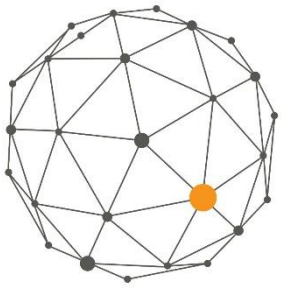

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Questionnaire

Sustainable Manufacturing and Environmental Pollution: A Case Study of Food & Beverage Sector in Kenya

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Sustainable Manufacturing and Environmental Pollution: A Case Study of Food & Beverage Sector in Kenya

Export-led industrialization is putting pressure on natural environment and on livelihoods.

Objective: identify / map institutions (industry associations, international organizations) and private sector initiatives (MSME and large enterprises) implemented to achieve a sustainable manufacturing, control pollution and related environmental and health impacts, and also to enhance workers safety.

Research Focus: Export oriented manufacturing enterprises in the food & beverage manufacturing value chain: MSME and large enterprises

SMEP: The United Nations Conference on Trade and Development (UNCTAD) has developed a set of indicators for assessing port performance, which are broadly designated into financial and operational performance categories.

Environmental Considerations

1. Business organizations start paying attention to natural environment and the environmental degradation from industrial activities. This is mainly due to government (through legislation), society, and domestic and global market pressures. Natural environment preservation, pollution prevention and environmental management initiatives and practices are gaining place. A paradigm change. How this is happening in Kenya, particularly the adoption of environmental management initiatives and tools by the private sector?

Answer: While there is a weak attention to the environmental degradation by industries in Kenya, the existing concern is majorly driven by the government legislations, internal factors (reduce production costs) and to some extent the society and the external market. Environmental protection concerns started in Kenya long time ago from Parliament's passage of the Environmental Management and Co-ordination Act (EMCA) of 1999 and the creation of the National Environmental Management Authority (NEMA) (EMCA, 1999 part II § 7) to govern the environmental regulations. NEMA was charged with enforcing EMCA's provisions and the subsequent legislations. The government has established several policies legislative and institutional frameworks on the areas of water quality, waste management, controlled substances, biodiversity, wetland, river and seashore, and environmental impact assessment (EIA) regulations. These legislations are expected to govern all business activities to ensure environmental protection. NEMA is thus mandated to review and issue licenses and ensure compliance with existing environmental regulations. Additionally, the Kenya's constitution also expresses the rights of individuals to clean and healthy environment and assigns the obligation of individuals and the state on matters of environmental protection, conservation, well use of resources and ecologically sustainable development (Mwendwa & Kibutu, 2014). Every business established in Kenya is thud required to get a permit from NEMA, which is renewed every year on condition that the business operates within the environmental regulations. Apart from EMCA act, The Public Health Act, the Kenyan Bureau of Standards (KEBS) (KEBS, 2015) and Biosafety Regulations (2011) also regulate the food and beverage industries to ensure that importers and exporters comply with the environmental regulation providing necessary protection to Kenya's consumers in safety, health and environmental matters.

Despite the well-established environmental legislation measures in Kenya, environmental management initiatives in private sector tends to be internal linked to maximizing benefits

and externally driven by the market demand. Most firms have been reported to comply with the environmental requirements of air pollution and management of wastes, in order to minimize the operational costs (Mosbei Bor et al., 2019). The society and market availability have also influenced environmental compliance through consumer preference, especially among the medium and big food and beverage manufacturing industries by purchasing. While the domestic market seems not to care about the quality of products but purchase preference given to cheap products due to their low income. The established standards in the foreign markets, especially in the Middle East, US and EU has transformed production sector in Kenya (FPEAK, 2019; KMC, 2015; Were, 2016). For instance, attaining the necessary ecolabels requires the firms to maintain sustainable production strategies throughout the product life cycle. Sustainable manufacturing have thus been shown to result to higher performance in the food and beverage processing sector in Kenya and also increase their competitiveness in the foreign markets (Mosbei Bor et al., 2019; Were, 2016). This involved the purchase of products that promote green environment, enhancing green production by suppliers as they try to comply promoting sustainable manufacturing. For instance the Lipton through Kenya Tea Development Agency influenced farmers' production by sourcing its teabags from Rainforest Alliance CertifiedTM certified farms making more farmers to comply with the certification conditions in order to access the market (SME COMPETITIVENESS OUTLOOK, 2016).

Another driver that has been influencing the compliance of manufacturing industries to environmental protection is the society. The public uproar through social media and audio visual productions through TV documentaries have revealed the firms non-compliance exposing them to the regulators and attracting fines. For instance, Citizen TV airing investigative piece on 'Wreckless pollution' by industries in Nairobi and Athi River attracted the public attention leading to closure of five factories in Nairobi in 2019. The society, mainly driven by the media and civil societies have also influenced the environmental management initiatives among businesses. For instance the public outcry in Ruaraka Nairobi on air and water pollution that was exposed through social media and National TV led to the management of the wastes in the industries in the area. Another case was in 2000 when the Kenya National Human Rights Commission sued and pushed Del-Monte towards ensuring workers security, the event that saw the company sign an agreement to support the campaign for worker rights, and implement positive changes including tree-planting campaign in its neighborhood as part of a pledge to promote sustainable land use and environmental protection (Business & Human Rights & Resource Centre, 2015).

Other Laws with provisions that affect food manufacturers in Kenya includes the following: The Meat Control Act (cap 356) entails provisions that regulate how animals and meat sources that provide raw materials for meat processing firms should be treated, along with other regulations of importance to food companies. The Pig Industry Act (Cap 361) adds to these regulation as it directs that pigs awaiting slaughter should be contained in well roofed houses with lairages to protect them from potentially increment weather. The Animal Disease Act Cap 364 requires that food animals including poultry, cattle, and pigs be raised in adequately constructed and well ventilated housing conditions, relieved off all avoidable forms of pain fed off innocuous and non-toxic materials, and given enough portable drinking water. Also, the Fisheries Act Cap 378 requires that manufacturers and processors using fish as raw materials should source fish from non-toxic environments, or those laded with heavy metals such as lead or mercury. For firms using plant and animals for production, the Pest Control and Products Act Cap 346 requires that only certified pesticides be used to control pests and recommended withdrawal periods be allowed to reduce pesticide residues. The law links with certain provisions in the Food, drugs and chemical substances Act Cap 254 which requires that food processing be done using animals treated on appropriate antibiotics and recommended withdrawal periods allowed to reduce drug residues from food products. There is also the Radiation Protection Act Cap.243 which is implemented by the KEPHIS, and which directs food manufacturers on the level and types of radiation to which food must not get exposed.

2. Do global markets exert any kind of pressure to boost Kenyan enterprises to change to a sustainable manufacturing? For instance, is there any kind pressure from external bodies, international organizations, international society, foreign buyers (businesses)? If positive, how are they exerting such pressure? Does this pressure impact MSME or only large companies? What are the results of such pressure? Do they give any kind of support to enterprises, particularly MSME (technical, financial)?

Answer: Although most MSME operates within the domestic market, there have been an increased interest to explore the global market, which are having established standards that cover environmental sustainability aspects. Exporting to developed countries are always restricted by meeting specific standards of that country. Kenya's enterprises that are exporting to US and EU markets need to get certification labels from these regions. Compliance thus requires them to practice sustainable manufacturing in order to be allowed to export within the territory. The government have recently signed different bilateral free

trade agreements with UK and US, within the agreements environmental aspects are included (Kenya News Network, 2020), the MSMEs thus have to comply in order to be able to access and increase their competitiveness in the markets. Most Kenyan population is in the rural areas depending directly on agriculture. Due to low income and hence low purchasing power, the urban population in Kenya thus have weak influence on food and beverage market. Most of these products, for instance cheese, yogurt, cream and other high-value dairy products are thus mainly consumed by tourists, expatriate residents and Kenya's relatively small middle- and upper-income population distributed through hotels, restaurants and upmarket grocers and chain stores (Were, 2016). Large amount of the products thus attract external markets due to low domestic market in the country (KMC, 2015; SME COMPETITIVENESS OUTLOOK, 2016). Access to global market pushes eco-labelling and certification of products to meet the international environmental standards. These mechanisms address resource constraints, global climate change, and other pressing environmental issues. For instance, exporting to the EU and United States market, especially California, requires enterprises to meet strong environmental regulations in order to qualify for the US and EU Ecolabel standards. Enterprises like Del Monte and other horticultural enterprises like Oserian, Naivasha. Another example is Kenya Meat Commission (KMC) that has managed to achieve sustainable manufacturing in order to get the 'Halal' certification in order to access the huge market in the Middle East. KMC thus have to ensure that the 'Halal' conditions are met right from the raw material (animal) suppliers. The pressure of ensuring sustainable manufacturing is however only application to formal medium and large enterprises with interested to access the external markets. In order to ensure compliance and sustainable supply of raw material, most enterprises work together with the government, NGOs and other private organization and offer support to the suppliers inform of financial incentives like soft loans, artificial insemination, transport services, trainings on production best practices, pest control etc. The suppliers (farmers) are also supported to form cooperatives where they can boost production through savings, warehouses and share knowledge. This is widely applied among milk, sugarcane, tea, coffee, and millers. The Kenyan government is currently striving to create environmental conditions through crating policies that enhances green economy investments to reduce wastes and climate change effects in order for SMEs to qualify for the global market. Other eco-labelling regional initiatives that is driving Kenyan SMEs to sustainable manufacturing are the African Eco-labelling Mechanisms (AEM's) and ECO Mark Africa (EMA).

The SMEs have always received support from both government, local and international NGOs to in terms of financial, technical helps through trainings, provision of soft loans,

equipment and transportation to enable them achieve sustainability. In all the recent signed bilateral agreements, the government has always ensured that the MSMEs support spec is included (Kenya News Network, 2020; The East African Business, 2019). Private organization like Safaricom provide solar panels, green communication strategies (Mpesa) to SMEs at discounted prices, while several banks provide low interest loans and free transactions to SMEs to boost their production efforts. The US through USAID, and EU governments have provided support to the Kenyan government to support its efforts towards green production. These are informs of joint ventures in providing technical and financial support to farmers, education programs, infrastructural development, conducting research and market access strategies. Financial support is given in form of soft loans with low interest rates, for instance, The AgriFI Kenya Challenge Fund (2018-2022) provided by the EU to agro-enterprises to enhance the capacity of smallholder farmers/pastoralists to practice climate-smart and environmentally sustainable agriculture (SME COMPETITIVENESS OUTLOOK, 2016). Additionally, many churches are giving support to SMEs through trainings, impacting skills that ensures sustainable production especially in agriculture.

3. Do importing countries or importing companies require that Kenyan export enterprises comply with home country environmental regulations and standards? How this does happens? Do they give any kind of financial or technological support?

Answer: The policy landscape in the food manufacturing and processing sub-sector have traditionally been developed and implemented on sectoral basis. Changes have however, occurred due to continued rise of regional economic blocs, globalization of trade in manufactured food, growth in agriculture and food manufacturing, and also emergence of new food handling and distribution patterns.

The international regulatory framework of food manufacturers has progressively developed and coordinated by three key international bodies, the International Plant Protection Convention (IPPC), the International des Epizootic (OIE), and the Codex Alimentaius Commission (CAC). These bodies oversees the formation and implementation of a set of internationally recognized codes of practice, standards, and guidelines relating to food production, processing, and safety; global dissemination of valuable information regarding animal diseases and their control and establishing standards for protecting humans and animals against diseases, pathogens, and pests (OIE, 2008); and promote appropriate measures for control of food safety. The Sanitary and Phytosanitary Agreement was formed

under the World Trade Organization (WTO/SPS) to link the three bodies (CAC, OIE, and IPPC) in their efforts to oversee food safety and trade throughout the entire value chain. Kenya is a signatory of this agreement and has continued to design and implement regulatory policies that emulates the details of the agreement.

The growth of global trade and the increasing amalgamation of global value chains has raised questions about how trade and the environment interact with each other. Economic growth resulting from the increase of trade can have an obvious direct impact on the environment by increasing pollution or degrading natural resources (OECD, 2021). Additionally, trade liberalization may lead to specialization in pollution-intensive activities in some countries if environmental policy stringency differs across countries, the so-called pollution haven hypothesis. As a country becomes more integrated within the world economy, its export sector becomes more exposed to environmental requirements imposed by the leading importers. Effective environmental policies and institutional frameworks are needed at the local, regional, national and international levels. The impact of trade liberalization on a country's welfare depends on whether appropriate environmental policies are in place within the country in question. Stringent environmental policies are compatible with an open trade regime as they create markets for environmental goods that can subsequently be exported to countries that follow suit on environmental standards (OECD, 2021). Importing countries are usually very vigilant about the health and safety of its citizens from food consumption and potential environmental damages that can arise due to the introduction of foreign flora and fauna.

Kenya is a party to various Multilateral Environmental Agreements (MEAs) aimed at protecting and safeguarding the environment and natural resources. Vision 2030 is the country's development blueprint covering the period 2008 to 2030. It aims at making Kenya a newly industrialized, 'middle-income country providing a high quality of life for all its citizens in a clean and secure environment by the year 2030 (GOK, 2007). In Kenya, the Kenyan Bureau of Standards (KEBS), is a statutory organization of the government of Kenya and it is responsible for the adoption and application of Standards for both imported and domestically manufactured products in the Kenyan market. KEBS ensure that only quality goods gain entry into the country as provided for in the Standards Act Cap 496, Laws of Kenya and the Quality Imports Order No. 78 of July, 2005, thereby offering the necessary protection to Kenya's consumers in safety, health and environmental matters (KEBS, 2015). KEBS force importers to comply with the environmental controls. Moreover, the Biosafety (Environmental Release) Regulations, 2011, ensures that there is safe movement of

genetically modified organisms into and out of Kenya while protecting human health and the environment.

Kenya is party to a number of laws that ensures that any product getting in or out of the country compliance with environmental and safety standards. For instance, an import license is required for any product that comes into the country in order to affirm that the product complies with the security, health or environmental reasons as detailed in the Imports, Exports and Essential Supplies Act (Cap 502) (KEBS, 2015). Kenya being a member of East African Commission is also party to EAC Customs Management Act of 2004 which provides for quantitative restrictions and controls on some imports on grounds of national security, health, morals and the environment. This is to be expected as importing countries usually regulate food products very vigilantly for reasons of consumer and environmental protection. Studies conducted in various sites has shown that within the agricultural sector, importers are much more affected by burdensome regulations than exporters. To ensure that the product do not cause harm to the environment, they are usually subjected to technical regulations, which is the regulations that relate to product-specific properties, include regulations related to quality standards, safety, production process and sanitary requirements and are usually implemented to protect the consumer or animal health, environmental protection or national security. The products are also subjected to conformity assessments which are the measures that determine whether a product or a process complies with a given technical regulation.

Environmental sustainability is important in the case of export in responding to consumer concerns firms often use sustainability instruments as a way of managing catastrophic reputational (Godfrey et al., 2009) and supply risks. Kenya export a number of agricultural products to the European market and they are required to comply with voluntary standards such as Global G.A.P (formally EUREPGAP) which is a Good Agricultural Practice pre-farm gate standard that covers all production process from certification of feed or seedlings and all farming activities. It is designed to reassure consumers about how food is produced on the farm by minimizing detrimental environmental impacts of farming operations and reducing the use of chemical inputs, as well as ensuring a responsible approach to worker health and safety and animal welfare (ITC, 2012). This standard remains voluntary; however, finding buyers without Global G.A.P certification is difficult. Among the top food retail chains in Europe, the suppliers are required to be Global G.A.P. compliant. These suppliers account for 76% of fresh fruit and vegetables sales and between 70% and 90% of fresh produce imports from Africa (Webber & Labaste, 2009).

Operating on the global supply chain has numerous pressure and challenges that hinder optimal performance. In the year 2007, Kenya was banned from exporting avocado for 11 consecutive years by South Africa leading to a loss of KES 2.8 billion in terms of revenue for both the farmers and the Government according to the Kenya Plant Health Inspectorate Services (KEPHIS) report. Recently Kakuzi was banned from exporting avocado to Tesco which is the largest supermarket in the United Kingdom with annual sales of EUR 56,883m and with over 3,787 stores and over 1.2 million customers across the United Kingdom and Asia. One of Tesco's strategies is to assure its customers that their products have been sourced with respect to the environment and the people involved. Therefore, ensuring that they offer ethical and environmental standards across the products at affordable prices. The action harmed the reputation of Kakuzi as one of the largest producers and the largest exporter of avocado in sub-Saharan Africa (Daily nation, 2020; Tesco, 2019).

4. What are the key drivers to a sustainable manufacturing? International pressure (society, businesses that are customers of Kenyan industries)? Cost reductions? Legislation compliance?

Answers: Manufacturing is a significant sector in the Kenyan economy that contributes to approximately 11% of the national GDP and absorbs more than 103,000 Kenyans (52,000 in EPZ-based manufacturers and 21,000 in the local sector, and 30,000 informally attached to both sub-sectors) (KAM, 2014). According to Mwaura et.al. (2017), manufacturing activities in the country have accompanied specific negative impacts on the environment. These include overexploitation of natural resources, constant pollution, overconsumption of energy sources, waste disposal. In 2013, Kenya's global emission totaled to 60.2 million metric tons of carbon dioxide (MtCO2e), accounting to 0.13% of the total global GHG emissions. The agricultural sector produced 62.8% of the emission, the energy sector emitted 31.2%, the industrial sector produce 4.6%, and wastes emitted 1.4% (NEMA, 2015). As a signatory of the Kyoto Protocol on Climate Change, Kenya is bound to implement emission control efforts to reduce its total emissions by 42% by 2025 (NEMA, 2015). Sustainable manufacturing (SM) by food manufacturing companies offers an opportunity on which national pollution control efforts can reduce the negative environmental impacts that emanate from such firms. Sustainable manufacturing entails integrated approaches of creating manufactured products using ways that minimize the negative impacts of the manufacture process on the environment. Sustainable manufacturing further targets to sparingly use natural resources to create manufactured

products that are economically sound, and which enhance the safety of employees, communities, as well as consumers.

