Open Access Library Journal
2023, Volume 10, e10751
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Circular Economy in Africa: Towards a Model for Affordability in Housing Including the Craftsmanship of Components, Involving Reusing, and Re-Purposing

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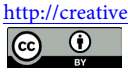
How to cite this paper: Jonathan, C. (2023) Circular Economy in Africa: Towards a Model for Affordability in Housing Including the Craftsmanship of Components, Involving Reusing, and Re-Purposing. *Open Access Library Journal*, **10**: e10751.
https://doi.org/10.4236/oalib.1110751

Received: September 16, 2023
Accepted: October 28, 2023
Published: October 31, 2023



Abstract

This paper presents an ethical view of the topic of Circular Economy in Africa, focusing on Kenya, building industry. It describes the research project that is towards the affordability in Housing, including the craftsmanship of components involving Reusing and Re-purposing, then describes the aspects of ethics associated with the research project including: Culture and Heritage, Risk and Harm, Minimal Risk, Conflict of Interest, Responsibility, Consent, Design Ethics, and Technology Assessment. This is aimed at providing an understanding of the modalities and moralities necessary for the successful implementation of the Circular Economy in an African building industry context. It is, however, given that ethics deals with values, with good and bad, with the right and wrong or moral behaviour of human relationships. It is also concerned with what is morally good and bad and morally right and wrong. The term is also applied to any system or moral values or principles theory. Ethics in this case strives for honesty in the implementation of circularity in the Kenyan building industry. The subsequent chapters of this paper present literature reviews, opinions, assessments, reports, writing, and evaluation on this topic.

Subject Areas

Architecture, Building Construction, Ethics in Research

Keywords

Ethics, Consequentialism, Deontology, Circular Economy, Building Sector, Affordability in Housing

1. Introduction

The construction sector in Africa is on the fast rise with the demand for housing due to population growth. The continent of Africa's population is expected to reach 2.4 billion by 2050 [1]. Although South Africa seems to be an exception to this increase in construction, East, West, and North African countries continue to experience both urbanization and urban sprawl. This will imply excessive extraction of raw material that would be required for construction, which would in turn continue to increase the emission of carbon and mercury leading to deforestation or erosion due to illegal mining of sands. Circular Economy presents an alternative option of reducing, reusing, recycling, and rebuying materials [1]. The circular economy can also present a solution to the construction waste that ends up disposed-off, leading to further flooding and environmental degradation, particularly in countries like Kenya, Rwanda, Nigeria, and Egypt.

Some strategies highlighted by the Ellen MacArthur Foundation that will promote circularity in the African building industry include: 1) Sourcing for local and reclaimed building materials and components: This approach is getting attention, but it's still largely associated with informal settlements or construction, where corrugated roof sheets are used for shelters or furniture covers. These lack durability are prone to fire, and are unsuitable for proper usage, therefore, work needs to be done to elevate this practice to promote the use of alternative building materials. Also, it includes re-purposing buildings, reusing materials and designing for deconstruction[1] [2]. 2) Incorporating bioclimatic and passive design and resource capture: introducing green roofs in buildings and introducing vegetation are features that can be achieved from the design stage[2] [2]. 3) Designing for modularity and flexibility: The concept of prefabricated components is built off-site and can perhaps reduce construction waste. This could be ideal for furniture production from recovered materials. In addition, digital technologies could make more efficient use of resources.

In Kenya, the population growth from 38.6 million in 2009 to 44.2 million in 2015 has contributed to the demand for housing. The available housing doesn't meet the affordability range of the majority. With a dependence on building components importation due to a shortage of materials and products, likewise, the construction wastes emerging from Kenya's construction are not accounted for. The Circular Economy in Africa focusing on the Kenyan Building Sector could support affordable housing initiatives by boosting strategies and practices for reusing components. In turn, it could provide a new perspective on affordability in housing and another source of material supply to local craftsmen (Jua Kali).

