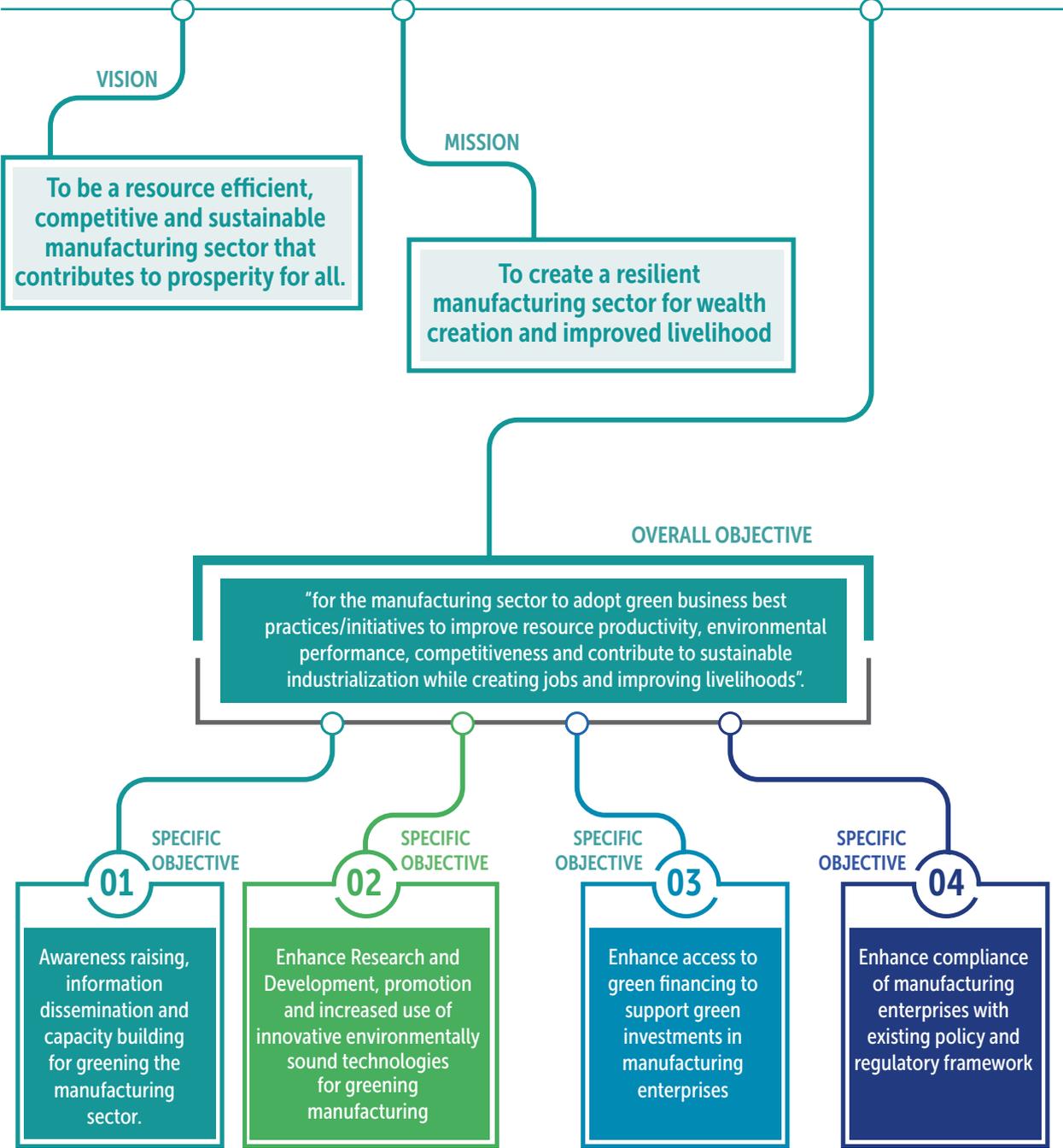
4.2 SUB-SECTOR BEST PRACTICES FOR GREENING MANUFACTURING SECTOR

| SUB-SECTOR | BEST PRACTICES FOR GREEN MANUFACTURING | INDICATORS |
|-----------------------------------|---|---|
| CEMENT INDUSTRIES | <ul style="list-style-type: none"> i) Continued implementation of effective controls, which reduce or eliminate the release of pollutants to the air, to the land, and/or to the water. ii) Actively seek ways to manage wastes in a responsible and environmentally sound manner. iii) Pursue effective improvements in energy efficiency and promote the conservation of resources. iv) Take precautionary measures to ensure safety and protect health of employees, neighbors, and customers in the production and distribution of a cement products v) Seek ways to beneficially and safely utilize recyclable wastes as raw materials, fuels, and product components as part of the overall commitment to waste minimization and recycling. vi) Continue to conduct mining operations in a responsible and environmentally sound manner. vii) Cooperate with lawmakers, regulators, and other interested parties in the implementation of rational and effective health, safety, and environmental laws and regulations. | <ul style="list-style-type: none"> i) Carbon Dioxide (CO₂) - Use of voluntary target of reducing carbon emission by 10% ii) Cement Kiln Dust (CKD) Environmental voluntary targets to reduce amount of CKD landfilled by 20% per ton of clinker produced iii) Environmental Management Systems(EMS)- use an auditable and verifiable EMS iv) Energy Efficiency |
| FOOD PROCESSING INDUSTRIES | <ul style="list-style-type: none"> i) Ensure that raw materials are from sustainably sources (e.g enterprises can consider use of Fair trade certified suppliers) ii) Processing food with minimal inputs including water, raw materials and energy will reduce the total impact of food processing. In addition, processors should aim toward using renewable energy or process wastes to produce energy. iii) Food safety should be at the center of operation (enterprise can consider use of third verification or certification) iv) Efforts for packaging should focus on reducing material use and using recycled content. v) Distribution should be as efficient as possible. Distribution systems should also leverage efficient technologies | <ul style="list-style-type: none"> i) Use of fair trade certification ii) Food safety certification iii) Use of environmentally friendly packaging materials iv) Eco-marks and eco-label certifications to verify efficient use of resource |

| SUB-SECTOR | BEST PRACTICES FOR GREEN MANUFACTURING | INDICATORS |
|------------|---|--|
| LEATHER | <ul style="list-style-type: none"> i) Compliance with the environmental legislative and other requirements which are subscribed ii) Application of recycling, recovery and reuse techniques to reduce the level of pollution at optimum achievable level iii) Proper treatment where applicable and disposal of all types of wastes . iv) Provide time to training to enhance the level of awareness and competency of all management and non-management workforce i) Decisions taken in the design phase of the product impact have to take into consideration the chemicals used most <ul style="list-style-type: none"> • To look for suppliers that offer fabrics with specific chemicals claims that are relevant to the company and the buyer. • To consider asking for alternatives for hazardous chemicals (e.g. natural dyes). • To define a company strategy on restricted chemicals in the supply chain and further reduction of the risks of chemical use. • To include suppliers in a dialogue on hazardous substances and the use of safe chemicals | <ul style="list-style-type: none"> i) IS 14898:2001 Eco Criteria for Finished Leather – Specification ii) IS14816:2000 Leather-Method of Tests for Eco criteria i) Reduction of chemical pollution of water streams from dyeing and other wet operations. ii) Percentage reduction of biological oxygen demand (BOD) and chemical oxygen demand (COD), iii) Re-engineering processes to reuse by-products, iv) Reduction and substitution of chemicals can eliminate chemical waste and the need for costly pollution control equipment. |
| | <ul style="list-style-type: none"> ii) Reducing the energy use within the supply chain will reduce costs and the negative impact on the environment; some examples are <ul style="list-style-type: none"> • To be aware of the energy consumption during the selection of fabrics and suppliers. • To be aware of the energy consumption of the wet-processing treatments, when deciding on the look and feel of the product (e.g. colour, print, bleach, finishing); less treatment means less energy consumption. • To define and implement a company energy strategy and action plan focusing on the company and the supply chains. • To include the suppliers in a dialogue on efficient energy use and to provide them with information on energy saving measures. | <ul style="list-style-type: none"> i) Application of good inventory management ii) Control energy consumption through efficiency in operations of Electricity consumption, hot water usage and steam (heat efficiency) |