The concept of sustainable manufacturing uniquely brings together the aspects of financial or profitability viability, social equity, and environmental safety in the process of value addition through manufacturing. Mainly, SM incorporates strategies that contribute to pollution reduction, as well as waste reduction, and lower energy consumption across a product's value and supply chain. Mwaura et.al. (2017) explains that SM not only involves the 3R model of conservation (reduce, reuse, recycle) at the product stage, but focusses on the 6R model (reduce, reuse, recover, redesign, remanufacture, and recycle). Food and beverage manufacturers must consider incorporating within both product and process levels, strategies towards reduction of environmentally toxic wastes, elimination of occupational hazards, and reduce levels of energy consumption. At the last level, the system level, sustainable manufacturers strive to implement approaches that cut across the entire product supply chain. The stages include pre-manufacturing, manufacturing, over many life-cycles, and use and post-use stage. The East African Breweries Limited, for instance, has resorted to sourcing all paper and board packaging, as well as reducing packaging altogether, in an effort to reduce greenhouse gas emissions across the product supply and value chains through reduced channeling of waste products to landfills.

The driving forces towards sustainable manufacturing in Kenya is either internal or external. These included environmental regulations, customer and/or supplier demand especially the interest to access international market as well as achieve sustainable and low production cost (Andersen et al., 2021). For instance using green energy sources like solar due to unreliable energy supply caused by frequent blackouts affecting their work. The demand by the global market for certified eco-labelled products have also pushed medium and large scale enterprises towards green production. Internally, a manufacturer's adoption of SM strategies can be affected by workforce skills and competencies, brand identity, organizational culture, brand reputation, along with the ability of the firm to undertake environmental management (Fatoki,2019).. The specific aspects of internal factors that facilitate organizational adoption of sustainable manufacturing among food and beverage companies in Kenya include personal and organizational commitment towards pollution eradication, the level of knowledge and organizational culture, and knowledge management framework and as well as priorities of the organization's top management (Mwaura et.al, 2017). Manufacturers that implement sustainable manufacturing are more likely to reduce production costs, expand profitability, earn a competitive edge, benefit from energy

efficiency and recycling of products, reduce pollution and carbon emissions, and utilize wastes better.

The external drivers of sustainable manufacturing include regulatory landscape, pressure from consumers, suppliers, or environmental advocacy groups, competitors, and communities (Fatoki, 2019). In Kenya, the government through regulatory bodies such as NEMA influence the environmental practice of food and beverage manufacturers and encourage them to implement environmentally viable production technologies to minimize pollution. In the recent past, for instance, Manji Foods has actively participated in a massive tree growing project at the Nairobi National Park, a project with which it aims to offset its carbon emission and to enhance environmental sustainability. By addressing deforestation and global warming in a simplistic approach, tree growing (Manji Food Industries, 2016).

Principle 10 of the Rio Declaration emphasizes the need for each global citizen to access public environmental information. In the wake of new milestones in climate change governance that have triggered progressive actions by government agencies, private organizations, and environmental activists both at the county and national levels, there needs to be in place an effective flow of climate change information to foster incredible adaptation actions from community level upwards (Ageyo & Muchunku, 2020). The Kenyan government has also influenced sustainable manufacturing in multiple manufacturing sub-sector through dissemination of valuable information on environmental issues and legislations (UNEP, 2017). The fifth section of the country's initial National Climate Change Response Strategy published in 2010 underscores the need for continued sensitization efforts targeting communities and organizations by use of diverse communication channels (Ageyo & Muchunku, 2020). The government also needs to expand and diversify its communication framework to touch on crucial issues such as sustainable manufacturing.

Nonetheless, the National Environmental Management Authority (NEMA) has in the recent past launched the Rapid Results Initiative (RRI) on Effluent Discharge License (EDL), a framework within which the government monitors and imposes fines and penalties for manufacturers that do not comply with environmental policy climate in the sector (NEMA, 2021). Also, the Kenya's Climate Change Act 2016 along with the National Climate Finance Policy, 2018 and the National Climate Change Action Plan 2013– 2022 demands strict adherence to environmental conservation policies by manufacturers in exchange for incentives such as government loans, tax concessions, and grants (Odhengo et.al, 2019). Collectively, these actions emerging from the government have facilitated behavioral

change as more food and beverage manufacturers increasingly adopt sustainability practices.

Another external factor pushing forward the sustainable manufacturing agenda among food and beverage manufacturers in Kenya is competition. The competitiveness of a firm emanates substantially from its ability to produce products that are perceived as safe and compliant to existing environmental control systems. Today market competitiveness is not solely linked to product quality, but also to factors relative to consumer's customers' awareness about environmental concerns. Remaining aware of the importance that consumer's environmental awareness holds as a source of competitive edge, C. Dormans, a middle-size beverage processing firm has developed a unique sustainable manufacturing framework that mainly involves improving coffee yields, cutting down on energy use, waste recycling, and offsetting (Food-Business-Africa, 2020). The company has an established partnership with Mt. Kenyan Trust to protect and serve the environment around Kenya's major coffee growing areas. The company also holds annual coffee quality competition in which farmers who implement best practices and acquire outstanding quality coffee get distinct rewards. The company's current partnership with Tatu City has availed 5,700 square meters of roof space to accommodate 2,880 solar modules with the potentials to produce 1.4 million kilowatt-hours of electricity per year (Food-Business-Africa, 2020). The project plays the double role of insulating the warehouse roof against climate misfortunes, but also enhances the production of clean energy used for the company's operations. Dormans' set of sustainability indulgences sets it as an example of a company that adopts sustainable manufacturing practices. The strong sustainability agenda adopted by the company sets it on a course to chart a new growth trajectory despite the current setback caused by the COVID pandemic.

5. Which are the barriers, difficulties, opportunities for MSME and large enterprises to implement environmental management initiatives and tools from the policy and management perspective?

Answer: Several challengers have been reported to affect the implementation of environmental management initiatives and tools among MSMEs. One such challenge is the high cost of establishing the set standards in order to get certification. The certification systems provide buyers with assurances about food safety, opening opportunities for producers to access new markets. For instance, for a product to be officially registered in the market they need to have Hazard Analysis and Critical Control Point (HACCP)

certification. However, meeting certification requirements may be a challenge to micro and small firms. Additionally, lack of information about the standards and conformity assessments as well as cost of qualified experts can be intimidating. This is why most small enterprises prefer to operate illegally then registering their firms.

Another challenge that MSMEs are struggling with is the business environment in Kenya that is quite complicated and difficult due to so many types of taxes that the business owners have to pay which may demotivate their interest. This was very common in the past since the government was not making any effort to improve improving the living conditions in the country. Uncertain policy environment also affects the SMEs as taxes keep on increasing adding to the production cost. Sometimes levies are suggested and incentives but they fail to be implemented.

Material supply in terms of delays and shortage caused by droughts, transport issues due to poor roads, long delays in the port due to clearance problems at the port of Mombasa. Most MSMEs rely on local raw materials that have seasonal influence with reliance on rains. This has caused damage of products resulting to huge losses. In terms of infrastructure, energy supply has also been a problem due to frequent unpredictable black outs that cause damages to perishable products and ram materials, lack of post-harvest preservation facilities and appropriate waste handling equipment with expensive installation costs. Additionally, insufficient investment in processing facilities with most of them using traditional methods and also struggling with accessibility to credit and inflation in the country (Kedogo, 2013), unhonored payment agreements, taxation policies, interest rate policies among lenders that with rising interest rates increasing the costs to business of borrowing money, and also causes consumers to lower their expenditure leading to a fall in business sales. The late settlements by the buying supermarkets as they fail to pay within the agreed time causing a serious cash flow problems. This has made some firms to turn to informal money lenders, or 'Shylocks' due to their flexibility, since the informal enterprises are not able to get loans from the banks, but demand even higher interest rates than the banks. Besides these, lack of skilled staff and support at top-level management are factors hampering the adoption of sustainable manufacturing (Omuterema 2012).

Competition from both local and global market is also another challenge to SMEs in Kenya (Mutheke, 2016). Currently with many trade agreements the government has opened its local markets, for instance the Chinese products which relatively cheap due to lower production costs in China than in East Africa. The local firms thus have to reduce their product prices in order to compete effectively with other produces. This has been highly

evidenced among oil and fish producers in the country. Some other challenges are high production costs, inadequate and slow implementation of government policies, use of obsolete technologies and skills and resistance to change. Additionally water supply, increased production cost from alterative water sources and waste water handling is another major challenge affecting the SMEs (Andersen et al., 2021). Furthermore, there is increased cost of doing business due to devolution causing overlapping responsibilities between country and national government is another challenge, resulting to double collection of levies from both county and national level with the establishment of counties. Inadequate information and ignorance about the best manufacturing practices e.g. communication and advertisement to investors, value addition process to increase longevity is another barrier hindering their engagement on it. Furthermore, political instability in the country has been causing increase in production and distribution costs. For instance, the Post-election violence in 2008 and in the consecutive elections have caused massive losses to SMEs. The political environment still remains unpredictable leading to high political risks, this hinders long term investments and may also affect investment to sustainable manufacturing. The violence affects transportation of raw materials and goods as well as the production process

The MSMEs are thus struggling with a lot of challenges limiting their concentration on green manufacturing investments. However, several opportunities exist like investment in storage facilities, primary processing of raw materials, collaboration with other MSMEs, establishment of a One-Stop-Shop for all information required by investors, investment in research and development for drought resistant livestock and crops, technological investments. The country can also use the expanding SMEs sector to expand its markets and increase its bargaining power during negotiations. Other opportunities for SMEs are the increasing middle-class population and changing lifestyles and aspirations, spending on healthy food demand for ready food by working population as well as supermarkets in the country creating a locally available market. The country thus needs support the MSMEs and transform agriculture from a “Low input-Low output” rain-fed subsistence farming system to a “High input – High output” mechanized system to address shortage of raw materials; Increase Value Addition not “price addition”; Invest in storage (including cold storage) and Logistics to ensure food products reach the market as well as processors and be competitive internationally through Quality related interventions- standardization, traceability and ISO certification

6. Private sector-led initiatives: adoption of pollution prevention practices, environmental management initiatives, tools and their current implementation status by MSME and large enterprises:

i. Source reduction (raw material substitution, toxic materials reduction, best available technology).

Answer: In Kenya, the environmental factors and by-laws have played a big role in the source reduction of environmental pollution in the food and manufacturing industry. For instance with the ban of single use polythene paper bags majority of MSMEs that depended on them for packaging of their products and suppliers were forced to change manufacturing technologies and substitute the plastics to reusable and environmental friendly materials. Some firms especially those in the beverage industries are substitution of packaging materials from the plastic to glass that can be easily reused. Some are also using solar energy to avoid the use of fossil fuels and reduce the effect of global warming. One such example is the C. Dorman's, a middle-size beverage processing firm that has partnered with Tatu City and has availed 5,700 square meters of roof space to accommodate 2,880 solar modules with the potentials to produce 1.4 million kilowatt-hours of electricity per year (Food-Business-Africa, 2020). Most firms have also established massive end-of-pipe infrastructures in form of incinerators and effluent treatment plants to manage their wastes.

ii. Pollution prevention or reduction at the source.

Answer: With the government ban on plastics, most firms are now avoiding the use of non-reusable plastics in order minimize the amount of wastes produced. Some firms are also avoiding printing of materials and has digitalized book keeping to minimize paper wastes. Additional, some food and beverage industries has developed strategies for waste water treatment and reuse within the firm as well as value addition and upcycling to minimize the amount of waste generated. For instance, Del Monte has created value addition the pulp which is used to create animal feeds. Another example in Mumias Sugar and EABL that are fermenting the organic sugar wastes to produce biogas that is used as a source of energy in the firm. Additionally, BIDCO has established a state of the art recycling system (Effluent Treatment Plant), which has minimized environmental pollution and damage by our waste products and recycle water through their treatment plant to reduce wastage (Bidco Oil Refineries Ltd, 2013). Studies also found out that most enterprises within Nairobi do not

comply with Procurement and Disposal Act as they disposed waste electrical and electronics without observing laid down procedures (MBINYA, 2012).

iii. Cleaner production measures

Answer: Although it is still not well developed, most food and beverage manufacturing industries are making efforts to achieve cleaner production. This has been done through recycling or raw materials like water, involving all employees and suppliers in environmental initiatives being undertaken; staff training and seminars on the importance of environmental conservation; minimizing on paper wastage by only printing and photocopying when it is absolutely necessary; and development and adoption of renewable power generation technologies.

iv. Eco efficiency

Answer: Study conducted in the area showed that most food and beverage manufacturing factories are profit oriented and not sensitive to the eco efficiency of their products. This has been evidence in terms of the rampant environmental pollution complains in the area. Air and water pollution complains are common in big cities in big cities like Nairobi, Kisumu and Mombasa where the big firms are located (Andersen et al., 2021; MBINYA, 2012). Additionally, the packaging materials from the firms makes the highest component of solid wastes generated in the country. The products produced are thus not eco-friendly.

v. By products and waste recycling and reuse (on-site and off-site)

Answer: Re-cycling and reuse of waste materials is common in the food and beverage industries including the micro and small enterprises. This is very common in water and packaging materials. Some firms have also developed technologies to ensure that all the by-products are used within the system leaving no waste generated. One such example is Del Monte that creating animal feeds from pulp that could have otherwise be disposed. KMC is also using all the ram materials generated from animal ranging from skin, hooves, horns etc. to produce other products. Some other industries are also using organic wastes to produce biogas that is used in the firm. BIDCO have established an environmental friendly cogeneration in the production process that eliminates unwanted solid wastes from the environment; has less emissions and significant reduction in greenhouse gas emissions;

lowers primary energy consumption, reduced energy bills, no transmission and distribution losses and less burden on national government for power generation.

vi. Extended product responsibility (EPR)

Answer: This has been recently adopted to ensure that the country achieves the SDGs through a circular economy initiatives. This has included initiatives to help manage the effluent waste and post-consumer solid waste in particular plastics. The actins implemented through this includes Implementation of the Kenya Plastic Action Plan 2019; Creation of policy and legal frameworks to establish Extended Producer Schemes for post-consumer waste and localization and implementation of SDG Goal No 12 on Responsible Production and Consumption under circular economy. This is common among medium and large food processing companies' for instance bottled water produces over 1.5 million tons of plastic waste each year. This has created a big problem in the industry pushing them and the government to work how to deal with waste disposal problems Most of the forms firms conduct consumer satisfaction surveys in order to ensure that all the products and services are in compliance with ISO satisfaction e.g. BIDCO. In the recent past, PET industry producing packaging materials used by most food and beverage firms also launched an initiative that has seen payment for collection of the plastic materials communities and return to the industry for recycling. This has improved environmental qualities in the area as it also minimize expense on raw materials extraction.

vii. Reverse Logistics

Answer: Reverse logistic practices like recycling, re-use and returns have been reported and are evident among most MSMEs in Kenya and this has been reported to have greatly positively impacted on their procurement performance through reduction of cost, clean environment and increased quality of supplies (Odoyo, 2020). Re-use is very common in packaging materials and recycling is also witnessed in by-products produced which have been possible through value addition,, which have offered firms opportunities to reduce cost of operations through use of minimal packages, reduced disposal costs and raw materials bought. A large number of ford and beverage MSMEs have been struggling with managing piles of wastes which has consumed large amount of their operational costs. This has been through high cost of energy, increase in discharge of hazardous chemicals and solid wastes that has caused compliance nightmares to firms and making them attracts huge fines or

closer from the ecological management regulatory authority (Odoyo, 2020). Reversed logistics have thus helped to manage all these.