However, there is a need to critically examine the ethical aspect of this practice, and the rights and wrongs that could be associated with circularity practice

[1]EI Mandara eco-resort in Egypt was renovated using local materials.

[2]Strathmore University in Kenya produced 0.6 MW of electricity, with cost savings of 51% using photovoltaic panels.

in Kenyan construction sector with a focus on achieving affordability in Housing. The subsequent topics in this paper analyse literature, reviews, and comments on the aspects of ethical philosophies, the cultural view on waste collection and conservation of nature, the risk and harms of circular economy initiatives, the conflict of interest in a circular economy business, and the responsibility of stakeholders to the advancement of circularity, are ethical prospect to be considered when designing for circularity and technological attributes. This would also be necessary for decision-making, especially for stakeholders and practitioners.

2. Overview of Research Project

2.1. Circular Economy in Africa: Towards a Model for Affordable Housing Including the Craftsmanship of Components, Involving Reusing, and Re-Purposing.

The building or construction industry has been a major factor in the future of urban cities. Globally cities contribute about 50% of global greenhouse emissions, consuming nearly 75% of global energy sources [3]. The impact of this industry on the global consumption of raw materials is alarming with over 3 billion tonnes of raw materials used in steel production. By 2050 unprecedented population growth especially in emerging economies of Africa, Asia, and Latin America will continue to impose pressure on the material consumption of its urban cities [4]. Given the expected increase in demand for materials in the mentioned emerging economies, perhaps circularity could be applied to keep low carbon emissions. Circulating focused on material efficiency on the strategies of recirculating a larger share of materials reducing waste production and reducing raw material extraction thereby extending the life cycle of products. Profitable to the building sector in reusing building materials, reusing and reducing construction waste, saving cost, and reducing carbon emissions.

Africa has always been in motion, from emerging new cities after post-war years, to the development of new cities in the post-colonial years of the 20th century, *i.e.* Abuja (Nigeria), and Yamoussoukro (Ivory Coast) [5]. Africa is the second most populous continent in the world, the urban population is expected to nearly triple by 2050 to 1.34 billion [2] Cities continue to struggle to keep up with this growth, resulting in informal settlements with no or limited access to electricity, water, sanitation, and waste management. About 190 million people in Sub-Saharan Africa lived in informal settlements. Moreover, the growing middle-class population appears underserviced with unplanned settlements bordering elite gated communities, growing in most African cities. The resources needed to service construction services move linearly and most infrastructure is not extensive. About 60% to 80% of the housing demand needed for the growing population across the continent is not yet laid [2]. With the vast challenges African countries face, including poverty, unemployment, rapid population growth, urbanization, and the failure to meet the housing demand of the

exponential growth of cities, employing the principles of the circular economy could be a valuable solution, reducing the cost of acquiring construction materials and building components, reducing waste and pollution, and creating employment opportunities by improving service delivery of materials for re-using and re-purposing.

The Circular Economy in Africa research project focusing on Kenyan Building Industry aims to research a revamping phenomenon of the so-called survival economy that is associated with the reusing of components. Through the research for alternative provisions to affordability in housing and researching for alternative provision of other sources of material supply to local craftsmen, particularly furniture makers *(*Jua Kali*),* which could open new business opportunities and provide models for affordability.

The Housing Affordability in this regard focuses on the aspect of lowering the Construction cost, which is relatable to the use of materials and components.

Reusing and re-purposing materials and components involving the Local craftsmen presents a more attainable and environmentally friendly approach. Since the approach does not require complex industrial processes like remanufacturing or recycling (**Figure 1**).