| SUB-SECTOR | BEST PRACTICES FOR GREEN MANUFACTURING | INDICATORS |
|-----------------------|---|---|
| TEXTILE | <p>ii) There are several ways to influence the water footprint of the product and its contribution to pollution; the main solutions and approaches are:</p> <ul style="list-style-type: none"> • To be aware of the impact of the wet-processing treatments on water use and pollution, when deciding on the look and feel of the product (e.g. colour, print, bleach, finishing); less treatment means less impact. • To include suppliers in a dialogue on efficient water use and waste water treatment. • To buy only from suppliers that offer (certified) fabric from water-efficient cultivation and textile mills. • To consider performance on chemical use when selecting the suppliers. Hazardous chemicals may end up in waste water when irresponsibly used. | <p>i) Reduction in the energy use</p> <p>ii) Recovery, recycling, and reuse can be effective tools for minimizing pollutant releases to the environment.</p> <p>iii) Reduction in water consumption, through reuse, recycle and recovery of process water</p> |
| IRON AND STEEL | <p>i) Working towards zero incidents and accidents during production</p> <p>ii) Use of Environmental Management Systems (EMS) to improve environmental performance and operating efficiency</p> <p>iii) GHG reduction in Iron & Steel Industries by switching to use of cleaner sources of energy through new technology. (e.g use of electric furnace as compared to fossil fuel powered furnace, continuous casting technology)</p> <p>iv) Decreasing energy consumption in process by using Energy saving technologies & Productive efficiency.</p> <p>v) Increase iron resource efficiency in the steel manufacturing process by recycling of all iron waste since iron is 100% recyclable</p> <p>vi) Emission Mitigation of CO2 by use CO2 capture technologies.</p> <p>vii) Converting pollutants and wastes into byproducts and promote their utilization and recycling along with the use of the product.</p> <p>viii) Ensure that the materials used for product packaging shall be recyclable or reusable or biodegradable</p> <p>ix) Adopt use of environmental policy</p> | <p>i) Use of carbon capture technologies</p> <p>ii) Adoption of Occupation Safety and Health systems</p> <p>iii) Energy efficient technologies</p> |

5. VISION, MISSION AND OBJECTIVES



The Green Manufacturing Strategy for Uganda has the following Vision, Mission and Specific Objectives as indicated above.

5.1 SPECIFIC OBJECTIVES

SPECIFIC OBJECTIVE 1: Awareness raising, information dissemination and capacity building for greening the manufacturing sector.

STRATEGIC INTERVENTIONS

- i) Facilitate wider engagement and networking among universities, research institutions, service providers, manufacturers and public sector at national and international levels for sharing of experience, skills and knowledge on green manufacturing practices, technologies and products.
- ii) Support promotion and implementation of resource efficient and pollution prevention programmes in manufacturing enterprise for improved productivity, safety and health and environment protection.
- iii) Support capacity building of technical institutions as service providers to enterprises to facilitate adoption of green technologies and practices.
- iv) Develop a mechanism for disseminating information on green technologies, products and the economic, environmental, and social benefits that accrue from green manufacturing

SPECIFIC OBJECTIVE 2: Enhance Research and Development, promotion and increased use of innovative environmentally sound technologies for greening manufacturing .

STRATEGIC INTERVENTIONS

- i) Support collaborative research and strengthen linkages among R&D institutions, government and manufacturing enterprises to foster innovation, green jobs and transfer of green technologies.
- ii) Support R&D for greening existing manufacturing methods or processes, machines or systems, creating new processes and products
- iii) Develop R&D supporting infrastructure for greening manufacturing such as incubation centres, research grants, Science Technology and Innovation (STI) parks,

SPECIFIC OBJECTIVE 3: Enhance access to green financing to support green investments in manufacturing enterprises.

STRATEGIC INTERVENTIONS

- i) Enhance provision of fiscal incentives for triggering and prospering green investments by enterprises in the manufacturing sector.
- ii) Build capacity and support financial institutions to provide green finance to manufacturing enterprises.

SPECIFIC OBJECTIVE 4: Enhance compliance of manufacturing enterprises with existing policy and regulatory framework.

STRATEGIC INTERVENTIONS

- i) Enhance coordination and harmonization of activities and objectives goals and priorities, and establish a coordinated approach among relevant Ministries Departments and Agencies for green manufacturing.
- ii) Support development and implementation of Compliance Assistance Programmes to help enterprises improve resource efficiency; reduce pollution while meeting regulatory and certification requirements.
- iii) Enhance the capacity of regulatory agencies to enforce laws and regulations relevant to promotion of green initiatives within the operations of the manufacturing enterprises.

5.2 CROSS CUTTING ISSUES

- i) Ensure that data and information on green manufacturing is available, accessible and adapted to all persons – including vulnerable and marginalised groups,
- ii) Establish mechanisms to ensure inclusion of youth and women enterprises in green manufacturing initiatives
- iii) Ensure tailored capacity building programmes in green manufacturing are accessible to all persons including vulnerable and marginalized groups
- iv) Ensure production of green products that are gender sensitive.
- v) Ensure gender sensitive green manufacturing practices

5.3 GUIDING PRINCIPLES

The following will be the guiding principles in implementation the Green Manufacturing Strategy;

- i) Alignment with National Priorities: Implementation of green manufacturing interventions will be in accordance with National Priorities as indicated in The Vision 2040, National Development Plans, National Green Growth Development Strategy 2017, and The Climate Change Policy 2015 among others,
- ii) Equity and socio- inclusion: this principle entails ensuring that all persons participate without exclusion in all processes and activities be it social, political, and economic. All obstacles must be eliminated or addressed so that all persons can participate and progress equally and fairly in socio-economic activities .
- iii) . This will aim at improving access to services for the most disadvantaged, improving access to resources and benefits of green manufacturing for the most disadvantaged, meaningful participation in decision making for the most disadvantaged in the process of greening the manufacturing sector
- iv) Entrepreneurship and business management: - this entails mentorship for start- ups, small and medium enterprises to equip and utilise financial and managerial skills and use of communication technologies to grow their businesses.
- v) Technology and innovation: -This will involve putting green technologies, concepts and ideas to practice, and making them commercially successful.
- vi) Market Development: this aims at reaching or tapping into a different segment or unexplored markets of green products and technologies
- vii) Precautionary: this enables decision-makers to adopt preventive measures especially where there is a degree of uncertainty and the associated risks to the environment are high. The Policy action will then be to protect the society and the environment.
- viii) Efficiency and Effectiveness; Green Manufacturing strategy will equitably use available resources, optimize 'high impact/ low cost' solutions actions with most appropriate funding mechanisms.