Most firms have also been sensitive to ecological procurements in order to ensure environmental protection as described in the Kenyan constitution and environmental policies. This has been evidence in most medium and large industries for instance Cadbury Kenya Limited, Bidco and East African Breweries Limited investing millions of shillings in implementing eco-procurement practices (Odhiambo, 2014). Most firms are currently diverting to green tendering including e -Request for Bid, E- Submission of Bids and E-Evaluation of tenders and green inventory involving digitalized inventory system and green sales in terms of online advertisement and marketing, as well as money transfers through online banking. This minimized travelling, generation of solid wastes through printing.

viii. Life cycle assessment

Answer: So far, no information exists on the life cycle assessment in the food and beverage sector. This is despite the fact that environmental policies in Kenya calls for life cycle assessment among firms in Kenya, this is mainly conducted by medium and large food and beverage enterprises in the country. This may be due to the huge cost implications involved or ignorance about its importance in the production process. Although the information may be available for the exporting countries, this may be in accessible for the public as it has been the case during this research.

ix. Eco-design (DfE)

Answer: This is practices currently by most firms that ensure environmental consideration in the production chain. Most food and beverage industries are supporting their suppliers to ensure sustainable farming practices and working with them in environmental campaigns like tree planting and environmental clean-up activities to reduce air pollution, increase carbon sinks. They are also redesigning the production process to ensure waste minimization, one such example is the Del-Monte that is working with communities around Thika on Tree plantation campaigns and utilizing every waste produced (Ndungu Kamanga & Noor Ismail, 2017). Some firms, for instance BIDCO have established an environmental friendly cogeneration in the production process that eliminates unwanted solid wastes from the environment; has less emissions and significant reduction in greenhouse gas emissions;

lowers primary energy consumption, reduced energy bills, no transmission and distribution losses and less burden on national government for power generation.

x. Eco labelling

Answer: Eco-labeling is widely used by larger firms especially those exporting to the global markets. However, the quality of products are monitored by KEBs that provide labels for certification of all products from food and beverage industries imported and exported in the country (KEBS, 2015). For the food industries to be able to officially sell in the market, they require Hazard Analysis and Critical Control Point (HACCP) certification (SME COMPETITIVENESS OUTLOOK, 2016). This ensure that all the contents of the products are indicated and to ensure human safety and is monitored by KEBs. There are other local, regional and international ecolabels that the MSMEs in Kenya are using in order to increase their competitive advantage the market. For-instance eco-labelling regional initiatives that is driving Kenyan SMEs to sustainable manufacturing are the African Eco-labelling Mechanisms (AEM's) and ECO Mark Africa (EMA). Most micro-and small enterprises operate without eco-labels citing cost implications. Some firms have also developed their own eco-labels to ensure sustainable production among its stakeholders. Lipton, for example, decided in 2007 to source all its tea for teabags from Rainforest Alliance CertifiedTM farms. This involved obtaining certification for Lipton-owned tea farms, and also aligning the practices of smaller suppliers to the requirements of Rainforest Alliance Certification. As part of its efforts to assist such suppliers, Lipton engaged the help of the Kenya Tea Development Agency.

xi. Eco labelling: EDP certification

Answer: Although KEBs has been keen on monitoring the issuance of labels in the country, attaining the EPD eco-labels have been mostly among the enterprises interested and exporting in the global market. Del-Monte, Oserian and Kenya Tea Development Authority (KTDA) are such examples. This is because of the restrictions on the standards to be met in order to acquire such labels that some firms management have admitted that it is expensive to keep up with (Andersen et al., 2021; MBINYA, 2012).

xii. Clean development mechanism projects

Answer: Most firms are investing on using cleaner energy sources like solar panels in order to reduce costs and emission of GHGs. There is also investment in recycling and upcycling especially of packaging materials and water to reduce wastes emitted. Firms are also converting to greener procurements, reverse logistics, green inventory, and advertisement and tendering activities. Most firms are also investing on employee trainings to improve their skills and avoid wastage and ensure sustainable manufacturing. Additionally, most firms have adopted and are working with the government and the public conducting tree planting and environmental clean-up campaigns.

xiii. Environmental management system – EMS (certification)

Answer: About 70% of food and beverage firms assessed in Nairobi and Mombasa were reported to have established EMS (Andersen et al., 2021; MBINYA, 2012). As reported in the studies, almost all the firms are either having established EMS or are interested in having one as this is a requirement by the government policies in order to achieve certification which is yearly renewed based on performance. This clearly indicated that that firms have started working more strategically and systematically with environmental issues. The studies were however, limited to medium and large companies with small companies not assessed. This is common among the registered medium and large firms that have well defined environmental policies and established environmental department and environmental officers and auditors. It also include environmental database of products and product testing reports, monitoring, internal and external reporting, and related environmental compliance systems. In the policy documents, the firms have defined methods for managing the environmental impacts of their activities, workers safety, pollution control mechanisms, waste reduction methods, calendar of environmental events and trainings on environmental conservation activities to their employees. It also include also the environmental auditing roles, frequencies and reporting mechanisms. Earlier studies have however indicated that majority of the manufacturing firms put little effort with regard to measures of minimizing environmental pollution. As a result, most of them are unable to control their practices from air, water and solid pollution. This is enhanced by costs incurred in the management process and the corrupted legislators who issue permits without field evaluation but being bribed to accept the submitted environmental reports by firms.

xiv. LEED certification

Answer: Most micro and small food and beverage firms are established in family buildings without any LEED considerations. The government policies also advocate for it but it is rarely evaluated before issuance of permits. Most firms are thus situated in areas and buildings that are cost effective for them. This is evidence in earlier high reports of bad working conditions with no emergency doors, poor ventilation, poor waste management in food and beverage industries in the country (Business & Human Rights & Resource Centre, 2015). However, there is a great improvement especially in medium and large enterprises that have adopted to the good working conditions and creating efforts towards waste management and energy conservation. Workers safety and capacity building is always in the top list of such firms to gain confidence among the public and increase their competitive advantage.

xv. Sustainability reports

Answer: Although almost all MSMEs admitted keeping records of their firms' activities, most of these are towards profits ad expenditure with few on environmental performance which is highly in medium and large enterprise. These enterprises have established department equipped with fully trained internal auditors selected from across all departments and also external auditors for statutory purposes. The environmental auditors generate quarterly or yearly environmental performance reports which is given to NEMA for renewal of permits after conformity confirmation and other relevant legislating bodies like Public health. The responsible officers monitor records and evaluate the consumption of energy and raw materials and water, identify areas of improvement and advise the management on to enhance efficiency through re-design and implementation of energy efficiency programs. Accordingly, the firms have environmental, waste and energy policy statements that they have to make sure that the firms adheres to.

xvi. Industrial Symbiosis

Answer: With the creation of industrial parks, most MSMEs have been getting their raw material easily from other local firms reducing their transport costs. One such example is where the grain millers are supplying the Animal Feeds Manufacturing Companies with their waste for production of fish and poultry feeds. The same is also similar for Sugar companies producing the waste molasses for creation of cattle feeds. Meat processing companies like KMC are also supplying the by products like skin to the textile industry and horns and hooves

to the gum producing companies. These helps in reducing transport and disposal costs, as well as environmental impact of the industries while ensuring increased and profitable production process. An industrial Symbiosis conducted in the textile industry indicated conversion of desired product conversion rate of up to 97% of the raw materials. With the wastes from the textile industry used by boiler fuel and as feedstock for the manufacture of sofa sets and cleaning mobs (Khisa et al., 2018).

xvii. Eco industrial parks

Answer: There have been increasing trends in the gazette zones with an increase in employment opportunities and sales. These zones have facilitated the flow facilitated the flow of materials at low costs. For instance the wastes from grain millers is used for the production of poultry and fish feeds. The parks has ensured that non-product outputs are put into use by other industries at no extra costs minimizing their environmental impacts. This is also witnessed in the supply of package material that are produced within the area. However, for food and beverage industries, it has brought firms close together making it easy to establish infrastructures like roads, supply of materials has become easy and also collaborations in establishing equipment like freezer rooms as well as marketing and employee trainings. This has reduced the carbon foot prints. It has however been characterized with pollution in one particular area with most firms not willing to take responsibility for air and water pollution. For instance, fish, meat and fruit processing MSMEs have benefited from sharing equipment that would rather be expensive, this also help in energy saving and reduction in carbon footprints. Reports of poor waste management and linear use of resources like water have been reported in most if these areas making wastes a major challenge in these regions (Khisa et al., 2018).

xviii. Circular economy.

Answer: With less than 10 years remaining to achieve SDGs, a decade of action call was made in 2019 to mobilize everyone towards their delivery with global, local and people actions. This saw a global call for sustainable business practices continued to shape both the private and public sectors. The sectors have thus strived to incorporate sustainable practices in their activities through enhanced policy frameworks and the introduction of circular economy. The local industry through KAM has been in the forefront of instituting sustainable manufacturing practices in the firms' activities for the achievement of the

country's development goals. The long term goal has been ensure minimize the adverse effects on the environment whilst conserving and replenishing energy, water and other natural resources.

Kenyan government has tried to achieve this through establishment of eco-industrial parks. Earlier studies established that circular innovations are relatively widespread among the MSMEs in Kenya with ensuring resource supply seems to be a more important incentive than cutting costs (Desmond & Asamba, 2019). The implementation of circular economy in Kenya has by the government has been greatly focused on creating jobs and maximizing the use of resources than environmental conservation, therefore the concept of circular economy in the region has been viewed as vague and still in its infancy by researchers (Andersen et al., 2021). Some industries for instance Mumias Sugar company, before its collapse had initiated production of energy from its organic wastes ensuring that no waste is produced from the system. Circular economy has however been indicated to be hampered by weak waste recovery and recycling infrastructure.

7. Kenya manufacturing sector is dominated by MSMEs (98%, 1.56 million licensed MSMEs and about 5.85 million unlicensed businesses). Talk about the implementation of sustainable manufacturing, pollution prevention practices by those enterprises.

Answer: An early study conducted in Ruaraka, an industrial area in Nairobi, showed that manufacturing companies seem relatively green categorized under moderate to the medium stage of greening with the larger companies being generally greener compared to smaller enterprises. A large proportion of companies were found to be engaged in environmental management systems and also recognizes and seemingly have high interest of furthering green and circular innovation potentials. Several strategies have been established among enterprises to ensure resource efficiency and end of the pipe (EoP) curative measures like adoption of more advanced green recovery and product innovations. In many industries, attention to the EoP technologies are have been on the wastewater treatment that is a central policy target and thus subject to environmental enforcement by the environmental authorities. Less attention is being given to air pollution and solid wastes with the later given to licensed collectors to take to local dumpsites without analysing for quantity and quality. Several enterprises have however installed waste water pre-treatment plants with up to 69% of large companies and 29% of smaller companies having their own plants (Maj Munch et al., 2021). The study also observed that up to 67 % of bio-based company's had wastewater treatment plants in Ruaraka. Most of these plants have however been shown to be in

effective as witnessed by several waste water scandals in the area. Additionally, 11% of bio-based companies were established to have eco-design and recovery targets with 36% of SMEs compared to 8% of the large companies. However, reuse of waste-water and general recycling of wastes was observed to be very low with only 22% likely due to the water specificities of the production process. Some enterprises have adopted innovative value addition strategies to create new products, for instance, Del-Monte utilizes the peels to make cattle feeds. Use of excess energy (heat and cooling) was also noted as a way of energy conservation. More SMEs also scored high in terms of possession of strong green competencies compared to large companies that scored 8% reflecting the presence of some dedicated green smaller/medium companies who are offering green products which fit with the eco-design scores. Researchers however, cite difficulty in establishing the status of compliance with government set policies as most companies are not willing to disclose their information citing to insecurity from competitors and the government (Mutheke, 2016).

8. For the enterprises that have implemented those initiatives, what drove them? Would they go beyond?

Answer: As already described earlier most MSMEs implement sustainable production initiatives due to the government regulations and as a way to cut down production coast especially in waste management. This is however different with medium and large firms what are also striving to increase their competitiveness in the global market that have laid standards that they have to comply with. A study conducted in Nairobi indicated that while most industries are having established EMS, most of them saw it expensive and reluctant to pay for the permits due to non-performance in infrastructural development on the side of the government (MBINYA, 2012).

9. What are the enterprises perception on sustainable manufacturing: an opportunity to cut costs, improve efficiency, competitiveness, reduce environmental and health impacts, international relations or an extra cost?

Answer: While most medium and large firms see sustainable manufacturing as a way to increase their competitiveness in the markets small firms see it as a way of cutting down production costs. Most of the enterprises have been shown to have well laid EMS indicating recognition of environmental issues but still noncompliance is very high in the country due to what they say as high cost of investing in sustainable manufacturing. This has also been

enhanced by corruption and weak implementation of policies. Several studies conducted in Kenya has indicated that most of the manufacturing companies are not sensitive on pollution control practices since they disposed waste products before treatment and this resulted to pollution of the air and water (Andersen et al., 2021; MBINYA, 2012; Mutheke, 2016). This has exposed the waste products to members of the public to contaminated water leading to health complications. Most manufacturing firms also do not invest in environmental research terming it expensive. The manufacturing firms also do not like partnering with other stakeholders and ISO compliant firms before production of goods and services and do comply with Kenya Bureau of Standards regulations like packaging of products with environmental friendly materials.

10. Moving from free pollution to pollution control (command and control, compliance with national and international environmental legislation and standards), to pollution prevention, to making the difference, seeing the adoption of environmental management initiatives as a business strategy and competitive advantage. In which step are Kenyan food manufacturing enterprises?

Answer: The increase in consumption and production of goods using non-replenishable resources and environmentally detrimental manufacturing practices over the past few years has increased the scale of negative human impact on earth. Manufacturing industry provides mankind with goods to fulfill his various needs but at the same time it generates serious problems of the resource depletion and environmental degradation. Every day manufacturing firms generate wastes in the form of pollution (Davies et al., 1976). In response to the above environmental problem there has been an increasing demand from the stakeholders, requesting the manufacturing companies to be more environmentally responsible to their products and production processes (Rusinko, 2010).

Since achieving independence in 1963, Kenya's economy has remained largely agriculture based, so industrialization remains a key factor in Kenya's development plans. In 2011 the industrial sector in Kenya contributed 16% of the country's GDP; the contribution of GDP from industry has remained fairly consistent throughout the 2000s. Kenya's industrial production growth rate for 2011 was recorded as 3.1% (AKM, 2011). Manufacturing contributes 11% of Kenya's GDP per capita, and makes up the largest section of the country's industrial production.

In Kenya, food processing sector remains the largest components of manufacturing sector representing 21.8% of the KAM registered members (KAM, 2020). The sector contributes about 28.7% to the country's Gross Domestic Product (GDP) (Kenya National bureau of statistics, 2012). The sector also faces challenges including: high production cost resulting from high; energy, raw material, labor, and transport costs, slow development and implementation of policies and use of obsolete technologies and skills, competition from sectoral association and environmental degradation (GOK, 2011).

Many business firms worldwide have adopted formal environmental management systems (EMSs) as procedures for systematically identifying environmental aspects and impacts of their operations, setting explicit goals for compliance, performance, and continuous improvement, and managing for them throughout these operations. This procedure has been standardized and promoted by the International Organization for Standardization (ISO: 15000). KAM (2020) asserts that environmental management system helps organizations identify, manage, monitor and control their environmental issues in a holistic manner.

Environmental Management Systems provides a framework for environmental management best practice to aid organizations to prevent pollution, minimize environmental footprint, conform to environmental legislation and develop their business in a sustainable manner (KNBS, 2015; KAM, 2020). Most EMSs involve implementing a written environmental policy, environmental performance indicators/goals, and environmental training program in place for employees, and internal environmental audits. Application of EMS in the manufacturing sector has contributed to improved environmental performance of firms locally and internationally. Despite the challenge of implementing EMS by many firms around the world, a survey conducted by ISO (2015) revealed that firms are likely to achieve increased productivity based on compliance to ISO 15000 standards.

Hasan (2013) argues that organizations and people must adopt environmentally responsible production and consumption in order to recover environmental quality, reduce poverty and bring about economic growth, with resultant improvements in healthy working conditions, and sustainability. Every organization including tea processing firms must put measures in place to ensure all dimensions of its operations are environmentally friendly (Okemba & Namusonge, 2014).

11. Does Kenya has environmental programs/ strategies at nationwide scale (for example: pollution prevention and/or cleaner production, industrial symbiosis, eco industrial parks and/or circular economy promotion at country level)?

Answer: The Kenya government is currently making numerous efforts to achieve sustainability by formulating new industrial policies, for instance the 'Kenya Vision 2030', which aims at converting the country newly-industrializing country through provision of high quality of life to its citizens in a clean and secure environment (Government of Kenya 2007). Other subsequent ones include the Green Economy Strategy and Implementation Plan' (GESIP) (Government of Kenya 2016), the National Climate Change Action Plan (NCCAP) (Government of Kenya 2018) and the Nationally Appropriate Mitigation Act (NAMA) based on the Circular Economy Solid Waste Management Approach (Koech and Munene 2020).

The plan to foster industrial growth through special economic zones (SEZS) has been a culture in Kenya over the last decades, and its relevance is echoed both in the industrialization Medium Term Plan (MTP II) (2013-2017) and most recently in MTP III (2018 – 2022). Like other players in the private sector, Food and Beverage processing industry is recognizing the role of SEZs in providing energy, water, telecommunications, transport, and waste management infrastructure that lacks in alternative manufacturing locations across the country (Khisa & Onyuka, 2018). However, SEZs concentrate manufacturers to a specific locality, hence extending the urgency to incorporate programmers that foster efficiency of resource consumption, innovativeness in pollution mitigation, and exchange of by-product through industrial symbiosis (UNEP, 2017). The overarching aim of such integrated strategies, especially among food and beverage manufacturers, is to push forward productivity, while lowering the total national carbon footprint, hence fostering competitiveness.

Unfortunately, the planning, design, construction, and operationalization of Kenya's special economic zones (SEZS) is not premised on the need to achieve industrial symbiosis, but broadly on the traditional wasteful linear industrialization frameworks. The traditional wasteful linear, which mainly encompasses the extraction or acquisition of raw materials, conducting value addition through manufacturing, and eliminating waste products accruing from manufacturing into landfills, results into a linear pattern in the flow of matter at each step of the value and supply chain (Khisa & Onyuka, 2018). Kenya is not a country endowed with an unlimited supply of agricultural raw materials to serve its expanding demand for food and beverage products, and urban regions that host SEZs lack unlimited land spaces for waste disposal. It therefore follows that the linear, yet wasteful economic expansion

framework is not applicable to the country. Industrialization policymakers are gradually recognizing the need to abandon over-reliance on this model, hence the progressive efforts to incorporate integrated and more sustainable models that align with the international standards.

The United Nations Industrial Development Organization (UNIDO, 2015) emphasized the need for developing industrial markets to implement industrial models framed on industrial symbiosis. Industrial symbiosis comprises of closed material, energy and/or water cycles within the clusters of co-located industries. In Kenya, the existing special economic zones such as the Athi River SEZ currently lack the design and architecture that cluster together industrial plants, and which can facilitate the exchange of wastes and by-products (Khisa & Onyuka, 2018). As such, the food and beverage manufacturers in such SEZs do not accrue the economic and environmental benefits that emerge from the implementation of such company-level resource efficient production models. Khisa & Onyuka (2018) postulates that without such a deliberate move to effect industrial symbiosis in emerging SEZ schemes across the country, Kenya cannot achieve its goal of attracting green foreign direct investments.