2.2. Ethical Aspect of Circular Economy for Housing Affordability and Components Reusing and Re-Purposing in Kenya (East Africa)

There is an urgent need for African countries to adopt Circular Economy approaches, move away from the linear economy, and take full advantage of the economic, environmental, and social benefits of a Circular Economy. But there is also a disadvantage side of waste recycling or reusing that is growing momentum in African countries, one of which is the norm of Sub-Saharan African countries as a dumping ground for the global market [7]. Also, the concept of recycling, and reusing components, and furniture is not a household norm as revealed [8] South African Households lack awareness of the Circular Economy, which has always limited the drive and acceptance for reused components. In

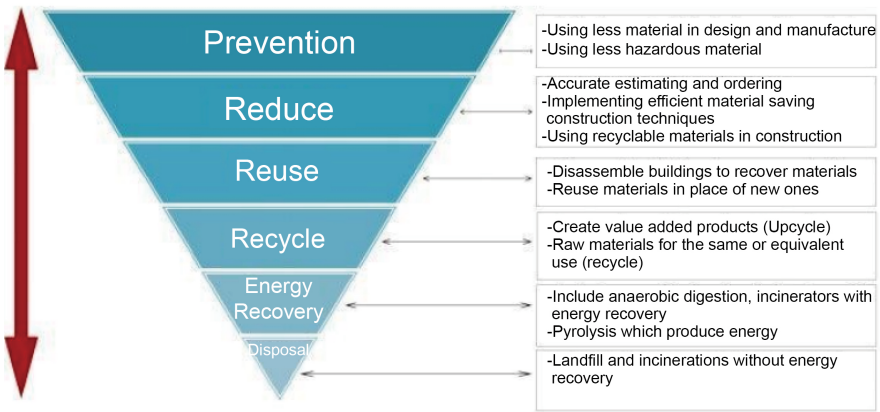


Figure 1. Waste management hierarchy. Source: Tanui (2019) [6].

Nairobi city of Kenya, contractors attested to knowing the implications of construction waste on the environment [6] but the lack of policy framework in construction waste management has been a hindrance to possible Circular Economy initiative. Viewing through the lens of Ethical values and morals for a Circular Economy in the building industry sector and beyond could help us understand better how to improve the practice. More importantly the social values of what the people would want and how to make the people understand the importance of reusing and recycling components, more also make policymakers understand the need to avoid dumping wastes or accepting wastes from foreign countries which the host country cannot manage properly.

In this regard, the Ethical phenomenon of Consequential which is the principle of attaining the greatest good for the greatest number could be implied in the scenario where the circular economy approach has a greater benefit over the possible risk or harm. While the Principle of Deontology sees the need for value that can only be justified, this can be influential for policy making. This principle will guide further paragraphs on the aspect of ethics that could affect this topic of Circular economy in the Kenyan (African) Building Industry.

3. Ethical Aspects That Should Be Considered for Circular Economy Initiatives in the Building Industry in an African Context (Kenya)

3.1. Culture and Heritage towards Conservation of Nature, Urban Life, and Waste Collection

Kenya is a multilingual and multicultural country, with different Ethnic groups. The country has a population of over 35 million people [9]. The country has the major religions of Christianity, Traditionalist, and a growing Islam religion. The capital city of Nairobi, the city has evolved with a growing population of Asians and Europeans. Kenya parks are one the major tourist attraction from a global perspective, Kenya also has arable land that enables coffee and tea plantations. Kenya's Economy has over 80 percent employed in Agriculture, 7 percent employed in industry, and 13 percent in the service industry [9]. This is perhaps a Deontological justification for a policy to support industrial growth through circular economy approaches. Likewise, to protect the natural environment for the majority employed in the agricultural sector. Traditional art and crafts have been a cultural heritage for most ethnic groups, most of the objects used in traditional Kenyan homes are made by local artisans with locally sourced materials. Also, the traditional art for example the Massai bead works. These artisans also include blacksmiths. In today's Modern Kenya, these local artisans still make up the informal sector, which has become a major employer of labour [10]. This aspect of informal craftsmen also presents an opportunity for a Circular Economy Business model, as an evolution of the traditional Kenyan culture. The traditional houses across Kenya are always made with the available material which could be Stone, Wood Grass, or Mud like the herder's home of the Swahili people

[9]. It is, therefore, to respect this heritage even in the case of technological development, housing affordability, or circular economy initiatives for housing referring to available local materials. The example of Lamu Old Town Kenya, a Heritage site that is embedded in the influences of Indian, European, and Swahili Architecture, makes provision for waste collection as part of its conservation strategies [11]. This further reveals the importance of waste collection and how it can be properly managed for the conservation of heritage sites (**Figure 2**).