6. IMPLEMENTATION ACTION PLAN MATRIX

| SPECIFIC OBJECTIVE 1: AWARENESS RAISING, INFORMATION DISSEMINATION AND CAPACITY BUILDING FOR GREENING THE MANUFACTURING SECTOR | | | | | | |
|--|--|---|----------------------------------|----------------------------------|-------------------------------|--|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT- TERM (2020/21-2024/25) | MEDIUM-TERM (2025/26-2029/30) | LONG-TERM 2030/31-2034/35) | |
| STRATEGIC INTERVENTION 1.1 Facilitate wider engagement and networking among universities, research institutions, service providers, manufacturers and public sector at national and international levels for sharing of experience, skills and knowledge on green manufacturing practices, technologies and products. | | | | | | |
| 1.1.1 Establish a knowledge management platform for sharing knowledge, skills and experience among researchers, enterprises, manufacturing sector associations and experts. | Operational Knowledge management platform established | # of people accessing knowledge and information from the platform | | | | MTIC in Collaboration with relevant MDAs and local governments |
| 1.1.2 Promote uptake and application of results of research programs on water, energy material efficiency, renewable energy, pollution prevention by enterprises | Research findings/ results on water, energy and material efficiency as well pollution prevention promoted among enterprise | # of research findings applied by the enterprises /industry | | | | MoSTI, MTIC, MWE, MEMD, NEMA in Collaboration with relevant MDAs local governments |
| 1.1.3 Introduce exchange programmes at national and international level aimed at learning from international best practices and putting foreign innovations into local context | Operational exchange program for green manufacturing technology transfer | Number of green technologies and practices local adopted through exchange program | | | | MTIC in Collaboration with relevant MDAs development partners and regional blocks |
| 1.1.4 Organise green technology exhibition events to link suppliers, manufactures, and end users for fostering transfer of green technologies to manufacturing enterprises | Operational program to locally exhibit both local and international green technologies | Number of green technology exhibition events held | | | | MSTI, MTIC in Collaboration with UJRI, UNCST, UCPC and the private sector |

| SPECIFIC OBJECTIVE 1: AWARENESS RAISING, INFORMATION DISSEMINATION AND CAPACITY BUILDING FOR GREENING THE MANUFACTURING SECTOR | | | | | | |
|---|--|--|---------------------------------|----------------------------------|-------------------------------|--|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT-TERM (2020/21-2024/25) | MEDIUM-TERM (2025/26-2029/30) | LONG-TERM 2030/31-2034/35) | |
| <p>1.1.5 Establish and operationalize Program Working Group (PWG) comprising representatives from relevant MDAs (such as Ministry of Trade, Industry and Cooperatives, Ministry of Water and Environment, Ministry of Labor Gender and Social Development and Ministry of Energy and Mineral Development, NEMA, UNBS, NPA), Local governments Academia and research institutions and private sector associations (such as UMA, USSIA, PSFU).</p> | <p>Program Working Group established and operationalized.</p> | <ul style="list-style-type: none"> # of meetings held by the PWG # of reports produced and disseminated by the PWG | | | | <p>MTIC in Collaboration with MWE, MEMD, MLGSD, UJA, NEMA, NPA, UNBS, MoLG</p> |
| <p>Strategic intervention 1.2: Support promotion and implementation of resource efficient and pollution prevention programmes in manufacturing enterprise for improved productivity, safety and health and environment protection.</p> | | | | | | |
| <p>1.2.1 Engage enterprises in training on resource efficiency and other related concepts such as low carbon production, industrial symbiosis and eco-innovation.</p> | <p>Enterprises engaged and trained in resource efficiency, low carbon production, industrial symbiosis and eco-innovation.</p> | <p>Number of Enterprises engaged and training in RECP, Low Carbon Production, Industrial symbiosis and eco-innovation)</p> | | | | <p>MTIC, in collaboration MEMD, MWE, UNCST, UCPC</p> |
| <p>1.2.2 Conduct in plant assessments in enterprises to identify measures for greening manufacturing processes and systems through material substitution (use of less toxic, renewable and recyclable materials), technology change, better process control, equipment modification and changes in management practices</p> | <p>In plant assessments for green manufacturing carried out in manufacturing enterprises</p> | <p>Number of MSMEs that have carried out in-plant assessments for green manufacturing</p> | | | | <p>MTIC, in collaboration MEMD, MWE, UNCST, UCPC</p> |

SPECIFIC OBJECTIVE 1: AWARENESS RAISING, INFORMATION DISSEMINATION AND CAPACITY BUILDING FOR GREENING THE MANUFACTURING SECTOR

| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
|--|---|--|----------------------------------|----------------------------------|-------------------------------|--|
| | | | SHORT- TERM (2020/21-2024/25) | MEDIUM-TERM (2025/26-2029/30) | LONG-TERM 2030/31-2034/35) | |
| 1.2.3 Introduce and implement comprehensive programmes on Resource Efficient and Cleaner Production, Industrial Symbiosis and Eco-innovation for improving resource efficiency, environmental performance and enabling a shift from linear to circular production system. | Comprehensive programmes on Resource Efficient and Cleaner Production, industrial Symbiosis and Eco-innovation introduced and implemented | Number of manufacturing enterprises that have adopted or are implementing activities on any of the concepts such as RECP, Industrial Symbiosis and eco-innovation | | | | MTIC, in collaboration MEMD, MWE, UNCST, UCPC |
| 1.2.4 Support establishment of recycling industries and create market for recycled products | Recycling Industries established and use of recycled products promoted | <ul style="list-style-type: none"> • # of recycling industries established • Number and Volume of recycled products on the market. | | | | MTIC in collaboration with MFPED, MWE, NPA, UIA, UDC and LGs |
| 1.2.5 Develop appropriate infrastructure for sorting, collection, transportation, recycling, treatment and ultimate disposal of waste | Appropriate infrastructure developed | <ul style="list-style-type: none"> • Number of waste collection and sorting in place • Number of waste transportation equipment/facilities in place • Number of waste treatment facilities in place | | | | MTIC in collaboration with MFPED, NPA, UIA, UDC |
| 1.2.5 Develop a database on waste from industries to facilitate industrial synergies on waste and bi-products reuse and recycling | A database on waste from industries developed | Functioning database in-place | | | | MTIC, in collaboration MEMD, MWE, UNCST, UCPC |

| SPECIFIC OBJECTIVE 1- AWARENESS RAISING, INFORMATION DISSEMINATION AND CAPACITY BUILDING FOR GREENING THE MANUFACTURING SECTOR | | | | | | |
|--|--|---|----------------------------------|----------------------------------|-------------------------------|--|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT- TERM (2020/21-2024/25) | MEDIUM-TERM (2025/26-2029/30) | LONG-TERM 2030/31-2034/35) | |
| 1.2.6 Develop monitoring and evaluation programmes based on standardized guidelines to assess impact of adoption of green manufacturing technologies and practices and annually publish sustainability manufacturing performance report | Monitoring and evaluation programmes and tools based on standardized guidelines developed | Number of manufacturing enterprises monitored and evaluated to determine impact of adoption of green manufacturing practices and technologies | | | | MTIC, MSTI, MEMD, MWE, NEMA, UCPC |
| STRATEGIC INTERVENTION 1.3: Support capacity building of technical institutions as service providers to enterprises to facilitate adoption of green technologies and practices. | | | | | | |
| 1.3.1 Identify existing technical institutions and assess their capacity needs (human resource, support infrastructures, equipment, software and hardware, finance) for providing green manufacturing services to enterprises | Technical Institutions and Centers identified and their infrastructure capacity assessed | Number of technical institutions and Centers identified with their infrastructure capacities assessed | | | | MFPEd, MoPS, MTIC, MICT &NG, MoES, NCHE, NCD, |
| 1.3.2 Develop a capacity building framework to address the capacity gaps of technical institutions | Capacity building framework developed | Number of institutions with sufficient capacity built to promote green manufacturing | | | | MFPEd, MoPS, MTIC, MICT |
| STRATEGIC INTERVENTION 1.4: Develop a mechanism for disseminating information on green technologies, products and the economic, environmental, and social benefits that accrue from green manufacturing | | | | | | |
| 1.4.1 Develop accounting systems that capture (account for) environmental cost and benefits and integrate such systems in national accounting and reporting system | Well-developed accounting systems for monitoring and reporting sustainability aspects of green manufacturing | Number of manufacturing enterprises capturing sustainability aspects of green manufacturing and their financial or accounting report | | | | MFPEd, UBOS, NEMA, MTIC, and Association of professional accountants |