The National Forest Programme (2016–2030): Supporting the industrialization goals echoed in the Kenya Vision 2030 is its emphasis on the dependence between industrial growth and the environment, natural resources, and the need for appropriate conservation strategies. The National Forest Programme is an instrumental aspect of the Vision 2030 that aims to sustainably manage, conserve, restore and utilize forests and allied resources for socio-economic growth and climate resilience in pursuit of industrial expansion goals (MENR, 2016). Through sustainable forest management, the programme intends to increase tree cover, facilitate forest-based economic, social and environmental benefits, foster value addition of forest products through capacity development and research adoption, and to create an enabling environment to facilitate the mobilization of resources to facilitate forest development.

The manufacturing sector relies upon forests for its role in energy production, sound food production, and the provision of a host of non-timber forest products that directly or indirectly contribute to industrial agility and productivity. Various players in the food and beverage subsector have contributed immensely to the gradual success of the programme in an effort to offset greenhouse gas emission within operations. The East African Breweries Limited, for instance, has partnered with Nature Kenya to plant 100,000 trees over a 250 acre space on Mount Kenya. Along with over 1 million trees planted to conserve the

Ndakaini dam from where Nairobi's water supply accrues, the company the Mt Kenya project has attained over 85% success rate (EABL, 2020). Similar projects have been conducted by other food and beverage manufacturers such as Manji Fundi Industries.

Nationwide Legal Framework toward sustainable manufacturing: Various global players, including the UNEP and the World Bank Group have in the last decade focused on promoting environmentally friendly eco-industrial economic zones by encouraging policy realignment to reflect resource use efficiency, cleaner production and industrial symbiosis. The benefits of such policies, as demonstrated in South Korea and China, is that countries embrace environmentally friendly economic practices, and hence design, construct, and operationalize eco-industrial parks with industrial ecology in mind (Switch Africa Green:, 2019). However, the current policy framework is weak and does not effectively drive the agenda of industrial ecology. There is an urgent need for a clear industrial policy that is focused on industrial ecology, and which prioritizes the transition of the country's manufacturing model from the traditional wasteful linear model to a more ecologically conscious model.

Within Kenya's industrialization policy is the Special Economic Zones SEZ Act (2015) that neither reflects the desire for sustainable manufacturing nor appears to foster an industrial ecology framework grounded on green and resource efficient for low carbon emission. Aside from that, the country's industrial legal framework does not clearly spell out its strategies on combating the problem of residual waste management, which is central to industrial ecology and sustainable manufacturing. In 2012, Kenya brought to attention the Green Growth agenda that has remained critical issue of focus for NEMA. The policy framework guiding green economy is an essential aspect of the Green Economy Strategy and Implementation Plan (GESIP), the National Climate Change Action Plan (NCCAP), the draft Kenyan Climate Change Policy of 2014, the Climate Change Act, Number 11 of 2016, and National Climate Change Response Strategy (NCCRS). However, the Green Growth agenda is not clearly outlined in the Kenya Vision 2030, Kenya Industrialization Policy, the amended Environmental Management and Co-ordination Act, EMCA 2015, and the SEZ Act of 2015, as a viable avenue towards achieving sustainable development goals (SDGs) (Khisa & Onyuka, 2018).

The country has made commendable efforts through policy restrictions, which have resulted to a significant increase in industrial waste material recovery, drawing the country close to achieving industrial symbiosis (G.O.K, 2017). However, Khisa & Onyuka (2018) noted that unfortunately, the end of lifecycle of both recovered and unrecovered waste materials is

landfills, rendering such policies futile. However, these efforts have been marred, in most industrial zones, by non/minimum compliance, mainly emanating from the design and operationalization of SEZs. Also, the national government, through NEMA functions, and under the Science Technology and Innovation (STI) Act of 2013, has committed to align 2% of the national GDP towards National Research Fund (NRF). However, fulfilling this goal has appeared to burden the government. While the noble intentions of the country's industrialization policies have been spelt out, Kenya needs to implement a workable action plan toward aimed at gradually transitioning its SEZs into a closed loop supply chain industrial model.

Solid Waste Management/Pollution Control Programmes: A crucial component of the industrial objectives as mirrored in the Kenya Vision 2030 is the establishment of fully functional solid waste management systems in the industrial zones in an effort to towards a low-carbon and climate resilient industrial development model. Khisa & Onyuka (2018) noted that most SEZs in Kenya, particularly those within Nairobi Area possess the requisite number of manufacturing and processing firms that can facilitate collaborative approaches to effective waste and by-product management. However, by design and operationalization, most of these SEZs do not accord to tenant companies the incentives to explore innovative solid waste management that could help divert such wastes away from landfills. The absence of integrated solid waste streams that cycle back wastes into the value addition process within such zones has led to unprecedented accumulation of solid wastes in landfills.

An inherent problem to solid waste management and pollution reduction efforts across SEZs is their over-reliance on the end-of-pipe approaches, as opposed to source-based prevention efforts (Khisa & Onyuka, 2018). Dutt & King (2014) suggests that developing economies need to proactively engage waste management solutions that intergrate innovative preventive approaches to waste production in the first instance. Food manufacturers, as compoents of various SEZs must play the crucial role of environmental stewardship within their zones. While there are a few frontrunners such as Dormans embracing industrial symbiotic practices by recycling of raw materials back to the value addition cycle and selling off wastes to other companies for reuse, the greater majority of food and beverage manufacturers are yet to embrace such approaches. At Athi River SEZ, for instance, the zone authorities have articulated policies controlling leakages, spillages and over flow of wastes, which constitute a major source of pollution (Khisa & Onyuka, 2018). However, the absence of a capable waste management hierrachy whose roles are

grounded on fostering waste avoidance, reuse, recycling, and waste recovery, as opposed to waste treatment for final disposal, has paralysed polution control efforts in Kenya (UNEP, 2015).

A clear nationwide roadmap to eradicating pollution emerging from industrial solid wastes is yet to be established, although there exist well-articulated waste management policies. The Government of Kenya in 2017 initiated the proposed Greening Climate Fund in which it invited accredited entities to submit concept notes presenting programme ideas that would enhance sound design and operation of both existing and upcoming industrial zones, in line with the fundamentals of circular economy, and with the aim of mitigating the country's environmental burden. At the pre-feasibility study stage of the project, the government selected Athi River Export Processing Zone (Machakos County), the Mombasa EPZ (Mombasa and Kilifi Counties), the Ruaraka Export Processing Zone and Industrial Park (Nairobi City County), and the planned Samburu Special Economic Zone in Kwale County. The Athi River and Ruaraka SEZs are mature, enjoy developed infrastructure (including rail, road, telecommunication, power, and sewerage) (G.O.K, 2015). The two SEZs host a score of operational food and beverage manufacturers such as Kenya Breweries Ltd and Royale Beverages Ltd. The proposed Samburu EPZ, which is at its planning stage, will also host several manufacturers with potentials for producing large solid waste products (Government of Kenya, 2017).

The Government of Kenya (2017) targets to use the interventions implemented in the zones to test its potential for effective waste and by-product exchange in an industrially symbiotic system. The outcome of such interventions have strong replicability for future SEZs throughout Kenya, the EAC, and Africa. In essence, food and beverage manufacturers operating in the target industrial systems may benefit from such initiatives by closing wastes through waste and by-product recycling, reuse, and recovery, and through efficient material use and minimal energy use. The goal of such waste management approaches is to minimize solid waste generation at the source, in the first instance, and defining all other non-recycled waste products for marketing purposes (UNIDO,2015). The proposed interventions also need to put into consideration the need to adequately plan and analyse waste channels for a successful by-product exchange network to be implemented within these zones.

12. Regarding climate change, do food and beverage enterprises consider / have knowledge about the physical impacts of climate change, the effects on the business, particularly the availability of raw materials, since the inputs are agricultural based, and the costs associated to it? Do they have knowledge about the country vulnerability to climate change? If positive, what measures are being taken?

Answer: The National Environmental Management Authority (NEMA) constantly assesses how nationwide climate change elements such as constant rise in atmospheric temperatures, change in precipitation patterns, incidence of extreme weather, rise in sea levels, and constant seasonal shifts affect our day-to-day lives through floods, droughts, limited water supply, as well as poor air quality and resultant health conditions (NEMA, 2010). The report reflected some of the country's evidence to climate change incuding the persistent and extensive droughts, increased nationwide water scarcity, the constant rise in sea levels, receding rangelands, increased disease prevalence (TB, ebola, Lyme disease, and Rift Valley Fever), human-wildlife conflict, displacement and migration from climate disaster-prone areas, and distruction of some of the popular tourist attarction cites. Kenya has both adpatation and mitigation programs targeting multiple sectors including manufacturing, transport, and agriculture.

Previous studies conducted in the region indicated that most investors in SMEs in food and beverage industries are aware of the existence of climate change (Kihiko and Kinoti 2016). Most managers from manufacturing sectors are aware of climate change and expecting higher operating risks and costs and thus devising strategies for adoption. This is due to the fact that their raw materials are directly link to the climatic conditions that govern growth of crops, affect water availability and transport systems. The government, through NEMA and the Ministry of Environment and Mineral Resources (MoEMR) have been in the forefront of creating awareness of the need for tree planting, industrial pollution control, Environmental Impact Assessments (EIA) and systematic solid waste management in order to encounter the environmental challenges.

Their efforts have been supplemented by individuals, civil society organizations and corporates who conduct environmental conservation education and awareness campaigns. The government has also been working with various NGOs and private sector like USAID, EU, and International Trade Centre (ITC) to create awareness on climate change and adoption strategies through various channels and reduction of greenhouse gasses. The study conducted in Ruaraka reported that managers recognised the existence of climate change and the fact that it was going to affect their production. The major impacts of climate

change has been noted from increasing prices of raw materials increasing the cost of production. This is occurs because of destruction of raw materials, delayed crops maturity, increased production due to adopted strategies like irrigation, emergence of pests and diseases, destruction of infrastructure like roads and power supply (DANIDA, 2009). Most enterprises have been shown to be aware of the climate change. For examples with the problems of water brought about by prolonged droughts. Enterprises are working with farmers to adopt to the climate change impacts through irrigation, use of energy saving cook stoves, producing their own raw materials to maximize supply. Some enterprises also offer support to farmers in terms of trainings, financials incentives and transportation (fish) (SME COMPETITIVENESS OUTLOOK, 2016; United Nations, 2019).

About 80% of Kenya is under Arid and semi-arid areas, and the country is already experiencing water scarcity, the country is thus very vulnerable to climate change effects. Farming activities in Kenya has been highly affected by prolonged droughts and floods causing agricultural losses.

Kenya has very well established environmental management systems including policies and management institutions starting the national government through ministries of Environment and Natural Resources to the local sub-county levels. NEMA is however, the main authority to govern compliance of industries to the established policies, other existing institutions include Kenya Maritime Authority, Ministry of Public health, and Department of Fisheries and Agriculture, Arid and Semi-Arid Areas, and etc. all of which are associated with management f environment and emerging issues of climate Change... There have been however overlapping roles and inadequacy of resources that have hindered effective implementation of environmental policies.

13. Business awareness and compliance with environmental regulations:

i. Environmental Law compliance?

Answer: Most studied conducted on medium and large enterprises have reported awareness of environmental legislations as indicated by them complying with the environmental laws indicated in implementing or showing interest in EMS (Andersen et al., 2021; MBINYA, 2012; Mutheke, 2016). This can especially be assumed to be true for the formal enterprises that requires auditing before renewal of licenses. An earlier study indicated that almost 75% of the as the assessed companies were having established

environmental management system (EMS) with about one third having certified systems (Maj Munch et al., 2021). There was however a section of 4% that were not interested in EMS, these are the industries that find their ways to operation by corrupt deals with the authorities, resulting to rampant pollution among some industries that has been witnessed in the country. About 81% of the firms surveyed by (Mutheke, 2016) reported having an environmental representative implying full compliant with NEMA regulatory policy which deals with protection of the environment. However, a different study in Nairobi established that most of the manufacturing firms did not have pollution prevention mechanisms and not sensitive to pollution control practices as evidenced on disposal of untreated wastes into waterways and still packaging products with non- biodegradable materials despite the set regulation by NEMA and Kenya Bureau of Standards regulations (MBINYA, 2012). The study also found out that many firms had registered high number of accidents annually among its workers due to lack of environmental safety measures and awareness and incurred high cost in legal issues associated with court suits from various stakeholders like workers and consumer protection institutions.

ii. Environmental Law enforcement by government authority?

Answer: Most of the studies have reported reluctance and weak implementation of environmental policies in Kenya. This has been associated with corruption through issuance of bribes by the firms to escape from being audited. The legislators also have been shown to not conduct field assessment of the firms due to lack of adequate resources needed. The funds allocated by the government to NEMA has been reported to be in adequate for the running of the activities, this forces the legislators to rely of the reports by the firms which are always cooked and misleading (Andersen et al., 2021). In some areas however, the legislators have been very strict after public uproars and studies have reported that firms have been closed and others incurred high fines due to noncompliance (MBINYA, 2012). On weakness of the Environmental Laws in the country is that they lack defined quality standards, and adopted the use of EPA which are always not met. Besides, the beaurocratic nature of government laboratories makes the process of analyzing air, water and land quality parameters too long and expensive making the firms prefer bribing the legislators with cooked results.

iii. Monitoring / inspection by government authority?

Answer: Environmental auditing and Monitoring are done occasionally before issuance of permits. In most cases, this is always done without prior notice in order to capture the status of the firms without preparations. It is done in order to ensure that the firms comply with the legislators at all particular times.

iv. Monitoring data is shared? Data transparency?

Answer: The auditors' reports are normally filed in the institution's files and maybe websites. It is however not easy to find them as most firms hide them citing insecurity from their competitors (MBINYA, 2012). This has also been confirmed by this study as most company's environmental policy documents and reports are not available online for public access. However, NEMA produces the state of the environmental report annually which is however sold to the public despite the fact that it does not portray the real picture in the firms.

v. Noncompliance can be attributed to financial constraints (cost of implementing BAT, technology acquisition, maintenance, operating costs)?

Answer: Most non-compliance has been attributed to financial constrains although ignorance is also high among the micro-and small enterprises (Kedogo, 2013). In other studies, it has been reported that firms deems the compliance process being expensive and prefer operating in secret that registering with legislators as most of them see it as a way of minting money from the citizens inform of permit charges by the government for their own benefits due to high corruption in the government (Voeten, 2016).

vi. Noncompliance equals fines / penalties application?

Answer: Environmental pollution aspect that is rampant in food and beverage industries include water and air pollution. This included discharge of effluent directly into water bodies mostly through discharge of raw sewerage from industry and hotels. Illegal discharge is also done by those who do not meet the required standards that are not connected to sewers or septic tanks as is required by law. The law breachers are usually given one month's notice by NEMA to put up adequate septic tanks and exhaust them regularly, or come together and set up an effluent treatment plant through the newspapers. Failure to do so results in

their buildings being condemned (Kamweti et al., 2009). The fines always vary depending on the level of pollution and the implementing authority. Fines and penalties are well stipulated in the environmental Laws and revisions are always done occasionally with the emergent of new environmental issues. These ranges from payment of fines, closure of firms and/or imprisonment of the offenders. Studies have reported that most firms have been closed and also fined due to breach of the laws especially those related to pollution. The recent policy on the ban of plastics exposes Kenyans producing, selling or even using plastic bags will risk imprisonment of up to four years or fines of US$40,000. The fines are also different in the county level, for instance a policy was passed in 2018 in Nairobi that littering the streets with candy wrappers and cigarette butts attracted a fine of $50 or up to six months in jail. While a fine of $1000 or a one-year jail term for huge solid waste dumping (Face2Face Africa, 2018).

vii. Enterprises prefer to pollute and pay fines in comparison to implement best available technology (BAT)?

Answer: Studies have revealed that majority of the manufacturing companies were ranked poorly on environmental performance due to non-compliance to set regulations by environmental authorities, lack of awareness among leaders and employee (Muigua, 2017; Mutheke, 2016). Earlier studies have reported non-compliance of a number of manufacturing firms in Kenya. Omonge (2012) reported inefficacy in procurement that resulted to high cost of energy, increase in discharge of hazardous chemicals and solid wastes that have attracted huge fines from NEMA. It also emerged that most firms did not comply with Procurement and Disposal Act as they always disposed waste electrical and electronics without observing laid down procedures (Mutheke, 2016)

This is an evidence that most firms prefer to pollute and pay fines than implementing the necessary regulations. Furthermore, it has been difficult for legislators to establish the polluting firm in the EPZs.

viii. Industrial effluent discharge, industrial waste management and disposal, industrial air emissions: control, monitoring, reporting, compliance with existent standards. How this does happens?

Answer: Most industries have been reported to be discharging untreated effluents in to the waterbodies and environment despite the government having set regulations. The Water

Quality Regulations 2006 prohibits any person from discharging any effluent from sewer treatment works, industry of other sources into the environment without a valid effluent discharge license issued by NEMA. The regulations also outlines that waste water should be treated before being discharged into a public sewer line. Many firms in Kenya have been contravening these provisions by either discharging untreated effluent into a public sewer or discharging into the environment without an effluent discharge license (National Environment Management Authority (NEMA), 2021). A studies conducted in Nairobi reported admission of non compliance from 38% of those surveyed from bio-based maufactoring sector (Andersen et al., 2021). This was evidence from several factories that have been closed after being caught with illegal discharges of wastewater, and four of the case Ruaraka companies were also found with illegal discharges but not closed (Maj Munch et al., 2021).

14. What is civil society perception and awareness about industrial pollution? Do they have knowledge about the damage on the environment and on people's health?