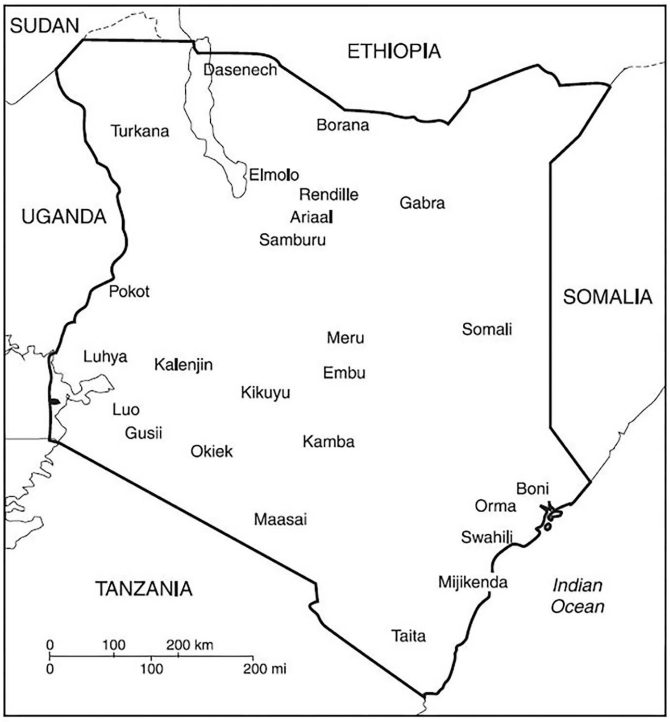


Figure 2. Location of major ethnic groups in today's Kenya. Source: Sobania (2003) [9].

3.2. Risks and Harm of Circular Economy Initiatives

The ethical aspect of consequentialism can override the risk and harm with the larger benefits; however, it is also important to highlight the risk and harm involved in these initiatives which should be followed by a consideration of the possible minimal risk. The risk and harm will be evaluated in three aspects: environmental, economic, and social. On the aspect of environmental risk, most of the circular economy activities in the Kenya construction sector are based on recycling this is largely from the recycling of plastic wastes into pavement and bricks. This is largely due to the 2017 policy ban on plastic bags [12]. It is reported that recycling activities from circular economy initiatives can increase carbon emissions in Kenya by 0.16% (percent) by 2030 [13]. This is not good for an economy that has over 70% employed in agriculture, with respect to the issue of climate change that is contributing to deforestation, in Kenya [14]. Also, flooding, and low agricultural outputs. Perhaps there is a need to rethink the

approaches of the Circular Economy to adopt with minimal risk to the environment, this could be reusing and re-purposing. This information about environmental risk could also be available to the public for awareness to encourage reusing and re-purposing and promote the practice of a Circular Economy.

Economically, the attribute of environmental harm does affect the economy as it lowers the annual agricultural outputs. The issue of deforestation has contributed to the Timber deficit in Kenya which has made locally manufactured furniture more expensive compared to imported furniture components. It is also suggested that a circular economy approach of repairing and reusing furniture could provide for cheaper furniture components. The same literature [15] suggested that used furniture be imported from Europe which could be repaired by local craftsmen and sold at cheaper prices (**Figure 3**). This initiative would also enable a business model involving local craftsmen in the circular economy. However, contrary to this another report, [16] and [7] advocate against the dumping of imported waste in Africa from the rest of the world. This has created further contamination of air quality due to the burning of E-waste (**Figure 4**). In

Figure 3. Furniture manufacturing of repaired furniture by the roadside of Nairobi. Source: Waweru (2017) [15].