SPECIFIC OBJECTIVE 1: AWARENESS RAISING, INFORMATION DISSEMINATION AND CAPACITY BUILDING FOR GREENING THE MANUFACTURING SECTOR

| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
|---|--|--|----------------------------------|----------------------------------|-------------------------------|---|
| | | | SHORT- TERM (2020/21-2024/25) | MEDIUM-TERM (2025/26-2029/30) | LONG-TERM 2030/31-2034/35) | |
| 1.4.2 Establish a common green manufacturing information platform accessible to all manufacturing sector stakeholders. | A functional knowledge and information sharing platform | Number of MSMEs, and People accessing knowledge and information resources on the platforms | | | | MTIC in Collaboration, MEMD,MWE, MSTI, UCPC, NCST, private sector |
| 1.4.3 Conduct awareness raising events such as workshops, seminars, talk shows on resource (water, energy, materials) efficiency, and renewable energy | Awareness campaigns on green manufacturing practices and technologies carried out | Number of awareness raising events carried out and reports produced | | | | MTIC in Collaboration, MEMD, MWE UCPC, UNCST, LGs |
| 1.4.4 Develop Information, Educational and Communication(IEC) materials such as brochures, newsletters and sector specific technical manuals on green manufacturing and make them accessible to stakeholders including manufacturing enterprises | IEC materials developed | <ul style="list-style-type: none"> Number of IEC Material developed on green manufacturing Number of institutions/ enterprises/ other users utilizing the produced materials/documents | | | | MTIC in Collaboration, MEMD, MWE UCPC, UNCST, LGs and private sector associations |
| 1.4.5 Engage the media (print media, radio, television, social media) to disseminate information on economic, environmental and social benefits of green manufacturing | Economic, environmental and social benefits of green manufacturing disseminated and savings made after knowledge acquisition | Number of media houses disseminating information on economic, environmental and social benefits of green manufacturing | | | | MTIC in Collaboration, MEMD, MWE UCPC, UNCST, MoICT&NG |

| SPECIFIC OBJECTIVE 2: ENHANCE RESEARCH AND DEVELOPMENT, PROMOTION AND INCREASED USE OF INNOVATIVE ENVIRONMENTALLY SOUND TECHNOLOGIES FOR GREENING MANUFACTURING | | | | | | |
|---|---|---|------------|-------------|-----------|--|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT-TERM | MEDIUM-TERM | LONG-TERM | |
| Strategic intervention 2.1: Support collaborative research and strengthen linkages among R&D institutions, government and manufacturing enterprises to foster innovation and transfer of green technologies. | | | | | | |
| 2.1.1 Create and operationalization of research networks among local and international research institutions | A network of local and international research institutions such as RESCP institutions created | # of institutions listed, subscribed and networked | | | | MSTI, MES in collaboration UJRI, NCST, Universities |
| 2.1.2 Promote exchange programmes for researchers in green manufacturing technologies at national, regional and international level | operational research exchange programmes on green manufacturing technologies in place | Number of Joint research programmes on green manufacturing technology | | | | MTIC, MSTI, MFPED, MoFA, MEMD, MWE, MES, Universities |
| 2.1.3 Put in place structures for Science-Policy interface to trigger evidence based policy reforms that support adoption and diffusion of green manufacturing technologies and practices. | Operational green manufacturing forum for scientist and policy makers in place | Number of dialogues for scientist and policy makers carried out | | | | MTIC, MSTI, MEMD, MWE, MES |
| Strategic intervention 2.2: Support Research and Development (R&D) for greening existing manufacturing methods or processes, machines or systems, creating new processes and products | | | | | | |
| 2.2.1 Carry out R&D that improves technologies that create or improve manufacturing processes that deliver improved resource productivity and environmental benefits. | R & D on the Green Manufacturing technologies and improvement on their performance conducted | Reports and articles about the R&D results published. | | | | MSTI, MES in collaboration with research institutions (UJRI, NCST), and Universities |
| 2.2.2 Carry out R&D Systems level technologies for innovation in the manufacturing enterprises including innovation in extended enterprise functions critical to manufacturing such as quality systems, resource management and technologies for improved workforce safety and health. | Operational R&D program on green manufacturing systems | Number of green manufacturing systems developed | | | | MSTI, MES in collaboration with research institutions and Universities |

| SPECIFIC OBJECTIVE 2: ENHANCE RESEARCH AND DEVELOPMENT, PROMOTION AND INCREASED USE OF INNOVATIVE ENVIRONMENTALLY SOUND TECHNOLOGIES FOR GREENING MANUFACTURING | | | | | | |
|---|--|---|------------|-------------|-----------|--|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT-TERM | MEDIUM-TERM | LONG-TERM | |
| 2.2.3 Carry out R&D for improving machine level technologies that create or improve manufacturing equipment for improved capacity, safety, efficiency, accuracy and precision. | Operational R&D program on green manufacturing technologies | Number of green manufacturing Machinery/ technologies developed | | | | MSTI, MTIC, MES in collaboration with other research institutions and Universities |
| Strategic intervention 2.3: Develop R&D supporting infrastructure for greening manufacturing such as Incubation Centres, research grants, STI parks, | | | | | | |
| 2.3.1 Facilitate establishment of incubation centers to foster research in green product development and innovation | Incubation Centres for research in green product development and innovations established | Number of Incubation Centers for research in green product development and innovations established | | | | MoFPED, MSTI, MTIC, UDC |
| 2.3.2 Establish and operationalize research grants to support R&D in green manufacturing technologies, renewable energy and green products | Operational grant for R&D grant in green manufacturing | <ul style="list-style-type: none"> Number of R&D in green manufacturing funded Number of researchers conducting green manufacturing R&D | | | | MFPEd, NPA |
| 2.3.3 Support Establishment of Science Technology and Innovation (STI) Parks to facilitate demonstration of prototypes and commercialization of local green technologies | Operational STI Parks in place | Number of green manufacturing technologies locally developed and commercialized | | | | MoFPED, MSTI, MTIC, UIA, UDC |
| 2.3.4 Establish award schemes for innovators and researchers to raise interest in research in green manufacturing technologies | Operational award schemes targeting innovators and inventors in green manufacturing technologies | Number of innovation award events organized | | | | MSTI, MTIC |

| SPECIFIC OBJECTIVE 2: ENHANCE RESEARCH AND DEVELOPMENT, PROMOTION AND INCREASED USE OF INNOVATIVE ENVIRONMENTALLY SOUND TECHNOLOGIES FOR GREENING MANUFACTURING | | | | | | |
|---|---|---|------------|-------------|-----------|-------------------|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT-TERM | MEDIUM-TERM | LONG-TERM | |
| 2.3.5 Strengthen the capacity (budget allocation, equipment, personnel, and networks) of institutions involved in R&D to carry out research in areas such as renewable materials, renewable energy and energy efficiency, processing methods and technologies, green products, | Institutional Capacity strengthening programmes in place | Number of institutions strengthened to carry out R&D in green manufacturing initiatives | | | | MoFPED, NPA |
| 2.3.6 Establish sub sector specific research institutes for sub sectors such as leather, textile, sugar, metal, Dairy | Operational industrial sector specific R&D institutions | Number of industrial sector specific R&D institutions and programs established | | | | MoFPED, NPA, MTIC |
| 2.1.7 Enhance enforcement of provisions of the Industrial Property Act 2014 for promotion and protection of Intellectual Property rights (copy right, trade mark, patents) to encourage innovators to further their research and innovation in green technologies. | Enforcement of provision of Industrial Property Act 2014 for promotion of intellectual property rights enhanced | Number of patented R&D results/innovations in green manufacturing | | | | MJCA, URBS |