Answer: The civil society's commitment to environmental restoration, conservation, and protection started long time ago with Green Belt Movement (GBM) in 1970s. They have been critical in fighting for protection of environment like important wildlife area, as well as citizen rights through Human Rights Commission in Kenya. Currently there are several civil-societies that are fighting for climate change and reductions in the emissions of GHGs. Some other groups, for instance Center for Environmental Justice and Governance (CEJAD), African Sustainability Network and Green Peace Africa have also been fighting against lead and plastic pollution in the country. The KHRC also have also fought for workers protection and ensured good working conditions and compensation of workers. For instance, in 2000, they sued Del Monte Kenya and requested them to address matters regarding their protection from chemicals, housing concerns and environmental pollution with success.

15. Case study: focused on environmental initiatives, solutions, interventions adopted / implemented by industries in the food sector

Answer: So many medium and large food manufacturing industries have established several interventions towards environmental sustainability. For instance, BIDCO established an effluent treatment plant to promote cleaner production, it has also been sending their

employees to attend NEMA organized environmental workshops, training employees on energy saving mechanisms, planting trees and supporting public initiatives like schools in their environmental conservation programs and value addition of by-products. The company also implemented solar panels as a move towards cleaner energy.

Social Issues

1. Are there social regulations?

Answer: The social protection of workers is well defined in the Kenya's constitution and several Acts of Parliament. The constitution provides for the right to equality and freedom from discrimination. It also provides for labour relations and states that every person has the right to fair labour practices including the rights to fair remuneration; reasonable working conditions; form, join, or participate in the activities and programmes of a trade union; and going on strike.

The Work Injury Benefits Act of 2007 provides for the International Labour Organization convention compliant laws pertaining to employee compensation in the work place. Following enactment of this Act, many of the sections were annulled by the High Court finding them unconstitutional.

The Occupational Safety and Health Act of 2007: The objective of this Act is to provide the legal framework for employers to maintain healthy working conditions and environment for their workers. The Act makes provisions for the safety and health of all workers in Kenyan workplaces and establishes the National Council for Occupational Safety and Health.

The Industrial Court Act No. 20 of 2011 The Act establishes a revamped Industrial Court that is the same status of the High Court as espoused in the Constitution of Kenya. The Industrial Court is established as a court of superior record. The Court is given powers to adjudicate over cases of employment and labour relations. It describes the qualifications, remuneration and security of tenure of the judges of the Industrial Court. It further establishes an Employment and Labour Relations Rules Committee for purposes of making rules for the Court in consultation with the Chief Justice.

Adopted from ILO - Defines the types of workers, workers legal duties, discrimination in employment, sexual harassment, prohibition about forced labour, wages and salary, deductions from wages, statutory deductions i.e. Every employer is required by law to deduct from each worker's wages a certain amount required to pay the National Social Security Fund (NSSF), National Hospital Insurance Fund (NHIF) and Pay as Your Earn (PAYE), working hours, overtime, leaves, health and safety of workers

Salary and wages - Under the law, every worker is entitled to receive full payment for work done.

2. If positive, what about social regulations compliance and enforcement?

Answer: Although the social regulations are well stipulated, many firms have not complied with them with some managers clearly stating that they fear registering their organizations because they will be forced to pay workers based on regulations which, they cannot afford (Voeten, 2016). Due to the high rate of unemployment in the country, most employers especially in the private sector have been reported to abuse the workers' rights. Several incidences have been reported in the private and informal sector where cases of violation inclusion unlawful dismissal, underpayment, poor working conditions, and overworking/long working hours have been reported. For instance, several cases have been reported from Del Monte (Business & Human Rights & Resource Centre, 2015; Karega, 2002; Matias et al., 2008). The company had been accused by human rights groups for exposing workers to hazardous conditions at the facility, poor sanitation, living and working conditions for workers and for intimidating trade union groups, workers termination threats lack of safety plans in events of emergency and underpayments (1999). Based in these, an Italian human rights group, Centro Nuovo Modello di Sviluppo (CNMS), began a campaign in Italy to boycott Del Monte pineapples for consumers after conducting research and confirming the situation, the campaign that was backed by Kenya Human Rights Commission. The KHRC have also assisted workers by fighting compensation for termination and unlawful dismissal. The compliance has been reported in medium and large firms with reports of good payment, working conditions and workers motivation (Bidco Oil Refineries Ltd, 2013). In most firms, the employment vacancies are always advertised if it is a senior position is required by law while the junior posts are awarded with very well defined job decryption and payment packages and allowances. Also no discrimination is expected as described in the policies. However this is always not the case in most firms as most employment in Kenya has been awarded based on ethnic lines, a practice that is also practiced in the public sector. Most firms are also offering donations to the society in terms of trust funds, building schools and paying fees for needy students as well as giving their products for free as to build confidence among community members.

3. What are the effects for enterprises in violating social regulations?

Answer: Violation of the regulations has resulted to numerous court cases and fights by human rights activists, payment of the affected employee and also boycott of products. For instance, in the year 2000, Del Monte, the company was asked by the Kenya Human Rights Commission (KHRC) to cease intimidation of trade unionists with Del Monte Kenya. KHRC

also requested that Del Monte Kenya address matters regarding worker protection from chemicals, housing concerns and environmental pollution.

4. Fair labour practices?

Answer: Equality and Gender Equality: The Employment Act and the Constitution guarantees the right to equality in employment among men and women. It also prohibits discrimination of persons based on race, tribe, place of origin or residence or other local connection, political opinions, colour, creed or sex or disabilities. It also forbids night shifts for women except in cases of emergency. The Employment Act also stipulates equal remuneration for work of equal value for both men and women. Additionally, a draft Equality Bill is still pending at the Cabinet level. The Bill that if implemented will introduce an Equality Board and Tribunal, and recognition of equality rights in employment, education, health services, profession, and many other areas of private and social life.

5. Health and safety issues?

Answer: Health and safety: the employer must provide a clean and safe working environment for the workers. Every factory must be kept clean and free from all forms of sanitary nuisance

- The employer must establish and make known to all employees clear rules for the handling of dangerous substances such as poisons and pest control products. Such rules must be in a language that all employees can read and understand.
- Adequately instruct and train workers in the use and handling of poisonous or dangerous substances or equipment. Make first aid facilities available to deal with any emergencies.
- Workers are entitled to Ensure own safety and healthy through co-operating with rules and regulations as set by the employer, wear protective clothing

6. Working conditions?

Answer: The working hours and conditions and Regulation of Wages (General) Order, subsidiary to the Regulations of Wages and Conditions of Employment Act, are well defined in the employment Act. The general working hours are 52 per week with modifications

possible under collective agreements. Conditions for operations during overtime, public holidays, annual paid leave, maternity leave –sick leave, compassionate leave, study leave and Leave for trade union purposes or because of the holding of public office are also well stated.

7. Child labour?

Answer: Generally, child labour is prohibited. However, a child may be engaged to work where the work benefits the child's education and well-being and does not interfere with his/her education. A child who is aged sixteen or younger should not work more than six hours in one day. Minimum age and protection of young workers: "Child labour" is defined in the Kenyan laws as any situation where a child provides labour in exchange for payment (Children Act, 2001). The Employment Act, in part IV, accords special protection to juveniles. It defines a "juveniles" is "child or young person"; and "'child' means an individual who has not attained the age of sixteen years", whereas "young person" means a person who has not attained the age of 18 years. The regulations states that Children under 16 should not be employed in any industrial undertaking or to attend machinery, unless they are apprentices or learners, at night except in cases of emergencies with registers required to be kept by employers engaging juveniles. The regulations also allow for light work with prior written permission of an authorised officer is however demanded to allow for the employment of children with a condition that the employment should not cause the children to reside away from parents without their approval. The permission to work in a bar, hotel, restaurant, etc., needs to be approved by the Labour Commissioner with annual renewal of such permits. The part of the Act, entitled "Safeguards for the rights and welfare of the child 'addresses child protection against economic exploitation and any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development. Any person who breaks the laws is culpable to fines of up to 50,000 shillings or imprisonment not exceeding 12 months or both.

8. Forced labour?

Answer: The law states that it is illegal to use or assist any person in the recruitment, purchase and sale or use of forced labour. This includes the recruitment or compulsory employment of children.

9. International conventions, international standards compliance?

Answer: ILO Conventions ratified by Kenya, the country joined the ILO in 1949 and had ratified the 49 ILO Conventions by mid-2004. The social protection of workers is well defined in the Kenya's constitution and several Acts of Parliament. The constitution provides for the right to equality and freedom from discrimination. It also provides for labour relations and states that every person has the right to fair labour practices including the rights to fair remuneration; reasonable working conditions; form, join, or participate in the activities and programmers of a trade union; and going on strike. The Labour Law Reform agenda under ILO let to the development of Draft on the Labour Relations Act that deals with registration, regulation, management and democratization of trade unions and employers organizations or federations, to promote sound labour relations through the protection and promotion of freedom of association, the encouragement of effective collective bargaining and promotion of orderly and expeditious dispute settlement, conducive to social justice and economic development and related matters. It also let to establishment of Draft on the Labour Institutions Act that introduced labour courts; Employment Act defining fundamental rights of employees; and Work Injury Benefits Act that provides for compensation of employees for injuries suffered and occupational diseases contracted in the course of employment, for insurance of employees and related matters. These have been followed by Acts of Parliament like Contract Act, Local Government Act, Public Service Commission Act, Factories Act and the Children Act.

The Work Injury Benefits Act of 2007 provides for the International Labour Organization convention compliant laws pertaining to employee compensation in the work place. Following enactment of this Act, many of the sections were annulled by the High Court's finding them unconstitutional.

The Occupational Safety and Health Act of 2007 was established with an objective to provide the legal framework for employers to maintain healthy working conditions and environment for their workers. The Act makes provisions for the safety and health of all workers in Kenyan workplaces and establishes the National Council for Occupational Safety and Health.

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and Labour Relations Rules Committee for purposes of making rules for the Court in consultation with the Chief Justice.

The Acts were adopted from ILO and they defines the types of workers, workers legal duties, discrimination in employment, sexual harassment, prohibition about forced labour, wages and salary, deductions from wages, statutory deductions i.e. Every employer is required by law to deduct from each worker's wages a certain amount required to pay the National Social Security Fund (NSSF), National Hospital Insurance Fund (NHIF) and Pay as Your Earn (PAYE), working hours, overtime, leaves, health and safety of workers.

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Equality: Gender Equality: The Employment Act and the Constitution guarantees the right to equality in employment among men and women. It also prohibits discrimination of persons based on race, tribe, place of origin or residence or other local connection, political opinions, colour, creed or sex or disabilities. It also forbids night shifts for women except in cases of emergency. The Employment Act also stipulates equal remuneration for work of equal value for both men and women. Additionally, a draft Equality Bill is still pending at the Cabinet level. The Bill that if implemented will introduce an Equality Board and Tribunal, and recognition of equality rights in employment, education, health services, profession, and many other areas of private and social life.

10. What measures are taken by trade partners, international buyers/brands, and international agencies to ensure social standards compliance? And in case of non-compliance?

Answer: The key export markets for Kenya outside the EAC, with high influence in sustainable manufacturing are in the European Union, Pakistan, China, India, UAE, and the United States of America (FPEAK, 2019; KMC, 2015). This is due to the preferential terms and conditions provided by the trade agreements. Kenya has been keen to retain these markets upon the expiry of the trade agreements(Kenya News Network, 2020). The domestic market in Kenya does not care about the environmental features in products apart from hotels, the pressure thus experienced from the international markets. The low income

and demand for cheap food has made the domestic market to be dominated by the informal sector (Mwangi, 2016). Access to global market pushes eco-labelling and certification of products to meet the international environmental standards. These mechanisms address resource constraints, global climate change, and other pressing environmental issues. For instance, exporting to the EU and United States market, especially California, requires enterprises to meet strong environmental regulations in order to qualify for the US and EU Ecolabel standards (SME COMPETITIVENESS OUTLOOK, 2016). Enterprises like Del Monte and other horticultural enterprises like Oserian, Naivasha. Another example is Kenya Meat Commission (KMC) that has managed to achieve sustainable manufacturing in order to get the 'Halal' certification in order to access the huge market in the Middle East. KMC thus have to ensure that the 'Halal' conditions are met right from the raw material (animal) suppliers (KMC, 2015). The pressure of ensuring sustainable manufacturing is however only application to formal medium and large enterprises with interested to access the external markets (Mwangi, 2016). In order to ensure compliance and sustainable supply of raw material, most enterprises work together with the government, NGOs and other private organization and offer support to the suppliers inform of financial incentives like soft loans, artificial insemination, transport services, trainings on production best practices, pest control etc. (ITC, 2019; SME COMPETITIVENESS OUTLOOK, 2016). The suppliers (farmers) are also supported to form cooperatives where they can boost production through savings, warehouses and share knowledge. This is widely applied among milk, sugarcane, tea, coffee, and millers. The Kenyan government is currently striving to create environmental conditions through crating policies that enhances green economy investments to reduce wastes and climate change effects in order for SMEs to qualify for the global market. Other eco-labelling regional initiatives that is driving Kenyan SMEs to sustainable manufacturing are the African Eco-labelling Mechanisms (AEM's) and ECO Mark Africa (EMA).

11. Case studies: focused on social initiatives/ projects implemented by MSME and large enterprises in the food sector

Answer: Most food and beverage enterprises have established social initiatives to increase their public image and motivate employees and increase their competitive advantage in the market. A good case study is BIDCO that has been advocating for environment conservation and have invested over 20% of its revenues to environmental conservation programs. It has been motivating its employees to increase productivity through increased benefits by payment for overtimes and awarding the best performing employees, which has

increased the employees' satisfaction leading to marginal improvement in productivity. The company has thus been able to retain talent and manage the expertise of employees making it gain positive public image that increases brand recognition and awareness. The company has also been ensuring that all stakeholders of the company befit from its operations and introduced an education trust fund that assists able and needy children within the community. Bidco also has adhered to and ensured that it have eco-friendly branding and production and adhered to ethical standards provided within the regions it operates (Bidco Oil Refineries Ltd, 2013; Mutheke, 2016).

Capacity Building

1. Kenyan technical education and training system?

Answer: Firms like BIDCO, Del Monte and many other large firms have very well planned education and training programs. The first thing done is that employees are engaged based on their academic qualification in the advertised field. The knowledge base will then be boosted through established indoor and outdoor training activities for their employees. The organizations work government intuitions and send their staff to trainings organized on environmental matters by NEMA, Public Health, KAM and other NGOs and private partners. Routine indoor trainings are organized including workers safety, workers' rights, energy conservation, waste management strategies and emerging technologies etc. The firms also have signed MoUs with research institutional and learnings institutions with agreements of them offering courses of their interest to their staff members, standardized payments for their staff and collaborative workshops with them offering attachment and internship opportunities as well as financial support and infrastructural development.

2. Employer support towards employees' capacity building? (integration between industry and education institutions (universities, institutes and other training institutions; investment in Technical Education and the effects on industrial productivity).

Answer: One problem that most enterprises are facing is lack the number of skilled workers needed to realize innovations that can steer them towards sustainable competitive manufacturing. Many firms are thus investing on employees training especially with the rise of new technologies. The firms have MoUs with KAM and TVETs and working together towards improving the knowledge and skills of staff towards sustainable manufacturing. The institutions pay for short courses for their staff for refresher courses and advancement of skills to specific fields with introduction of new technologies. Some firms also offer paid study leave besides sponsoring their fees to ensure their skills advancement. Attending trainings, especially those associated with entrepreneurial, management skills like book keeping has been shown to help in boosting the performance of SMEs in terms of compliance with the regulations (ITC, 2019; Voeten, 2016). They can track the energy consumption, waste produced especially in large organizations.

3. Women entrepreneurship support / initiatives?

Answer: Several government and local and international NGOs are working with women to promote their participation in the business sector in the country. While there are very few women managed medium and large food and beverage enterprises, most of them are in the micro and small categories. Most rural agriculture that supply the market are managed by women, there have been so many cooperatives formed targeting women empowerment and support. Keroche industry is so far the only top woman managed large enterprise in Kenya, the firm is however experiencing too many challenges including intimidation arising from competitive male managed firms and the society that do not embrace women leadership, especially in an alcohol industry. The government through KAM has partnered with the International Centre for Research on Women (ICRW) to conduct a research study on women in manufacturing in Kenya that aimed at promoting women in manufacturing. This will feature various stakeholders from government, private sector, and civil society and development partners and provide information that can inform the advocacy strategy to mainstream equality and inclusion in the manufacturing sector (KAM, 2018). Women in manufacturing industries are facing several problems like access to loans and market is a problem. The culture and traditions of the country also undermine women on senior leadership positions (Raymond Brandes, 2017). Several organisations (banks and international organisations) also issue soft loans specifically for women to boost their firms. For instance, Cooperative bank have been supporting women milk producers in Kajiado through Kajiado Women Dairy Cooperative Society. The society brought together all women milk producers in the region and help with collection storage and market of the milks. The Cooperative bank also provide soft loans, free transactions and ensure timely payment of the members. The bank has also partnered with Safaricom to provide the cooperative members with M-kopa solar panels, enabling then to use cleaner energy sources.

4. Investment in labour skills improvement (staff training, managers' trainings)?

Answer: Studies conducted in the area has reported that education and training, peer influence, innovativeness, registration process and licenses, physical Infrastructure and Government policies have been very important regulators of SMEs growth in Kenya (Kedogo, 2013). Through KAM most micro and small enterprises have been able to acquire managerial skills for their firms. The knowledge acquired in the trainings have improved the SMEs record keeping, level of accountability, relationship with customers, and enabled them have access loans, manage the business better and relate well with suppliers. However, for

medium and large firms, they have been able to invest on staff trainings especially with emergence of new technologies in the market. This is done in organized indoor training sessions or the managerial staff are sent to other local or international organizations to where they are trained and experience the new techniques with full support of their organizations. The workers have been trained on basic water, energy and waste management skills like energy saving strategies, basic IT skills for green purchasing, inventory, and avoidance of printing and photocopying to minimize carbon footprints.