Figure 4. Burning of excess imported E-waste at Agbogbloshie Accra, Ghana. Source: Minter (2016) [16].

addition to these, the European Green Party 5th Council Meeting adopted a resolution in Geneva on 15th October 2006, stating that "Europe must stop using Africa as a dumping ground for its hazardous waste". However, furniture components are not hazardous waste, but minimal risk must be established through policy making to avoid making the country dumping furniture components.

The aspect of social risks or harm could be associated with the norm that manufacturers need to make declarations on components that are refurbished or repaired, to let consumers know the quality of the repaired products. However, there is no policy to support this notion. An example is MYCOTILE in Kenya, the company had to produce an environment of recycled products for the integrity of their product, a policy that is not covered by existing manufacturing policies [17]. The public needs to also be aware of the performance of the ongoing waste recycling initiatives and projects. The legislative needs to begin implementation of laws and policies that support a circular economy this will enable more consideration of ethical values like in several European countries [18].

3.3. Minimal Risk to the Expected Risk and Harms of Circular Economy Initiatives

To achieve a consequential Ethical principle, it is paramount to set a minimal risk standard, towards the achievement of the greatest good. The issue of mass waste dumping of imported waste can be controlled through policies and proper policing. This will enable only the need waste components could be imported as indicated through proper market survey. To ensure the waste components are immediately repaired and refurbished and sold to the next consumer to continue the component life cycle. To determine the components needed by the market a network sharing can be introduced to gather information form possible buyers and possible suppliers. The construction waste needs not to be deposited into sand fills; this can be achieved by the Government's establishment of legislation to condemn the mass dumping of construction materials. Also promoting the activities of reusing more waste before considering the aspect of recycling, is because recycling also contributes to carbon emissions. The city of Nairobi has a growing increase in the number of construction activities, however, there is no proper management of all the construction waste generated [19]. Training and workshops should be a priority for contractors and developers to discover alternatives to manage construction waste. Moreover, designers and architects from the design stage need to be conscious of the prevention of waste generated during construction. By adopting flexibility in the design approach, design for disassembling, and adoption of Building Information Modelling (BIM) strategies before the commencement of construction activities [19]. This will further be discussed in the paragraph on design ethics. Further to reduce the environmental impacts of toxic plastic waste which is very much still a problem in the slums of Mombasa Kenya, the establishment of Government policies focusing on Circularity to target these slum areas with disposed of waste, to also fund/support companies to intend to venture into waste collection, reusing, re-purposing and

lastly recycling [20]. These initiatives can enable a minimal reduction of the environmental hazards associated with circular economy activities and practices.

3.4. Conflict of Interest in the Business of Circular Economy

The business of Circular Economy focuses on repairing already used components presents a challenge for the importers of foreign components in Kenya. Most of the construction materials in Kenya are imported from India, Japan, China, and South Africa. These products are available and readily available in large quantities, ranging from reinforcement steel bars to doors, and furniture components [21]. This is a big challenge to overcome because the business of the Circular Economy is not established compared to the market of importers. This conflict of interest is one of many that can affect the successful implementation of a circular economy business model. However, the issue of affordable housing due to the cost of construction materials remains a hurdle that Circular Economy could provide solutions to. The time constraints involved in acquiring construction waste, and recycling the waste to produce other materials is also a constraint that could discourage developers from adopting circular alternatives considering the existing conflict in the market between suppliers of new components and potential entrepreneurs of circularity. Most of the furniture components in Kenya are imported because it is cheaper compared to locally made furniture of the same quality. This is due to the timber deficit in Kenyan markets [10] and the lack of advanced technological developments in production. However, the practice of a circular economy could interfere with the interest of the existing importers of these furniture components. Meanwhile, reused furniture components and reusing of building materials and components could enable the achievement of Affordability in Circularity. Ethically this conflict of interest between the already existing market of importers of building materials, and furniture components and a potential business model based on a Circular Economy could be resolved by the preference of customers to determine their best approach. However, on the other side a consequential principle would advise for the greatest good, which involves protecting the environment, by using fewer natural materials which refers to adopting circularity, making these components more affordable locally by reusing and re-purposing of the discarded components since there is timber deficit already in Kenya. Innovative technological developments by using locally available materials instead of sourcing imported materials have also contributed to global carbon emissions through the extraction of virgin materials, production, and transportation. Furthermore, it will also contribute to the development of a local craftsmen network. This network will enable the creation of a new business model and enterprise, which is viable to create more employment opportunities. However, the existing market can improve by procuring sustainable certified products and products that can be recycled and reused this will also contribute to the advancement of green initiatives in the Kenya Building Industry. An initiative is already been promoted by