SPECIFIC OBJECTIVE 3: ENHANCE ACCESS TO GREEN FINANCING TO SUPPORT GREEN INVESTMENTS IN MANUFACTURING ENTERPRISES

| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
|---|--|--|------------|-------------|-----------|-----------------------------------|
| | | | SHORT-TERM | MEDIUM-TERM | LONG-TERM | |
| Strategic intervention 3.1 Enhance provision of fiscal incentives for triggering and prospering green investments by enterprises in the manufacturing sector. | | | | | | |
| 3.1.1 Provide incentives (e.g, tax-exemption, subsidies) for manufacturing enterprises to green their production processes and support operations. | Policy and legal provisions with incentives to promote greening of manufacturing | Number of incentives in place | | | | MoFPED, URA, NPA, MTIC, UDC,UEPB |
| 3.1.2 Introduce and implement green insurance policies/schemes/products among insurance companies so that resource efficiency, occupational safety and health and environment considerations/risks are incorporated in insurance packages for enterprises in manufacturing sector. | Operational green insurance schemes | Number of MSMEs with access to green insurance schemes to safe guard development of green manufacturing projects | | | | MoFPED, NPA, MTIC, UDC |
| 3.1.3 Provide for preferential public procurement (sustainable procurement policy) of green products and products locally manufactured under green processes. | Green/Sustainable procurement policy and regulations developed and implemented | Number of preferential procurements for green products enforced/implemented | | | | MoFPED, PPDA |
| 3.1.4 Provision of green lending models or green credit with incentives such as, interest discounts, guarantees and differentiated management of such credit based on performance in resource productivity, occupational safety and health and environment. | Green financing and credit models in place | Number of greening financing and credit models in place. | | | | MoFPED, Bankers association, MTIC |
| 3.1.5 Develop and encourage use of Natural Capital Accounting system in reporting annual economic growth and development in the manufacturing sector at the national level | A natural Capital accounting system developed and operationalized. | Natural resource consumption integrated in national annual economic growth of the manufacturing sector | | | | MoFPED, MWE, MTIC, UBOS, NEMA |

| SPECIFIC OBJECTIVE 3: ENHANCE ACCESS TO GREEN FINANCING TO SUPPORT GREEN INVESTMENTS IN MANUFACTURING ENTERPRISES | | | | | | |
|--|---|--|------------|-------------|-----------|---------------------------------------|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT-TERM | MEDIUM-TERM | LONG-TERM | |
| 3.1.6 Establish clear and standard guidelines describing green investment to avoid misuse of green financing in green washing projects | A white paper describing what is considered green manufacturing project and technologies | List of green manufacturing projects and technology identified and publicized | | | | MoFPED, MSTI, MTIC, MWE, MEMD, MoLGSD |
| Strategic intervention 3.2: Support financial institutions to provide green finance to manufacturing enterprises. | | | | | | |
| 3.2.1 Introduce, enhance implementation of green finance policies that require financial institutions to incorporate resource efficiency and environmental liabilities/risks in determining interest rates when lending to manufacturing. | Policies that encourage financial institutions to incorporate resource efficiency and environmental liabilities/risks in their financing mechanisms implemented | Number of financial institutions that have incorporated resource efficiency and environmental liabilities/risks in determining interest rates when lending to manufacturing. | | | | MoFPED, BOU |
| 3.2.2 Establish and promote green financing mechanism among financial institutions | Green financing established in financial institutions | Number of financial institutions with green financing products/schemes | | | | MoFPED, BOU |
| 3.2.3 Build/enhance capacity of financial institutions to put in place green finance products such as green bonds, low interest carbon credit, renewable energy and energy efficiency finance | Capacity building programmes for finance institution in green manufacturing in place | Number of financial institution equipped with resource and knowledge to offer green financing to MSMEs in manufacturing sector. | | | | MoFPED, BOU |
| 3.2.4 Build capacity of enterprises in manufacturing sector to formulate bankable proposals for green financing | Capacity of SMEs to formulate bankable proposals built | Number of MSMEs that have developed bankable proposal. | | | | MoFPED, MTIC, MEMD, MWE, UDC, UCPC |

| SPECIFIC OBJECTIVE 4: ENHANCE COMPLIANCE OF MANUFACTURING ENTERPRISES WITH EXISTING POLICY AND REGULATORY FRAMEWORKS. | | | | | | |
|--|--|--|-------------|-------------|-----------|--|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT- TERM | MEDIUM-TERM | LONG-TERM | |
| Strategic intervention 4.1 Enhance cooperation and harmonize goals and priorities, and establish a coordinated approach among relevant Ministries Departments and Agencies for green manufacturing. | | | | | | |
| 4.1.1 Establish multi-stakeholders Working Group, to support compliance of enterprises with environmental regulation/standards through greening their production process and their value chains. | A multi-stakeholders Working Group established | Number of MSMEs complying with environmental regulation/standards | | | | MWE, MTIC, MLG in collaboration NEMA, MEMD, MSTI |
| 4.1.2 Engage Sector associations such as UMA, USSIA, UFPEA, Federation of Small and Medium-sized Enterprises- Uganda to influence their member enterprises to adopt green manufacturing technologies and practices. | Private sector associations with Voluntary compliance program | Number of MSMEs participating in voluntary compliance program from their sector associations | | | | MTIC, MEMD |
| 4.1.3 Harmonize communication among relevant government institutions and establish a common compliance assistance approach for enterprises to meet regulatory requirements | A Harmonized/standard green manufacturing compliance assessment approach established among government institutions | Improved communication among MIDAs and compliance to regulatory requirements by SMEs | | | | MWE, MTIC, MEMD MOLG |
| Strategic intervention 4.2: Support development and implementation of Compliance Assistance Programmes to help enterprises improve resource efficiency; reduce pollution while meeting regulatory and certification requirements. | | | | | | |
| 4.2.1 Develop a compliance assistance programme for enterprises in the manufacturing sector with appropriate training packages and materials | A compliance assistance programme developed and implemented | Number of MSMEs supported under compliance assistance programme | | | | MWE, MTIC, MEMD, UDC, NEMA, UCPC |
| 4.2.2 Provide technical support and guidance to manufacturing industries aimed at improving compliance and reducing environmental liabilities | Functional compliance assistance program in place | Number of MSMEs supported to comply with environmental standards and regulations | | | | MWE, MTIC, MEMD, UDC, UCPC, NEMA |

| SPECIFIC OBJECTIVE 4: ENHANCE COMPLIANCE OF MANUFACTURING ENTERPRISES WITH EXISTING POLICY AND REGULATORY FRAMEWORKS. | | | | | | |
|--|---|--|------------|-------------|-----------|--|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT-TERM | MEDIUM-TERM | LONG-TERM | |
| <p>4.2.3 Provide technical support in implementation of managements systems such as Environment Management Systems (ISO 14001), Energy Management Systems (ISO 50001), Quality Management Systems (ISO 9001) Food Safety Management systems (ISO 22000) Occupational Health and Safety systems (OHSAS 18001) among manufacturing enterprises.</p> | <p>Technical support programmes for MSMEs to meet requirements for certification according to Various ISO standards</p> | <p>Number of MSMEs supported to get certified in Energy, Environment, Quality and Food Safety and OH&S management systems according ISO 50001, ISO 14001, ISO 9001, ISO 22000, 18001</p> | | | | <p>MWE, MTIC, MEMD, UDC, UNBS, UCPC, NEMA</p> |
| <p>4.2.4 Enhance capacity of technical institutions to provide technical assistance to manufacturing enterprises to meet regulatory and certification requirements.</p> | <p>Capacity of technical institutions enhanced</p> | <p>Number of Institutions capable of providing technical assistance to MSMEs</p> | | | | <p>MFPED, MoPS</p> |
| <p>4.2.5 Enhance development and implementation of eco-labeling standards, and use of eco-labels and eco-marks/ symbols</p> | <p>Functioning eco-lable and eco-mark standards support programmes</p> | <p>Number of MSMEs support to get eco-mark or eco-label certification</p> | | | | <p>MTIC, UNBS, UCPC</p> |
| <p>4.2.6 Develop and promote incentive schemes that encourage manufacturing enterprises to green their production processes, operations and comply with environmental regulations and standards.</p> | <p>Incentive schemes in place</p> | <p>Number of MSMEs greening their manufacturing process as a result of the incentive schemes</p> | | | | <p>MoFPED, MTIC, NPA, UIA, UDC, FZA</p> |
| Strategic intervention 4.3: Enhance the capacity of regulatory agencies to enforce laws and regulations relevant to promotion of green initiatives within the operations of the manufacturing enterprises | | | | | | |
| <p>4.4.1 Enhance the technical expertise of the personnel to carry out inspection and enforcement in manufacturing enterprises</p> | <p>Operational training program on energy Efficiency and management, Air quality monitoring, Resource Efficiency and cleaner production</p> | <p>Number of technical people certified in energy audit, Air quality monitoring and reporting and Cleaner according to international standards</p> | | | | <p>MoFPED, MTIC, MLGSD, MWELGs, NEMA, , NSWC</p> |