5. Investment in research and development (R&D)?

Answer: The assessment of Research and Development among SMEs un Kenya has been reported to as impossible since the owners do not systematically record R&D expenditures and have not registered patents (Andersen et al., 2021). However, available information shows that majority of the lot carrying out micro and small enterprises in Kenya are not quite well equipped in terms of education and skills. The firms as well as the government through KAM have invested in research and development to improve the performance and competitive advantage of SMEs in Kenya (Kedogo, 2013). Kenya through KAM has established has signed various MoUs with different international organisations to promote SMEs engagement in green manufacturing. The latest MoU was signed with GIZ-ED4/ SOGA, German Development Bank KFW (kreditanstalt fur Wiederaufbau) and Technical Trainings Institutions to promote Youth Employment and Technical Vocational Education Training in Kenya (KAM, 2018). KAM has also established a Manufacturing Academy for skills development by industries including those in food and beverage sector. The academy provides both in-house and open house technical/specialized and management training in various broad areas. It is also working with industries and TVET institutions to link graduates to industries and subsequently jobs, as well as supports Competency Based Education and Training (CBET) and pioneer placement of CBET graduates in the industries. This ensures that the learners acquire practical skills and knowledge that will enable them to perform required standards of industry and business (KAM Report 2019/20).

6. Case study: focused on capacity building and women entrepreneurship initiatives/ projects implemented by MSME and large enterprises in the food sector.

Answer: A number of capacity building have been established among women entrepreneurs. A good example is in the Dairy sector where the Kenya Cooperative society

has established many women managed groups to help them in the production process in different parts of the country in Kajiado, Baringo, Bomet, Bungoma, Embu, Busia, Kakamega etc. These cooperatives are managed by the women engaged in milk production themselves with the help of private and public sector. This was an initiatives by Cooperative bank which was meant to increase the competitive capacity of the women in the market. The societies have brought together all women milk producers in the regions and help with collection storage and market of the milks. The Cooperative bank also provide banking services, training on cattle keeping best practices and how to improve yields, bookkeeping, soft loans, free transactions and ensure timely payment of the members. The bank has also partnered with Safaricom to provide the cooperative members with Mkopa Delite solar panels, enabling then to use reliable cleaner energy sources.

Public Governance

1. Multiple regulatory agencies and institutions, probably with overlapping mandates, roles. How the inter-government agency coordination runs? Are there synergies between them?

Answer: Environmental protection concerns started in Kenya long time ago from Parliament's passage of the Environmental Management and Co-ordination Act (EMCA) of 1999 and the creation of the National Environmental Management Authority (NEMA) (EMCA, 1999 part II § 7) to govern the environmental regulations. NEMA was charged with enforcing EMCA's provisions and the subsequent legislations. The government has established several policies legislative and institutional frameworks on the areas of water quality, waste management, controlled substances, biodiversity, wetland, river and seashore, and environmental impact assessment (EIA) regulations. These legislations are expected to govern all business activities to ensure environmental protection. NEMA is thus mandated to review and issue licenses and ensure compliance with existing environmental regulations. Additionally, the Kenya's constitution also expresses the rights of individuals to clean and healthy environment and assigns the obligation of individuals and the state on matters of environmental protection, conservation, well use of resources and ecologically sustainable development (United Nations, 2019).

It has been argued that Kenya's policy makers formulate major environmental policy measures and programmes only in response to international environmental conferences. For instance, it is the 1972 United Nations Conference on the Human Environment at Stockholm, Sweden, that resulted in the first ever National Environment Secretariat in Kenya. Similarly, the 1992 United Nations Conference on Environment and Development held at Rio de Janeiro, Brazil, resulted in Kenya's adoption of the National Environment Action Plan in 1994. In the same vein, the passing of the Environment Management and Coordination Act in 1999 and the subsequent establishment of the National Environment Management Agency in 2002 came on the heels of the 2002 Earth Summit in Johannesburg, South Africa. There is an apparent lack of the requisite internal commitment and political will to follow these policies through their implementation. The EMCA of 1999 created the National Environmental Council (NEC) as a way to streamline environmental responsibilities and regulations. All of the agencies involved in environmental regulation are represented on the NEC, but the NEC has been ineffective in policing the overlap of responsibilities between agencies. It has not been able to overcome the inter-ministry rivalries that are supported by the fee structure currently in place (Bird and Kirira, 10, 2009).

The Constitution of Kenya 2010 introduced a devolved system of government with 47 counties and a national government. This has created complexity in policy making and therefore a risk of policy incoherence. Article 6(2) of the Constitution states that the national and county governments are distinct and interdependent and should conduct their relations based on consultation. Thus, the Constitution anticipates that the two levels of government work together for the benefit of the country. Kenya requires integrated policy making, planning and budgeting between the two levels of government. This has always posed a challenges in the recent past with parallel legislators performing the same role at the local and national government. The tax policies in Kenya is the main issue with both government collecting taxes from the firms. Complain of existence of too many disparate policy initiatives at county level, and devolution has made it difficult for investors as it increases transaction costs for investment. The same is also with NEMA and Ministry of Public Health that have overlapping mandate of ensuring environmental safety and waste disposal. Things like pollution cuts across but sometimes have been overlooked as each ministry expects the other to act, a case that is not similar to when it comes to sharing tax benefits, the departments thus normally take action after public outcry but not as routinely expected.

2. Is there institutional charts of agencies responsible for environmental pollution control and food-beverage industry?

Answer: Yes, Kenya has a very well defined chart of agencies responsible for environmental pollution control and food and beverage industry under the Kenya Environmental Sanitation and Hygiene Strategic Framework (KESSF) 2016-2020 (Kedogo, 2013). The Kenyan government also recognizes the need for citizens' access and utilization of safe food, and have thus formulated policies that ensure safe manufacturing, processing, and trade of food products. These are based on available policies in the sector. The country's industrialization policy statement for the agro- processing industry is geared towards achieving six overarching objectives with the key one being to promote public health and protect the public against food-related hazards. Policies have thus been formulated which are aimed at regulating, incentivizing, or informing players in the sector. The government has thus established a legal framework which agents in the industry must adhere adopted to implementation of structural and institutional framework to monitor and enforce established policies governing the food manufacturing sub-sector. The national food manufacture regulatory system is multi-sectoral in nature and is governed by different ministries under various sets of laws. The National Food Safety Coordination Committee (NFSCC), overseen

by the ministry of Agriculture and the Ministry of Health, is one such body that has remained instrumental in coordinating and integrating activities at each level of the regulatory processes. Other governmental organizations detailed with the roles of implementing and enforcing laws on food manufacturing and processing firms include Kenya Plant Health Inspectorate Service (KEPHIS), the Department of Veterinary Services (DVS), and the Kenya Bureau of Standards (KEBS).

3. Does government give any support to enterprises, particularly MSME to comply with environmental regulations / standards and/or implement environmental management initiatives /tools (technical, financial)?

Answer: Both Vision 2030 and the Big Four Agenda center on manufacturing as a strategic sector on which to facilitate economic growth, expand job creation, and foster industrial development. Both economic blueprints recognize the importance of agro-processing, agricultural value addition, and food manufacturing as a viable intervention that will progressively impact the projected economic growth in a positively trajectory. In fact, of the four pillars constituting the country's vision 2030, 'Food and Nutritional Security" and 'Manufacturing' stand out (Imungi, 2018). The Government of Kenya established within the Vision 2030, the Kenyan Industrialization Transformation Programme (KITP), which is responsible for designing strategic, comprehensive, integrated approaches towards achieving multi-sectoral industrial growth. There are ongoing initiatives implemented by the government to attract local investors, mainly women and youths into the food manufacturing (Otieno & Washington, 2017). The government have been providing numerous support to the SMEs through KAM which have led to expansion of local led business initiatives in Kenya. These has included infrastructural development, green financing, capacity building trainings, workshops and other exposure channels with some SME owners admitting that the organized agricultural trade fairs and exhibitions have helped them a lot (Voeten, 2016). Until the last decade, however, Kenya's food manufacturing industry has remained largely in the hands of large multinational corporates from various developing and developed countries, mainly from Europe and North America. Today, numerous small, medium, and large food manufacturing enterprises have emerged both in urban and rural settings making use of available agricultural produce such as legume mixes, dairy products, fruits and vegetables, and meat (ITC, 2019; KAM, 2018).

Through its Sessional Paper No 2 of 2005 the government launched the 4k MSE 2030 initiative under the first five years 2007 to 2012 of Vision 2030. The Institutions that were to

work under the 4K initiative include the Kenya Industrial Research and Development Institute (KIRDI), the Kenya Industrial Property Institute (KIPI), The Kenya Bureau of Standards (KEBS), and the Kenya National Federation of Jua Kali Association (KNFJKA) to improve the manufacturing industry. These institutions were tasked with Ensuring production of quality products that meet both local and international standards by SMEs, while enhancing consistency and cooperation with other sectors. The specific objectives of this initiative were to upgrade the SME products; build capacity for to manufacture upgraded products; promote innovation and technology transfer; instill a culture of quality and standardization; promote use of intellectual property as a tool of trade and business (Kedogo, 2013).

4. If government, due to external pressure strengths environmental regulations, what would be the effect on to enterprises, particularly MSME? What would be the effect on people jobs?

Answer: The MSMEs are already experiencing internal and external pressures that are demotivating their operations. Markets for fresh agricultural produce have become increasingly volatile, seasonal, and unreliable, surrounded by poor infrastructure dominant in rural areas. As a result, post-harvest losses continue to affect farmers' returns on investments. Most MSMEs will close down since most of them have been having issues due to non-compliance, meeting the regulations means spending more for instance in sanitation and waste management which many firms can manage ow due to other pressures. Food and agricultural subsector also is also part of agriculture and agro-processing remains a central sector in the country's economy. The sub-sector contributes food to more than 40 million Kenyans besides serving as a sustainable source of livelihood to more than 17 million people, mostly rural dwellers. Despite this significance, the sector is primarily dominated by smallholder farmers dependent on rain-fed farming, and who contribute more than 75% of the total agricultural produce in the country. Stringiest measures will mean closure of these firms with many Kenyans losing their jobs.

5. Would the country lose competitive advantage in the global market due to merchandize price increase as a result of salaries increase or/and as a result of the adoption of more stringent pollution control measures?

Answer: Although adoption of sustainable manufacturing strategies have been shown to improve the performance of food manufacturing firms in Kenya, in terms of sales and profitability and therefore competitive advantage (Andersen et al., 2021). Increasing

production cost means price increase of the products from Kenya. The country may lose its competitive advantage since price has already been a challenge to some firms in the country like BIDCO, with rise in multinationals from China forcing them to reduce the prices of particular products to match the prices of the competitors (Bidco Oil Refineries Ltd, 2013). Most enterprises are already struggling to keep themselves to the market, strict rules will thus make them shy away and move to other countries in the region especially the foreign investors.

Infrastructure Conditions

1. Country information regarding and its effects on industrial productivity:

Answer: Poor infrastructure in terms of roads, internet and basic services such as electricity, water supply, wastewater management and waste management are part of the challenges affecting sustainable manufacturing in Kenya. A study conducted in an Industrial area in Nairobi indicated that there is one energy utility and one combined water and wastewater utility, and no waste utility, though hazardous waste is incinerated in one central plant in Nairobi. There are no public recycling schemes for solid waste (Andersen et al., 2021). All non-recycled waste is taken by licensed trucks to the local dumpsite 'Dandora', Africa's largest dumpsite, which lies close by, where informal recycling is widespread and to a high degree run by the cartels. The environmental infrastructure conditions reported from an industrial site indicated a severe resource supply problems (energy and water shortages and blackouts) with less challenges for sinks (waste and wastewater handling). The conditions that seemed to drive the focus on innovations for resource productivity including resource savings, and circular innovations as well as strong perceived interest into circular innovations. There are some interesting indications that the Kenyan economy when it comes to materials (but less so on water and not in energy) may already be on quiet a strong circular technological trajectory relative to their degree of economic development. But the picture is varied, and more studies are needed to investigate this. There are, overall, still high potentials for green and circular innovations and none the least green product innovation, recognized by the companies' themselves.

2. Electricity supply, power generation capacity (hydro, thermal and geothermal)

Answer: The government has boosted the energy supply by establishing wind meals and solar panels to increase energy supply. The government through the World Bank supported rural electrification program that has boosted power supply even in remote areas in the village boosting the performance of SMEs. Additionally, there is also a growing development and adoption of renewable power generation technologies involving internal generation of power through installation of solar energy and biogas production using byproducts from the production process. Improvements in technology and lower costs of solar home system (SHS) have spurred them in the market with rising demand among the local and social entrepreneurs. M-Kopa local solar energy provider estimated that a customer saves about

$750 over the first four years by switching to its basic solar kit. Solar is a clean, renewable and affordable source of energy that can be afforded my many including those in remote rural areas.

3. Information technology

Answer: The IT sector is not well established in most food and beverage MSMEs in Kenya due to lack of skilled personnel. The firms are thus still using the traditional way of communication and book keeping especially in micro and small firms (MBINYA, 2012). The government through KAM has been offering training to managers on the modern form of technology and have been working with private partners to improve the level if IT I the country. With recent rural electrification and establishment of internet networks through Kenya Power Fiber Optic Network, more firms will be able to utilize IT in their work.

4. Logistics system

Answer: The government has in the recent years devolved most of its activities through the country government and also digitalized registration processes for easy access industries. The registration, permits renewal and other government related certifications of enterprises have been brought closer to people with the establishment of Huduma Centers up to sub-county levels. All the government activities have been digitalized and can be easily accessed through eCitizen Website with physical verification done at Huduma center, this has minimized travelling and waste of time and money as it used to be before.

5. Communication system

Answer: Communication within the firm and outside the firms vary depending with their level of development. While use of paperwork is still common in communication. Currently most firms are moving towards green communication with less printing and photocopying. The advancement in Information's and Communications Technology (ICT) through Kenya Power Fibre Optic Network have seen improved network and internet access -4G network boosting communication even in remote areas. Besides this, the mobile subscribers have been offering discounted mobile phones to enterprises enabling boosting their communication channels. In most medium and big enterprises, the employees have work emails where all

the firms' communication are channelled as well as websites for communication with the public and outside partners.

6. Transportation system (road, rail, air, pipeline and maritime transport infrastructure)

Answer: The government through The Kenya Urban Roads Authority, Kenya Highways Authority and Kenya Aviation have been in the forefront and several roads, bridges, airports and ports been built and expanded in the country in the last 10 years. The expansion has also been facilitated by devolvement of local roads to the county government enabling for their building offering good transport channels to SME. These roads have also been facilitated through public private partnership. The major achievement has been in the expansion of ports in Mombasa, Lamu and Kisumu, development of airports e.g. Manda, SGR, roads like Thika Highway, LAPPSET corridor and bridges like Likoni bridge and several others. These will ease transport and travel logistics of people goods and services for SMEs in the country and with neighboring countries.

7. Water quality / availability.

Answer: Water availability and quality is problem that is affecting many MSMEs in Kenya. This is because many of the firms rely in government supplied water which, depends on rain availability. Sometimes the government conduct water rationing in order to save water which impacts on the performance of the firms that rely entirely on the supply. Buying water from alternative sources have also been reported to increase the production cost due to high charges (Andersen et al., 2021). Many firms are thus turning to water harvesting, recycling and generation of underground water through wells to meet their water needs especially during dry season

8. Sanitation

Answer: Sanitation is still a problem to many SMEs with many micro and small enterprises operating without established human waste management systems. Waste water and effluent management is still very poor with reports of dumping untreated sewage directly to the environment especially waterways (Department), 2016; Mutheke, 2016; National Environment Management Authority (NEMA), 2021). A study conducted in Nairobi's industrial area reported that environmental infrastructure conditions reported severe waste

and wastewater handling conditions, similar cases have been reported in many with many firm in the country.

Specific Questions

0. MSME and large enterprises definition in Kenya

Answer: The definition of the regulatory and institutional framework for the Kenya's SMEs has been based on the number of employees and the company's annual turnover (MSMEs Act, 2012). The micro enterprises have been defined as enterprises employing less than 10 workers with annual turnovers of less than KES 500,000 and capital formation of less than KES 5 million for services or less than KES 10 million for enterprises doing manufacturing. Small enterprises on the other hand have been defined as enterprises that employ between 10 and 50 workers with annual turnovers between KES 500,000 and KES 5 million and capital formation between KES 5 million and KES 20 million for services or between KES 5 million and KES 50 million for enterprises doing manufacturing (UNCTAD Report 2013). Medium ones employing 51 to 100 workers (The Kenya Government Baseline Survey, 1999). Some definitions have also grouped and defined small and medium enterprises in Kenya's manufacturing sector are defined as enterprises with fulltime employees not exceeding 100 or annual sales turnover not exceeding Ksh 150 million (Mwirigi, P., 2007).

1. How many food manufactures are there in Kenya? Among those, how many are micro, small, medium and large enterprises? How many are direct exporters?

Answer: Out of about 7.41 Million MSMES in Kenya only 1,232 large, middle size, and smallholder businesses have been reported to belong to the food and beverage manufacturing sub-sector (KAM, 2018; KNBS, 2019). It is registered as the largest sub-sector that contributes approximately 13% of the country's GDP from manufacturing. According to a report published by the Kenya Association of Manufacturers Directory (2014), Kenya's Food and Beverage sub-sector comprises a KAM membership of about 181 (24% of total KAM membership). The sub-sector tops Service & Consultancy (12% of KAM membership) and Chemical & Allied Sectors which contributes a total of 9% of KAM membership. There are about 17 fish processing companies registered with the KAM, most of which can operate a capacity of 437 MT per day. There are also about 11 grain processing companies in the country, mostly dealing in maize fortified foods, baby formulas, rice, millet, sorghum. There are also about 9 in-built milk and dairy processing companies producing approximately 2.5 million liters each day. Registered Food and beverage manufacturing companies with Kenya Association of Manufacturers in Kenya were 217 as

at 2017 (Kenya Association of Manufacturers, 2017). Kenya food and beverage market size reported report strong growth rate due to increasing population, rising disposable incomes, coupled with changing trends and product innovations. However, intense government regulations, raw material price fluctuations and the recent COVID-19 pandemic have negatively affected the enterprises seeing many businesses shutting down.