| SPECIFIC OBJECTIVE 4: ENHANCE COMPLIANCE OF MANUFACTURING ENTERPRISES WITH EXISTING POLICY AND REGULATORY FRAMEWORKS. | | | | | | |
|---|--|--|------------|-------------|-----------|------------------------------------|
| ACTION | OUTPUTS | OUTPUT INDICATORS | TIME FRAME | | | RESPONSIBILITY |
| | | | SHORT-TERM | MEDIUM-TERM | LONG-TERM | |
| 4.4.2 Provide regulatory Agencies with appropriate equipment for monitoring pollution parameters as provided for in the various regulations/standards | Regulatory Agencies equipped with pollution monitoring equipments. | Number of Regulatory Agencies with pollution monitoring equipments | | | | MoFPED, MWE, MTIC, NPA |
| 4.4.3 Provide sufficient budget allocation to regulatory agencies to enable them carry their respective regulatory functions as provided in their mandates. | Sufficient budget allocated to regulatory Agencies | <ul style="list-style-type: none"> Increased budget allocation to Regulatory Agencies Number of MSMEs supported with improved compliance | | | | MFPED, MWE, MTIC, MEMD, NEMA, |
| 4.4.4 Enhance collaboration with other government entities such as the Uganda Police Force, the Judiciary, Local Government Authorities that can support the regulatory and enforcement functions | Strong collaboration among Government Agencies created | Enhanced compliance and synergies due to strong created collaboration | | | | OPM, MFPED, MWE, MTIC, MEMD, NEMA, |
| 4.4.5 Harmonize and coordinate inspection and enforcement functions to reduce duplication and overlaps that ensures better use of public resources, maximize effectiveness and minimizes burdens and fatigue on regulated enterprises. | Harmonized and well-coordinated enforcement programme in place | Number of MSMEs inspected and complying | | | | OPM, MWE, MTIC, MEMD, NPA, NEMA, |

7. RESOURCE MOBILIZATION AND FUNDING OF THE STRATEGY

7.1 GOVERNMENT FUNDING

The strategy will be implemented through the annual budgeting process using the outcome-based budgeting approach under the newly adopted Programme-Based Budget structure. The various MDAs shall mainstream the respective activities in their budget framework papers, annual work plans and prioritise green manufacturing initiatives in their activity plans for ease of implementation following the MTEF cycle.

7.2 PUBLIC PRIVATE PARTNERSHIP

A number of green manufacturing initiatives can be facilitated through public private partnerships. The PPP Act 2015, provides for PPP agreements; to establish a Public Private Partnership Committee and a Public Private Partnership Unit; a Project Development Facilitation Fund and functions of contracting authorities, the role of the private party in a public private partnership; the management of PPPs; project inception and feasibility studies, procurement, partnership agreements and monitoring of public private partnerships. Public investment in physical infrastructure, utilities, innovative activity, education and clean energy are identified by the NDP II as fundamental enablers for transition to green economy and, in line with Uganda Vision 2040.

7.3 FOREIGN DIRECT INVESTMENTS

FDI inflows to Uganda averaged US \$1,088.8 billion between 2011 and 2016, equivalent to 3.9 % of GDP compared to 5.2 % in 2012. ²⁸Future global FDI flows are expected to be driven by improved growth forecasts of major developing economies, technological changes, global urbanization, access to a skilled labour force, energy security and climate change. The most promising industries for attracting FDI in developing countries like Uganda over the medium term have been identified as agribusiness and information and communication. Therefore the government can popularise and provide incentives to attract direct investments into green manufacturing enterprises since it is a new area where production is being shifted globally given the ever growing scarcity of production resources and demand for health foods and products by the market.

7.4 INTERNATIONAL MULTI-LATERAL FUNDING AND GRANTS

International equity agreements provide the rationale for the existing multilateral financing for climate protection. Funding available under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol is the most important source of international financing for climate investments: the CDM, the Joint Implementation program (CCAP-JI), the climate change programmes of the Global Environment Facility (GEF), and the Adaptation Fund.

Other sources of funding include the World Bank's Climate Investment Funds and bilateral initiatives sponsored by Japan, Norway, Germany, and other countries.²⁹ Climate funding currently available under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol is about \$10 billion per year, most of it through CDM. Additional funding is provided by the World Bank and by bilateral aid programmes.

28 Ministry of Finance Planning and Economic Development 2018, Draft National Investment Policy

29 Stockholm Environment Institute (SEI) 2009, FINANCING THE CLIMATE MITIGATION AND ADAPTATION MEASURES IN Developing countries

8 MONITORING AND EVALUATION

8.1 PERFORMANCE FRAMEWORK

Determining the extent to which planned activities have been implemented and translated into results is a key step in the successful management and implementation of the MSMEs Green Manufacturing Strategy. To this effect, results framework specifying different outputs, outcomes and the corresponding indicators have been developed to guide the implementation process.

8.2 GREEN MANUFACTURING INDICATORS

Indicators are a well-established means of defining, tracking and improving performance. Measuring performance is a vital first step to improvement. Monitoring and evaluation of the green manufacturing strategy will be based on two categories of indicators; these are input-output-based indicators and impact-based indicators. The input-output-based indicators will be used to track progress of implementation of proposed strategic interventions while the impact-based indicators will be used to assess the extent to which implemented strategic interventions have impacted the enterprise level. The impact-based indicators are further categorised to give a clear impact at sector level (macro level) and at enterprise level (Micro level).

The impact-based indicators will be used to assess the impact of strategic interventions at both sector and enterprise level adopted from OECD Sustainable Manufacturing Indicators as categorised in the table below

| INDICATORS (ENVIRONMENTAL, ECONOMIC AND SOCIAL INDICATORS) | AT ENTERPRISE LEVEL | AT SECTOR LEVEL |
|---|---|---|
| | UNIT OF MEASUREMENT | UNIT OF MEASUREMENT |
| INPUTS | | |
| Non-renewable material intensity: <i>measures the use of non-renewable materials as inputs in the production</i> | % (percentage of non-renewable materials to total material inputs) | % (percentage of non-renewable materials to total materials used) |
| Restricted substance intensity: <i>measures use of substances restricted by law as a proportion of total production</i> | % (percentage of restricted substances to total material inputs) | % (percentage of restricted substances to total materials used) |
| Recycled/reused content: <i>Accounts for all the amount of recycled and reused material in the total production</i> | % (percentage of recycled or reused inputs to total material inputs) | % (percentage of recycled or reused inputs to total materials used) |
| OPERATIONS/ RESOURCE EFFICIENCY | | |
| Water Intensity: <i>Calculates only the intensity of total water intake of the overhead and production process.</i> | Volume of water use per quantity of product output (e.g. m ³ /Ton of products) | Volume of water use per quantity of product output (e.g. m ³ / GDP _M) |
| Energy Intensity: <i>Calculates energy consumed for production processes and overhead in the production facility.</i> | Energy used during the production of inputs, in KWh or KWh equivalent per Ton of Products | Total Energy used during the production of inputs, KWh or KWh equivalent per GDP _M |
| Renewable proportion of total energy use: <i>Measures the renewable energy consumed as percentage of Total energy consumed</i> | % (Percentage of renewable energy consumed to the total energy use) | % (Percentage of renewable energy consumed to the total energy use) |

| INDICATORS (ENVIRONMENTAL, ECONOMIC AND SOCIAL INDICATORS) | AT ENTERPRISE LEVEL | AT SECTOR LEVEL |
|---|---|---|
| | UNIT OF MEASUREMENT | UNIT OF MEASUREMENT |
| Air release intensity: Measures amount of all pollutant releases to air during the reference year | Kg or tons of carbon dioxide (CO ₂)eq or sulphur dioxide (SO ₂) per Ton of products | Kg or tons of carbon dioxide CO ₂ eq or (SO ₂) per GDP _M |
| Water releases intensity: estimates quantity of pollutants released on-site to surface water over the reference year | Volume of waste water discharge per quantities of products produced (e.g. Tons of product /M ²) | Volume of waste water discharge per quantities of products produced (e.g. GDP _M / M ²) |
| Residuals intensity: The weight of all materials consumed in overhead and production plus the quantities of the waste output generated | The total weight of all materials consumed in production plus the waste output generated per specific unit of output, (Tons/year) | The total weight of all materials consumed in production plus the waste output generated per specific unit of output (Tons/year) |
| Natural land use productivity | Area coverage per quantity output over a given period of time (Tons/Acreage/year) | Area coverage per sector output over given period of time e.g. (GDP _M) /Acreage/year |
| PRODUCTS | | |
| Recycled/reused content of products: This represents the average content of recycled, reused or re-manufactured materials in all products produced over the reference year | % (Percentage of recycled/reused/re-manufactured content all products produced) over the reference year | % (Percentage of recycled/reused/re-manufactured content all products produced) over the reference year |
| Recyclability of products: This indicator measures the average recyclability of the entire product mix produced at the facility within the reference year. | % (percentage of recyclable material to total product composition) | % (percentage of recyclable material to total product composition) |
| Restricted substance content: Measures the use of substances restricted by law as a proportion of production | % (percentage of restricted substances used on products) | % (percentage of restricted substances used on products) |
| Energy Consumption intensity: This indicator measures the annual energy consumption of the product mix produced during the reference year per unit of output | Product energy consumption rating per unit output e.g. watts or kWh | Product energy consumption rating per unit output e.g. watts or kWh |
| Greenhouse gas emissions intensity: Greenhouse gas emissions caused during the production of inputs. The most cost-effective way to decrease GHG intensity is through improved energy efficiency, conservation and the use of lower-carbon energy sources. | <ul style="list-style-type: none"> Total GHG Emissions = activity data (AD) x emission factors (EF), measured in tons/year | <ul style="list-style-type: none"> Total GHG Emissions = activity data (AD) x emission factors (EF), (tons/year) |
| ECONOMIC INDICATORS | | |
| Employment generation for local population | Number of jobs created by gender in the enterprises | Number of jobs created by gender in the sector |
| COST SAVINGS ACHIEVED | COST SAVINGS MADE | COST SAVINGS MADE |
| Access to resources | <ul style="list-style-type: none"> Access to Energy Access to Water Access to Waste treatment facilities | <ul style="list-style-type: none"> Access to Energy Access to Water Access to Waste treatment facilities |
| Innovative products | Number of innovative products produced and sold on the market | Increased productivity and competitiveness in the sector |

8.3 MONITORING STRATEGY IMPLEMENTATION

MTIC shall coordinate and lead the quarterly monitoring of the activities and annual reviews of the interventions together with other implementing partners.

The routine monitoring and evaluation tools to be used shall entail the following:

- (a) Joint Multi-Sectoral Steering Committee will be formed and the regular steering committee meetings held (at least once a quarter)
- (b) Green Manufacturing Sector Public and private dialogue platform Round Table meetings
- (c) Annual Key stakeholder implementation Strategy Review meetings
- (d) Annual Audits and Evaluations.

8.4 MONITORING AND EVALUATION TOOLS

8.4.1 Monitoring and Evaluation Approach

Monitoring and evaluation will include a mix of quantitative and qualitative methods to track progress in the implementation of the various strategic interventions as stated in the green manufacturing strategy. The major methodology shall be through conducting of annual industrial surveys aimed at obtaining the enterprises perceptions, milestones/achievements and challenges as they implement the various green manufacturing initiatives. The surveys may be done by selecting a representative sample of manufacturing enterprises in the different categories of industries .

The survey may also seek general views of relevant associations, academia, civil society organizations and regulatory agencies. Survey-based quantitative evaluations will be used to assess how people/agents feel about the realization of strategy outcomes before, during and after a given policy intervention. It will involve use of numerical scale to express a degree of agreement or disagreement, track progress of achieving the objectives of the strategy using the above listed green manufacturing indicators.

The monitoring and evaluation will be done at different stages of implementation. The first stage, ex-ante evaluation is to establish baseline conditions in areas of green manufacturing within the country. This will be followed by the mid-term or execution phase monitoring and review which will track progress and inform whether we are moving in the positive direction or there is need for change, improvement in the implementation mechanisms and finally end of strategy monitoring and evaluation which will inform the formulation of the next green manufacturing strategy.



Value added Products from Recycled paper



Briquettes for firing boilers or heating purposes

9. COMMUNICATION AND DISSEMINATION PLAN

The Communication and dissemination Plan aims to provide structure and considerations to communicate the state of progress in transition to green manufacturing. Communication will be based on transparency and credibility that earns stakeholder buy-in, providing appropriate context for the implementation phase will be a critical component to clearly communicating strategy implementation. Broadly, messaging should address why there is a need for intervention, what the proposed interventions entails, progress of implementing the strategic interventions and how it impacts the sector. This three-fold approach would include:

Description of the current state of the manufacturing sector and challenges that affect transition to a green manufacturing sector.

Description of progress of implementation and adoption of specific interventions to the sector that directly addresses the current challenges.

Description of the expected future state of manufacturing sector in relation to improvements gradually realized.

9.1 COMMUNICATION MATRIX

It is expected that the matrix will be a living resource that will be updated and expanded as the implementation of the strategy evolves. The initial stakeholder communication matrix below identifies the stakeholder group, a description of communication needs, the anticipated communication frequency for the group, and the mode in which communication will be provided. In the instances where more than one owner has been designated, communication may only be achieved through a fully collaborative effort among the identified parties. Further development and management of a comprehensive list is an expected task of strategy management.