Food Product Output 2008-2017: Retrieved from Kenya National Bureau of Statistics, KNBS (https://s3-eu-west-1.amazonaws.com/s3.sourceafrica.net/documents/119074/Kenya-National-Bureau-of-Statistics-Economic.pdf)

2. How many workers are directly and indirectly employed by the food sector?

Answer: The private manufacturing sector created 7,700 new jobs registering 329,000, 24,300 and 3 million wage employments in private, public, and informal sectors respectively in 2019 (KNBS, 2020). This is a rise from the number reported in 2011that the industry was employing over 200,000 family households and about 30% of the labour force (Obiso, 2011). O the other hand, public sector wage employment in manufacturing declined by 8.5% from 26,600 in 2018 to 24,300 in 2019. The number of employees engaged in manufacturing in the informal sector grew by 6% from 2.88 million in 2018 to 3 million in 2019 (KNBS, 2020).

3. Which were the achievements of Vision 2030 on the development of a diversified, robust, and competitive manufacturing sector in Kenya?

Answer: Through this policy, the government of Kenya has been trying to become industrialized and globally competitive economy by 2030. It aspires to become middle-income economy through expansion of the manufacturing sector. The country has attained a relatively large industrial sector across the region, (Ronge & Nyangito, 2000). At inception, the country needed to grow its GDP by US$4-6 billion (~10%) each year. For a country with an average economic growth capped at approximately 5%, achieving a 10% growth rate posed a significant challenge. However, the Vision 2030 proposed interventions to facilitate manufacturing and expand industrialization. Such interventions include strengthening the capacity and local content of domestically manufactured products, to enhance, generate and utilize research and development to foster industrialization and manufacturing, to develop niche products to occupy existing and new markets, and to raise the share of Kenyan products in the region from 7% to 15% (Otieno & Washington, 2017). Along with

the National Industrialization Policy and the Vision 2030, the government has in the recent past renewed interests in the manufacturing sector through the Big Four Agenda which seeks to expand the GDP contribution from the manufacturing sector from 8.4% to 15% by the end of 2022. Today, the manufacturing sector is the fourth largest sector in the country, contributing 11% of the country's total GDP (KNBS, 2019). The sector trails the agricultural sector, transport and communication sector, and wholesale sector. The private manufacturing sector created 7,700 new jobs registering 329,000, 24,300 and 3 million wage employments in private, public, and informal sectors respectively in 2019 (KNBS, 2020). The World Bank in 2015 reported that Kenya, among 9 other developing countries had attained a Gross National Income (GNI) of $1,290 per capita, becoming a lower middle-income economy (The Business Daily, 2015). The development of competitive and resilient small and medium enterprises (SMEs) forms an integral component of Kenya's initiatives to be globally competitive and prosperous nation with a high quality of life by 2030 (GoK, 2007). The policy has led to expansion in manufacturing industries, infrastructural development, creation of more jobs, improved healthcare opening new markets for MSMEs. Development of Thika highway, Standard Gauge Railway and the ports and the LAPPSET have open up market for the firm.

4. Which were the achievements of "The Big Four" (B4) on the country industrial development / industrial transformation?

Answer: The Big Four Agenda has increased the competitive value of Kenya SMEs. Initially, the country's industrial sector lacked a robust value-addition, particularly for the broadly available agricultural and other products from natural resources under the previous policy regimes; - import substitution and market liberalization. In 2007, the government launched the National Industrial Policy (NIP) that targeted to foster rapid industrialization and to place Kenya in a globally competitive position through export orientation strategies. The policy aimed at fostering wealth creation and solving the unemployment jargon. Its main objectives was to establish and sustain within the manufacturing sector, a 15% annual growth rate that would set Kenya as a globally competitive and Africa's most preferred economy for industrial investment. The Big 4 Agenda policy is anchored on investment in manufacturing, financial support to MSMEs, market search and signing of bilateral trade agreements to open market. It has let to formation of policies geared towards sustainable production.

The Micro and Small Enterprises (MSEs) policy and The Institute of Economic Affairs (IEA - Kenya) is a Public Policy Think Tank and Kenya's premier dialogue forum that seeks to

promote pluralism of ideas through open, active and informed public debates on key policy issues, and to propose feasible policy back-up to policy makers including members of parliament as well as through research and advocacy. Through its work, The IEA-Kenya provides alternative public policy choices and addresses the legal and institutional constraints to economic reforms and growth. The IEA-Kenya is independent of political parties, pressure groups, lobbies and any other partisan interests, and its only interest is the generation of cutting-edge knowledge to inform the public while contributing to the formulation of rational public policies. While small and middle size food and beverage manufacturers operate within local markets, there are large food manufacturers with the capacity to explore the regional and international markets (KAM, 2018). Collectively, the volume of exports from the Food and Beverage sub-sector in Kenya grew from US$ 253 million in 2009 to US$ 444 million in 2014, and to US$ 589 in 2019. This represents a compound annual growth rate of 11%. The United States and the European Union remain two of Kenya's largest export markets for processed food and beverage products. This trend of growth can be linked to Kenya's sufficient logistics and connectivity (three ports, improved road infrastructure, four international airports, and the 472 km long standard gauge railway line (SME COMPETITIVENESS OUTLOOK, 2016). Kenya also has a sound manpower scenario with relatively affordable wage rate, reliable power scenario (largest producer of geothermal energy in Africa), and favourable legal and regulatory framework. Current opportunities available in the sub-sector growth in Kenya include grains milling and marketing (maize and wheat), sugar, dairy, fruits (mangoes, pineapples and oranges), poultry, pigs and oil crops (sunflower, sesame, canola and groundnuts) (International Trade Centre, 2015). The industry is set to register a more robust growth trends.

5. The achievements of National Industrial Policy (NIP, 2007) in building a self-sustaining export-oriented industrial sector? Which institutions were created to support the industrial sector development?

Answer: NIP facilitated manufacturing and expand industrialization. Such interventions include strengthening the capacity and local content of domestically manufactured products, to enhance, generate and utilize research and development to foster industrialization and manufacturing, to develop niche products to occupy existing and new markets, and to raise the share of Kenyan products in the region from 7% to 15% (Otieno & Washington, 2017). Through NIP the government renewed interests in the manufacturing sector through the Big Four Agenda which seeks to expand the GDP contribution from the

manufacturing sector from 8.4% to 15% by the end of 2022. Today, the manufacturing sector is the fourth largest sector in the country, contributing 11% of the country's total GDP (KNBS, 2019). The private manufacturing sector created 7,700 new jobs registering 329,000, 24,300 and 3 million wage employments in private, public, and informal sectors respectively in 2019 (KNBS, 2020). The World Bank in 2015 reported that Kenya, among 9 other developing countries had attained a Gross National Income (GNI) of $1,290 per capita, becoming a lower middle income economy (The Business Daily, 2015).

6. How EAC and COMESA are contributing to boost Kenya's export performance?

Answer: The regional and international trade landscape in Africa is increasingly becoming structured in the aspects of supply and value chains. Even in the food and beverage sub-sector, there exist constant efforts to address and implement a set of strategies to overcome specific barriers to trade integration and to facilitate the participation of small and middle size food manufacturers into region wide supply chain. Regionally, Kenya is a member of the East African Community (EAC), Intergovernmental Authority for Development (IGAD), Common Market for Eastern and Southern Africa (COMESA), and New Partnership for Africa's Development (NEPAD). The EAC and COMESA are increasingly attracting the participation of SMEs in food and beverage processing supply and value chain in attempt to facilitate the robustness, competitiveness, and sustainable development of the food manufacturing sub-sector.

The East African Community (EAC) not only views food and beverage processing sub-sector as leeway to a robust industrialization progress, but also emphasizes on the relevance of the subsector in enhancing food security, reducing poverty levels, and its contribution to the broad economic development of member countries. Currently, only 28% of the region's total agricultural produce is processed into value-improved products. Factors such as lack of companies with adequate capacity, inferior infrastructural framework, and inadequate supply of agricultural produce needed as raw materials have been linked with the stagnation of the sub-sector. In 2012, however, the region established the EAC Industrialization Policy 2012- 2032 which offers a roadmap leading member countries towards an industrialized economy. The overarching objective of the policy is "Transforming the manufacturing sector with high value addition and product diversification, using competitive and comparative advantages of the region." The principle underlying the policy also apply to the food and beverage sub-sector and is set to foster regional value chains and to push the regions sub-sector to a global scale.

The COMESA Business Council, on the other hand, has in the recent past reported a robust annual real GDP growth of approximately 6.5% over the last five years. However, the council reported that this GDP has not reflected in a uniform economic transformation the entire trade region as there still exist disparities among member countries. In its Inclusive and Sustainable Industrialization Report 2017, COMESA Business Council claimed that despite an improved nature of regional integration, lack of industrial diversification in the region has led to member countries trading more than 90% of its products with other parts of the world. To address this problem, the COMESA Industrial Strategy was established in 2015 to provide a clear pathway by which member countries can achieve progressive industrialization through value addition. Over the years, the 11th Joint COMESA Technical Committee on Infrastructure (Transport, ICT and Energy) and the 3rd COMESA Technical Committee on Industry have occasionally met to chat a way forward achieving a collective framework for the expansion of manufacturing and processing sub-sectors. Also, the 1st and 2nd COMESA Agro-Industry Dialogues have constantly attempted to address the challenges extant to Agro-industrial supply chain within the region in an effort to foster development in the food and beverage manufacturing.

7. Industrial activity is concentrated around the three largest urban centres: Nairobi, Mombasa and Kisumu. What about sustainability in food processing industries located in these centres? Are there food processing clusters in Kenya? Being located at a cluster makes a difference regarding enterprises environmental performance improvement and or adoption of environmental management tools?

Answer: Clustering of food and beverage MSMEs exists in all the major cities in Kenya. Clustering has made the firms in food and beverage industry to acquire certification that would otherwise be expensive. Certification systems provide buyers with assurances about food safety, paving the way for producers to access new markets. In Clustering have improved the competitive advantage of firms, reduced production costs and eased the government efforts towards infrastructural development. The Food and Beverage manufacturing industries in Kenya is clustered as follows: dairy and meat processing firms, grain milling firms, edible fats and oils processing firms, beverages, fruits and vegetable processing firms, fish processing firms, wines and beer and spirits firms (Okello, 2010). Clustering has enhanced collaboration among firms to improve in their production. In these groups they can ensure sustainable supply to the market, they can also access loans and buy and share equipment that could otherwise be expensive. Access for training has also

been made easy for external partners and government supply of electricity, water and roads. For instance, the firms can easily collaborate on waste disposal and recycling strategies through clusters. Additionally, some clusters have been reported to have taken collective action to modernize equipment (such as testing tools) in order to comply with set standards in the global market. For instance, the fish-processing cluster in Kisumu, collaborated and established testing tools to ensure compliance with the European Union market standards for their exports of Nile perch from Lake Victoria. Clusters also have shared warehouses (cold-rooms) for storage of perishable goods and raw materials. In some cases, the transport of products and raw materials are also shared. Sharing of equipment have help them share costs resulting to reduced production costs and also reduce carbon footprints.

8. Export Processing Act, 1996 led to the creation of the Export Processing Zones Authority. Special Economic Zones Act (2015): Special Economic Zones (SEZ), Free Trade Zones (FTZ), Export Processing Zones (EPZ): explain how these zones operate, how are they succeeding in attracting investments, in improving exports, generating employment? Is there a specific zone for the food sector?

Answer: The Kenya's SEZ Act came into force in 2015 but existing documented work reports that its performance has been derailed by inadequate political will and commitment making it yet to be fully operationalized in terms of establishing the requisite institutions and accompanying regulations (Khisa et al., 2018). Localization of the firms have allowed them to enjoy a variety at lower costs. The reduced transportation and distribution costs has given the suppliers a competitive edge to locate within the same region as their customers. The establishment and operation of a variety of enterprises within the same geographical area has creates an enabling environment for industrial ecology as it becomes easier to match exchanges of materials and energy attracting more investors in the region. While there is limited documented work on the performance of the EPZs for food and beverage industries in Kenya, the existing literature indicates that the gazettement of these zones led to an increasing trend in employment opportunities and export sales with a decline in domestic sales (Khisa et al., 2018). It is for this reason that the government is striving to promote EPZ-Local Economy interaction through the Ministry of Industry, Trade, and Cooperatives by granted duty exemption to the companies operating within the zones to sell 20% of their production in the domestic Kenyan market under the "Buy-Kenya-Build-Kenya" initiative. The EPZs has also created an environment for green jobs involving collection of the by-

products for reuse and upcycling in the areas. There are specific food zones in all the major cities on Nairobi Mombasa and Kisumu.

9. Private sector industry institutions and associations: Kenya National Cleaner Production Centre, Kenya Association of Manufacturers (KAM), Kenyan Private Sector Alliance (KEPSA). How are they contributing to change the enterprises mind-set in pursuing a sustainable manufacturing? Projects implemented in the food & beverage sector?

Answer: The private sector and the association have been contributing to the perception of the enterprises through conducting capacity building initiatives like trainings, workshops, exhibitions, and offering material and financial support to SMEs. KAM has signed MoUs with several external partners including EU, Word Bank and local banks on to enable the firms acquire loans for running green enterprises. Recently KAM partnered with African Guarantee Fund for Small and Medium-sized Enterprises (AGF) to promote the growth and development of the manufacturing Small and Medium-sized Enterprises (SMEs) in Kenya. The initiative that aimed at identifying and analyzing funding gaps, institutional challenges and key impediments in the manufacturing sector and collaborate on implementing solutions to the same. This will promote blended financing, including green financing, to trigger appetite and demystify concerns for private sector players to join. Another partnership has been made with the Commonwealth Secretariat, Ministry of Industry, Trade, and Cooperatives organized the 2nd Intra-Commonwealth SME Trade Summit which is aimed at providing a Business to Business (B2B) platform for local SMEs to meet and network with exporters and importers drawn from the Commonwealth Countries. KAM has also signed a MoU with IDB Capital Kenya to provide green financing & information to Small and Medium Enterprises in the country. This will ensure that SMEs are trained on how to develop business plans that meet the requirements of financial institutions. The association in has also been linking learning institutions (collages, universities, TVETS) with enterprises and finding jobs of the qualified students through Manufacturing Academy. Furthermore, the association has partnered with E-Commerce players to promote market linkages for the manufacturing SMEs to local and international markets through e-commerce.

10. Kenya is working in building a strong Public-Private Partnerships (PPP). Explain a bit about it, and its contribution to enhance manufacturing, competitiveness and exports expansion in the regional and global markets.

Answer: Kenya has been working with several private institutions to boost its economic performance. This has been evident in areas of infrastructural development and green financing initiatives. Kenya through KAM has partnered with Nordic Countries and launched a Green Hub to address climate change challenges affecting the country that has boosted its efforts to mitigate energy efficiency by industry. The association has been able to abate more than 180,000 tonnes of carbon dioxide annually through the implementation of both energy efficiency and renewable energy projects through the Centre for Energy Efficiency and Conservation (KAM, 2018). The government has partnered with the World Bank and GEF in several infrastructural development and capacity building projects in the country ranging from roads, electrification like the World Bank's Scaling Solar project and the current solid waste management project. Some other private partners that have been active in the country include Safaricom that have assisted by providing financial series to SMEs through Mpesa, cheap energy and green finances through M-kopa and communication. USAID, EU and China have also partnered with the government through several capacity building and infrastructural development initiatives. The building of the SGR has been done entirely by the Chinese partners as well as the Thika Highway. All these development projects have enhanced communication, access to the market and raw materials as well as storage facilities for enterprises in food and beverage industries improving their competitiveness in the regional and global markets. Another initiative is by UNEP and the EU that are currently supporting industry, emerging green entrepreneurs, and policymakers through policy development, that supports the setting up of RECP and IS demonstration projects and other networking activities through the Switch Africa Green project being implemented by the Kenya National Cleaner Production Centre (KNCPC). The latest PPP have been evident in the social protection initiatives that the government through the Cabinet Secretary for Labour and Social Protection is working with the World Food Program (WFP) Representative and local banks financial agents and mobile banking at the grass roots through its Inua Jamii Programm to provide financial support to vulnerable members of the society.

11. "Kenya developed a range of environmental policies and laws, and created the institutional frameworks needed to implement those policies and laws. However, Kenya's environmental ambitions are frustrated by constraints on its capacity to execute, monitor, and enforce existing environmental regulations". Can you give evidence on that?