▲ Well-kept dried firewood as energy resource



▲ Improved cook-stoves for energy efficiency & cost savings

| STAKEHOLDER GROUP | COMMUNICATION NEEDS | RESPONSIBLE OFFICE | FREQUENCY | COMMUNICATION FORMAT |
|--|---|---|-----------|--|
| OFFICE OF THE PRESIDENT | <ul style="list-style-type: none"> Receive information on progress of implementation and pending changes in implementation of strategic actions both short term and long-term operations. Provide feedback on program design and feasibility of strategy requirements | MTIC-Directorate of MSMEs | Annually | Scheduled meeting |
| OFFICE OF PRIME MINISTER | <ul style="list-style-type: none"> Receive information on progress of implementation and pending changes in implementation of strategic actions both short term and long-term operations. Provide feedback on program design and feasibility of strategy requirements | MTIC-Directorate of MSMEs | Bi-annual | Scheduled meeting |
| PARLIAMENT | <ul style="list-style-type: none"> Receive information on progress of implementation and pending changes in implementation of strategic actions both short term and long-term operations. Provide feedback on program design and feasibility of program requirements | MTIC-Directorate of MSMEs | Bi-annual | Policy Brief |
| DEVELOPMENT PARTNERS (UNIDO, UNEP, UNDP) | <ul style="list-style-type: none"> Receive information on progress of implementation and pending changes in implementation of strategic actions both short term and long-term operations. Provide feedback on program design and feasibility of program requirements | MTIC-Directorate of MSMEs | Bi-annual | |
| MINISTRY OF TRADE, INDUSTRY AND COOPERATIVES | <ul style="list-style-type: none"> Receive information on progress of implementation and pending changes in implementation of strategic actions both short term and long-term operations. Provide feedback on program design and feasibility of program requirements | MWE-Directorate of Water Resources management NEMA, UCPC, MEMD - Directorate of Energy Resources | Quarterly | Policy Brief |
| JOINT MULTI-SECTOR TECHNICAL COMMITTEE | | Implementing secretariat | Quarterly | Work group meetings |
| PRIVATE SECTOR (MANUFACTURES ASSOCIATION, TRADERS ASSOCIATION, CONSUMERS) | | MTIC UCPC | Quarterly | <ul style="list-style-type: none"> Implementation workshops Public Website with relevant information, documents that may be distributed, and links. Electronic Media including TV Radio, New paper Blogs on Green Manufacturing Strategy in Uganda |

10. RISK MANAGEMENT

Successful implementation of the Green Manufacturing Strategy may be impacted by the highlighted risks. The types of risk, their likely incidence and the proposed mitigation measures are shown in the table below.

| S/N | RISK TYPE | LEVEL | MITIGATION MEASURES |
|-----|---|--------|---|
| 1 | Inadequate capabilities and understanding of the Green Practices by the Companies and their staff | Medium | <ul style="list-style-type: none"> Awareness raising and training of the top management and staff on the Green manufacturing practices Companies shall be encouraged to incorporate sustainability and environmental issues into their plans and practices holistically, such as improving measuring and monitoring of greening indicators. |
| 2 | Lack of strong leadership commitment from the top management of the Companies during implementation | High | Sensitization of the top Leadership on the benefits of the implementation of green manufacturing practices |
| 3 | Inadequate resources to support the full implementation of the strategy. | High | <ul style="list-style-type: none"> Mainstream the activities within the budget allocation Identify external funding sources. |
| 4 | Lack of cooperation, compliance and collaboration by other Implementing Partners and Agencies | Medium | <ul style="list-style-type: none"> An Inter-Ministerial Cooperation Agreement on sharing information in respect to GHGs emissions already signed. Sustainability and Environmental concerns have been emphasized in all development Policies, Strategies and Programs |

ANNEXES

The MSMEs Green Manufacturing Strategy is expected to be financed by the public and private sector, supplemented with financial support from development partners. This presents a succinct estimate of the financial resources required to implement the green manufacturing strategy in the short, medium and long term.

ANNEX 1.1 PUBLIC INVESTMENT REQUIRED TO IMPLEMENT GREEN MANUFACTURING STRATEGY

| | SHORT TERM INTERVENTIONS (2020/21-2024/25) | MEDIUM TERM INTERVENTIONS (2025/26-2029/30) | LONG TERM INTERVENTION (2030/31-2034/2035) |
|-----------------------------|---|--|---|
| TOTALS BY PERIOD | UGX 90,381,299,700 | UGX 129,469,103,800 | UGX 210,332,500,000 |
| ANNUALIZED BY PERIOD | UGX 18,076,259,940 | UGX 25,893,820,760 | UGX 42,066,500,000 |

ANNEX 1.2

ESTIMATED REQUIRED INVESTMENT FOR EACH STRATEGIC INTERVENTION

| STRATEGIC INTERVENTION | ESTIMATED COST | | |
|--|---------------------------------|----------------------------------|----------------------------------|
| | SHORT TERM (2020/21-2024/25) | MEDIUM TERM (2025/26-2029/30) | LONG TERM (2030/31-2034/2035) |
| OBJECTIVE 1: AWARENESS RAISING, INFORMATION DISSEMINATION AND CAPACITY BUILDING FOR GREENING THE MANUFACTURING SECTOR. | | | |
| Facilitate wider engagement and networking among universities, research institutions, service providers, manufacturers and public sector at national and international levels for sharing of experience, skills and knowledge on green manufacturing practices, technologies and products. | 633,140,000 | 11,746,725,000 | - |
| Support promotion and implementation of resource efficient and pollution prevention programmes in manufacturing enterprise for improved productivity, safety and health and environment protection. | 8,365,387,500 | 48,272,400,000 | 26,513,250,000 |
| Support capacity building of technical institutions as service providers to enterprises to facilitate adoption of green technologies and practices. | 637,500,000 | 41,141,250,000 | - |
| Develop a mechanism for disseminating information on green technologies, products and the economic, environmental, and social benefits that accrue from green manufacturing | 2,669,610,000 | 1,499,370,000 | - |
| SUB TOTAL | 2,305,637,500 | 102,659,745,0 | 26,513,250,000 |

| STRATEGIC INTERVENTION | ESTIMATED COST | | |
|---|---------------------------------|----------------------------------|----------------------------------|
| | SHORT TERM (2020/21-2024/25) | MEDIUM TERM (2025/26-2029/30) | LONG TERM (2030/31-2034/2035) |
| OBJECTIVE 2: ENHANCE RESEARCH AND DEVELOPMENT, PROMOTION AND INCREASED USE OF INNOVATIVE ENVIRONMENTALLY SOUND TECHNOLOGIES FOR GREENING MANUFACTURING | | | |
| Support collaborative research and strengthen linkages among R&D institutions, government and manufacturing enterprises to foster innovation and transfer of green technologies. | 970,202,100 | 599,811,000 | - |
| Support R&D for greening existing manufacturing methods or processes, machines or systems, creating new processes and products | - | 15,505,314,300 | - |
| Develop R&D supporting infrastructure for greening manufacturing such as Incubation Centres, research grants, STI parks, | 45,712,500,000 | 6,481,250,000 | 183,453,550,000 |
| SUB TOTAL | 46,682,702,100 | 22,586,375,300 | 183,453,550,000 |
| OBJECTIVE 3: ENHANCE PROVISION OF FISCAL INCENTIVES FOR TRIGGERING AND PROSPERING GREEN INVESTMENTS BY ENTERPRISES IN THE MANUFACTURING SECTOR | | | |
| Enhance provision of fiscal incentives for triggering and prospering green investments by enterprises in the manufacturing sector. | 1,867,370,000 | 1,533,260,000 | - |
| Support financial institutions to provide green finance to manufacturing enterprises | 77,112,500 | - | 365,700,000 |
| SUB TOTAL | 2,644,482,500 | 1,533,260,000 | 365,700,000 |
| OBJECTIVE 4: ENHANCE COMPLIANCE OF MANUFACTURING ENTERPRISES WITH EXISTING POLICY AND REGULATORY FRAMEWORK. | | | |
| Enhance cooperation and harmonize goals and priorities, and establish a coordinated approach among relevant Ministries Departments and Agencies for green manufacturing. | 1,315,250,000 | - | - |
| Support development and implementation of Compliance Assistance Programmes to help enterprises improve resource efficiency; reduce pollution while meeting regulatory and certification requirements. | 54,000,000 | 1,592,623,500 | - |
| Enhance the capacity of regulatory agencies to enforce laws and regulations relevant to operations of enterprises in the manufacturing sector | 27,379,227,600 | 1,097,100,000 | - |
| SUB TOTAL | 28,748,477,600 | 2,689,723,500 | - |
| GRAND TOTAL | 90,381,299,700 | 129,469,103,800 | 210,332,500,000 |



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