Answer: A review conducted with Kenyan experts on the current environmental legislation revealed that the Kenya's current system of environmental regulation is lacking in a number of key areas. The implementation process is thus compromised by inadequate funding, corruption, a lack of engagement with important community stakeholders, gaps or duplications of regulations, and a misunderstanding by society at-large of the benefits of a sustainable project. A clean and healthy environment has not been secured for all Kenyans as expected according to Kenya's Constitution. The major obstacles to this realization has been in the implementation and enforcement of existing laws and a lack of cooperation between ministries within the Government of Kenya (GoK). NEMA's review process has been handicapped by a lack of adequate funding thus unable to carry out its auditing and monitoring mandate with the government provided funds (Opondo 2012). It is for this reason that the Environmental monitoring and evaluation in Kenya is derailed with corruption. Lack of the necessary resources is the reason why firms are highly polluting the environment despite having NEMA permits and environmental certificates. For instance, Mumias sugar have been emitting its waste water in River Nzoia for years without NEMA's intervention. This is also similar with industries in Nairobi's industrial area that have rendered Nairobi River inhabitable due to pollution. However, despite the public uproar, the firms are always temporarily closed and opened without improvement of the waste management due to corruption. This is also similar to many food and beverage firms around the country

12. Does Kenya adopt any market-based solutions (pollution charges, tradable permits)?

Answer: Although gradual, Kenya has made notable progress in adopting and enforcing market-based solutions to pollution. One of the most outstanding market-based approach enforced waste banning of non-reusable polythene bags in August 2017 both by consumers and manufacturers for packaging purposes. Also, the recent launch of the Green Bond Programme – Kenya serves as an ideal market-based intervention to pollution. Although the programme does not directly involve food and beverage manufacturers, it aims at promoting innovation in the financial sector by initiating a green-bond market targeting financial institutions under the Kenya Bankers Association (KBA), Nairobi Securities Exchange,

Climate Bonds Initiative (CBI), Financial Sector Deepening (FSD) Africa and FMO - Dutch Development Bank.

Combined with increased funding of renewable energy and offsetting pollution through afforestation, the aforementioned interventions to pollution are commendable as they promote sustainability and mitigating climate change that emerges from pollution. Besides, the GOK should consider enacting control approaches that encourage manufacturers to adopt modern transport systems with less carbon emission by assigning relevant tax/offering tax exemptions targeting modern transportation means. In the long-run, it is hoped that the national efforts of pollution control will benefit immensely from market-based interventions.

13. Nairobi Securities Exchange: listed companies x corporate social responsibility x sustainability. Is there any commitment by listed companies to promote / to improve environmental and social performance? To disclosure environmental and social performance?

Answer: For a firm to be listed in the NSE, certain conditions have to be met. The listing requires the firm to meet certain ethical issues through provision of a certificate of good conduct, tax compliance certificates and management CVs. All noncompliant firs are blacklisted by the NSE. Ethics and integrity is currently becoming a major considerations for investors interested in Kenya. NSE thus provides information needed to analyses the sustainability of the companies in which they are interested including governance structure, audit records and CEO and management track records. A strong ethical behavior is always viewed as part of having a long-term sustainably profitable, well-managed business. Listing in NSE thus increases the competitive advantage of companies by giving investors' confidence in the company's performance.

14. Green Bonds markets have been growing in Kenya since 2016, being considered a bridge to achieve the Sustainable Development Goals. What are the results so far? What projects are being financed?

Answer: Green bonds were established to allow domestic banks and corporates to better deliver green investments in Kenya, renewable energy, low-carbon transport, water infrastructure and sustainable agriculture in order to steer the country towards Vision 2030. The areas that were targeted for climate finance in Kenya include are energy, agriculture,

transport, infrastructure, manufacturing, building and urban planning and water and waste management. The initiative involved different stakeholders including the Kenya Bankers Association and Nairobi Securities Exchange endorsed by the Central Bank of Kenya (CBK) and Capital Markets Authority.

So far the initiative has face-to-face training of bank credit risk managers, and the identification and certification of 35 local consultants on environmental and social risk management as defined by the IFC Performance Standards. It has also developed and adopted banking principles about the Sustainable Finance Initiative through rigorous stakeholder engagement process, including the banks and the regulator. KBA has also partnered with DEG and FMO to develop a course for all bank employees and also designed an e-learning platform which provided the platform for the coursework training more than 20,000 bank employees with certification of IFC, UNEP Finance Initiative, DEG and FMO, and reviewed by Cambridge University. KBA also introduced the Catalyst Awards to recognize and promote banks and other financial sector players that demonstrate the SFI Guiding Principles that received 33 entries with the winners being awarded 2016. Additionally, the SFI convenes an annual CEO Roundtable on Sustainable Finance which focused on aligning the financial sector with the UN Sustainable Development Goals in 2016 (Kenya Bankers Association, 2020).

15. Industrialization in Kenya is considered critical (UNIDO, CTCN, 2020). The SSFA project aims to promote the adoption of environmentally sound technologies (ESTs) for industrial SMEs in Kenya and Tanzania. Which are the results so far on the country industrial development, on promoting sustainability?

Answer: SSFA has steered Kenya towards sustainable manufacturing and promoted green initiatives in the two countries. It has led to establishment of environmental policies. The green financing initiatives are a result of SSFA. Firms have thus reviewed their production process to move towards sustainable manufacturing (Khisa et al., 2018). The ongoing circular economy initiatives like recycling of plastics with collection grassroots levels is as a result of the project. UNEP and the EU have been supporting industry, emerging green entrepreneurs, and policymakers through policy development, that supports the setting up of RECP and IS demonstration projects and other networking activities through the Switch Africa Green project being implemented by the Kenya National Cleaner Production Centre (KNCPC). It led to the formation of Green Economy Strategy and Implementation Plan (GESIP). The government has devolved the solid waste management system in the county

level to ensure effective solid waste recovery and recycling operations and currently facilitating infrastructure (in terms of collection, transport, and disposal systems). There has been a set department dealing with pollutants like Lead and POPs, conducting research and documentation. Adoption of Ocean Plastic Charter, National Stakeholder Forum on Industrial Effluent Management.

16. What are the bilateral trade agreements that Kenya has signed?

Answer: Bilateral Trade Agreements: -Kenya has signed bilateral trade agreements with several countries including US, Germany, Argentina, Bangladesh, Bulgaria, China, Comoros, Congo (DRC), Djibouti, Egypt, Hungary, India, Iraq, Lesotho, Liberia, Netherlands, Nigeria, Pakistan, Poland, Romania, Russia, Rwanda, Somalia, South Korea, Eswatini, Tanzania, Thailand, Zambia, and Zimbabwe (https://www.trade.gov/country-commercial-guides/kenya-trade-agreements). The trade agreements like Economic Partnership Agreements (EPAs), Africa Growth and Opportunity Act (AGOA) and Kenya – UK Free Trade Area (FTA) have helped Kenya secure markets for her MSMEs under preferential terms. Some of the trade agreements Kenya are listed below:

Trade Agreements Relevant to Food and Beverages MSMEs:

Multilateral Trade System (MTS): The only international organization that deals with the global rules of trade between nations that has been a member since its inception in 1995 is the World Trade Organization (WTO). Kenya has been an active participant with the 10th WTO Ministerial Conference held in Kenya leading to adoption of the "Nairobi Package" involving issues on agriculture, cotton, and issues related to least-developed countries (LDCs).

African Continental Free Trade Area (AfCFTA): An economic integration of the continent involving about 50 countries signed to form a free trade area spanning Africa with Kenya ranked the third among the members to gain most from the continental free-trade zone according to the World Bank.

U.S. – EAC Trade and Investment Framework Agreement (TIFA): This was an agreement signed by US and with the East African Community (EAC) in 2008, and with the Common Market for Eastern and Southern Africa (COMESA) in 2001 where Kenya is a member.

Regional Agreements: These are agreements signed with other countries in the region to allow member countries enjoy preferential tariff rates on exports and imports. Kenya is a member of the East African Community (EAC), a trade agreement signed together with Burundi, Rwanda, South Sudan and Tanzania. It is also a member of the Common Market for Eastern and Southern Africa (COMESA).

ACP/Cotonou Partnership Agreement: This was signed between Kenya and EU and provides for the country's exports entering the European Union are entitled to duty reductions and freedom from all quota restrictions. Trade preferences included duty-free entry of all industrial products as well as a wide range of agricultural products including beef, fish, dairy products, cereals, fresh and processed fruits, and vegetables. This agreement thus provides a good market opportunity to MSMEs under Food and Beverage manufacturing sector.

African Growth and Opportunity Act (AGOA): Kenya qualifies for duty free access until 2025 to the U.S. market under the African Growth and Opportunity Act. Some of Kenya's major products that qualify for export under AGOA include textiles, apparels, and handicrafts.

Generalized System of Preferences (GSP): Under the Generalized System of Preferences, a wide range of Kenya's manufactured products are entitled to preferential duty treatment in the Australia, Austria, Canada, Finland, Japan, New Zealand, Norway, Sweden, Switzerland, other European countries and the United States.

U.S - Kenya Free Trade Agreement: Announced in 2020, the United States and Kenya agreed to enter into FTA negotiations to seek a high standard agreement that will also complement regional integration efforts within the EAC and AfCFTA. In addition to the launch of trade negotiations, the United States and Kenya agreed on a Strategic Cooperation Framework to provide technical assistance and trade capacity building in Kenya with the aim of maximizing Kenya's utilization of the AGOA trade benefits for the remaining years of the preference program, which is scheduled to expire in 2025. The Framework will also support the development and competitiveness of key agricultural value chains in Kenya (www.ustr.gov).

U.S. - Kenya Commercial Memorandum of Understanding (MoU): A bilateral agreement signed in 2018 between the two countries to work together to intensify commercial coopetition. The MoU was signed to identify and prioritize trade and investment opportunities in strategic sectors including energy, health, digital economy, infrastructure, manufacturing, and agriculture.

Kenya –Germany trade agreement: Germany imports a wide range of products are mainly primary agricultural products (coffee, cut-flowers, fish, tea, spices, fresh fruits and vegetables) without or with less value addition constitution of constitute about 8% of Kenya's total exports. The two countries signed an agreement to avoid double taxation between them in 1977 which is still in force. Another agreement was signed in the year 1996, which came to force in the year 2000 a Treaty on the Encouragement and Reciprocal Protection of Investments. This treaty for equal treatment of investors in each of the two countries and was expected to stimulate private business initiatives by creating favorable conditions for investments undertaken by nationals and companies of either state in the territory of the other.

Apart from the above, the government is currently negotiating with several additional countries to expand its markets. These includes Belarus, Czech Republic, Ethiopia, Eritrea, Iran, Kazakhstan, Mauritius, Mozambique, and South Africa.

Definition of MSME in Kenya:

The definition of the regulatory and institutional framework for the Kenya's SMEs has been based on the number of employees and the company's annual turnover (MSMEs Act, 2012). The micro enterprises have been defined as enterprises employing less than 10 workers with annual turnovers of less than KES 500,000 and capital formation of less than KES 5 million for services or less than KES 10 million for enterprises doing manufacturing. Small enterprises on the other hand have been defined as enterprises that employ between 10 and 50 workers with annual turnovers between KES 500,000 and KES 5 million and capital formation between KES 5 million and KES 20 million for services or between KES 5 million and KES 50 million for enterprises doing manufacturing (United Nations, 2019). Medium ones employing 51 to 100 workers (The Kenya Government Baseline Survey, 1999). Some definitions have also grouped and defined small and medium enterprises in Kenya's manufacturing sector are defined as enterprises with fulltime employees not exceeding 100 or annual sales turnover not exceeding Ksh 150 million (Mutheke, 2016).

General Questions

1. Industrial Symbiosis (IS) opportunities at cluster level?

Answer: Several opportunities have been established to exist at the cluster levels. These includes opportunities for infrastructural development by the government as the establishment of the firms in one location makes it easy to provide necessary amenities like roads, waste management infrastructure and energy supply. The clusters have also been shown to be potential areas for green jobs and innovations. Access to market and finances is another opportunity that has been shown to be available at the cluster lever for the firms. While concentrations of enterprises in one area ha seen link to local pollution and congestion, this can also be an opportunity. It provides for opportunities for joint innovative ventures to address the problem by leveraging joint actions among enterprises with the industrial waste produced within clusters used to create new opportunities for other businesses as has been in the scrap metal industry. Clusters enables the enterprises to penetrate the global market outside Africa. It also provides opportunity for pooling operations like training employees, accessing loans, formulation of joint actions and attracting financial support from external donors including bilateral and multilateral development agencies and nongovernmental organizations.

2. Eco-Industrial Parks (EIP) development? Transformation of operating industrial states in EIP?

Answer: The need to promote low-carbon, resource efficient and climate resilient development pathways is the underscore of Kenya's National Climate Change Response Strategy (NCCRS) of 2010, the National Climate Change Action Plan (NCCAP) of 2013, the Green Economy Strategy and Implementation Plan (GESIP) of 2015. The government thus created Industrial Parks (IPs)/ Special Economic Zones (SEZs) to create a created an enabling environment for green growth within its economic sectors as it strives towards Vision 2030. This is due to the anticipation that the country's envisioned level of industrialization under Vision 2030 will put high pressure on the country's limited resources thus the need to embrace a circular economic development model. This will help divert wastes and by-products from the landfill hence relieving pressure on the use of country's virgin raw materials. It is due to this that the government has prioritized a shift from the traditional linear development model of material consumption to the adoption of a circular

economy driven by RECP, the 3Rs and IS. This have driven the transformed of the country's existing industrial parks / special economic zones into environmentally friendly eco-industrial parks (EIPs) and incorporating sustainability elements in the design of new ones from the very beginning.

3. Industrial symbiosis opportunities at Eco Industrial Parks? Pilot EIP and/or industrial symbiosis program/ project being developed?

Answer: Few existing studies have proved that the culture of waste and by- product exchange is spontaneously evolving among the zone companies is emerging in Kenyan SEZs despite the challenges in advancing industrial symbiosis signifying the fact that industrial symbiosis makes good business and environmental sense (Khisa et al., 2018). The study revealed that the conversion rate of the raw materials into desired final product was up to 97% with only 3% being classified as a by-product or a non- product output (NPO) under the SI initiatives as was observed by the clothing sub-sector. This meant that 97% of the raw material garment inputs were converted into the desired final product. Non-utilization of the NPO in another production process for energy cascading and manufacture of sofa sets and cleaning mobs could have demonstrated wasteful use of the company's limited resources with associated environmental and social consequences. However, the textile waste offcuts are used both as boiler fuel and as feedstock for the manufacture of sofa sets and cleaning mobs. A similar observation was made in the processing of oil and animal's feeds in the EPZs, the waste products from the oil industries used as raw materials by animal feed processing firms.

4. Circular economy promotion at clusters, economic zones and/or at eco industrial parks?

Answer: Clustering, creation of zones and eco-industrial parks have created potential sites to help the country achieve a circular economy. Geographical zonation and clustering provides an easy accessibility of the firms and provision of infrastructure. Clustering makes business within the economic zone ensures proper registration of all zone enterprises, easy to regulating the use of zone facilities. This promotes efficient use of resources, energy and water and acting as an arbiter in business disputes associated with disagreements resulting from waste and by-product exchange within industrial symbiosis networks. For example, increasing the fee for waste disposal will force zone enterprises to minimize waste generation at source and also look for innovative ways of diverting their wastes from the

landfill. Being concentrated in one place, waste management can be made easy by establishing a central collection point for wastes for easy access by other firms that use them in their production process. Clustering the firms also make it easy for the firms to have access to certification and easy to monitor their environmental performance and increase their competitiveness in the market. This included facilitation of licensing, permitting, and regulatory services within the SEZs, particularly relating to land use, business licensing, environmental permitting, building permitting, labor regulations (including foreign work permits), and inspections. The Kenyan Government through its economic zone authority through SEZ Regulator has been responsible for designating SEZs, facilitating government services, and monitoring compliance. The government have as well been able to offer joint trainings easily to the business owners and other necessary resources like transport mechanisms, storage facilities like cold rooms for storage of perishable products reducing the energy usage and carbon foot prints.

5. Consolidation and establishment of special economic zones, and development of industrial clusters?

Answer: While the consolidation and establishment of special economic zones have been entirely done by the government, the development of clusters have been facilitated mainly by the enterprises themselves and private sector. The government through Ministry of Industry, Trade and Cooperatives (MoITC) is mandated with the promotion of SEZ through conduction of strategic planning. This includes selection of potential sites for SEZ location and execution of feasibility studies. Currently, the devolved county governments in the country is expected to establish land banks fitted with common use infrastructure for industrialization, which will be used to build economic zones in future (Khisa et al., 2018). The government then establishes a Zone Regulating Authority to monitor the zone's compliance with the SEZ Act of 2015, including the accompanying draft SEZ policy, performance standards and the adequacy of the zone's infrastructure for waste recovery, reuse and recycling (World Bank, 2014).

Some clusters have been made at regional level based on production of common products like milk, tea, coffee, sugar, maize producers etc. These are majorly formed by individual enterprises in the same area to facilitate their market and financial access. Some clusters have also been formed based on gender. Studies have showed that accessibility to customers is the leading reason enterprises decide to locate within industrial clusters. The

clusters enhances their bargaining power in the establishment of government policies that affect them and resources pooling.

6. Political instability and insecurity: is there a predictable and stable policy environment for industrial development?

Answer: The political instability in the country which causes increase in production and distribution costs. For instance, the Post-election violence in 2008 and in the consecutive elections have caused massive losses to SMEs. The political environment still remains unpredictable leading to high political risks, this hinders long term investments and may also affect investment to sustainable manufacturing. The violence affect transportation of raw materials and goods as well as the production process.

Additionally, the tax environment is very unpredictable with regular policy shocks, for instance those tax measures introduced under the Tax Laws Amendment Act 2020 and Finance Act 2020 for example 1% minimum tax. Tax policies in Kenya have been reported as very unpredictable creating business uncertainty which is inimical to a conducive business environment. One example such uncertainty is the electricity rebate program which was gazetted on July 2019 to allow a 30% cost of electricity while computing final tax. This was however, removed in March 2020 before full implementation through the Tax Laws Amendment Act 2020. The tax Amendment Act that also reduced the investment allowance deductions for industrial buildings and machinery from 100% to 50% in the first year and 25% onwards ignoring the fact that ongoing investments and capital projects had been made on the basis of the previous provisions. This sudden change in policy is likely to stall investment projects and have a negative impact on cash flow.

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