the Kenya Green Building Society (KGBS). This calls for responsibility by all stakeholders involved in the building industry including policymakers and Government agencies.

3.5. Responsibility of Stakeholders towards the Awareness of Circularity

The responsibility of all stakeholders involved will be important to the achievement of progress in the Circularity for the African context of Kenya. These Stakeholders include Policymakers, Government legislators, Non-Government Organizations (NGOs), Architects/Designers, Contractors, Developers, Local craftsmen, and the public. These stakeholders and their responsibilities are discussed below:

3.5.1. Policymakers

There is no direct policy supporting Circular Economy in Kenya in recent years. However, it is important to note that in Africa, Kenya is seen as a frontrunner or hotspot for the transition to Circular Economy, however, most of its policies are related to waste management [13] with the economy strongly dependent on agriculture policies that support Circular Economy achievement in Kenya.

The predecessor administration of Uhuru Kenyatta in 2018 produced a BIG FOUR AGENDA that was targeted to cover the following issues:

- Food security;
- Affordable housing;
- Universal healthcare;
- Manufacturing.

The issues gave birth to preceding policies and awareness of the Circular Economy which includes the KENYA VISION 2030 which is a blueprint to transform Kenya into a "newly industrializing, middle-class income country with high-quality of life for its citizens by 2030 in a clean and secure environment" [12]. The Environment Management and Coordination Act (EMCA), this act gave birth to the Plastic bag ban in 2020, and the revision of the NATIONAL BUILDING CODE (2020) which illustrates that while carrying out building demolition, reusing, reducing, and recycling building waste should be prioritized [13]. Some regulations include the Waste Management Regulations of 2006, which provide for waste recycling, and The National Solid Waste Management Strategy of 2015 [12]. Clearly, none is directly on the Circular economy but of course, it passively enables the transition with some level of awareness of the Circular Economy which includes:

- National Awareness of Circular Economy (CE) in 2007;
- Business/industries awareness in 2020: of which 57% indicated a willingness to purchase sustainably made products;
- Consumer Awareness of Circular Economy: A follow-up to previous awareness of which many average Kenyans still lack knowledge or awareness about the Circular Economy.

With the ongoing trends of Circularity in Kenya, it will be important for Policymakers to begin implementing policies that directly relate to the advancement of Circular. This will enable the policymakers to have more understanding of the topic, which will take into consideration the social aspects of the various ethnic groups in the country.

3.5.2. Government Legislation

The Government of Kenya Legislation would have key responsibility towards Circular Economy, which seems another means of achieving affordable housing. This will be very important because designers, urban planners and developers would take the initiative more seriously. Currently the criteria for the selection of building materials in Kenya are based on categorization provided by the Housing and Building Research Institute (HABR) [22] of the University of Nairobi which includes:

- Consider the prevailing climatic conditions;
- Make use of local, readily available raw materials which are easy to work with implying a preference for technologies favouring low-skill labour;
- Incorporate indigenous techniques and skills;
- Exhibit low energy consumption referring to embodied energy;
- Make use of building materials of high availability and acceptability;
- Avoid the use of heavy machines for production, transport and handling, and family.

Other legislation that could enable the achievement of circularity in recent years in Kenya includes the 2017 Ban on Plastic Bags, the 2020 Revised National Building Code by the Ministry of Transport, Infrastructure, Housing and Urban Development (MTIHUD), and the Ministry of Lands Physical Planning (MLPP) the new code represents a considerable improvement to the previous building code of 1968. Although the new Building code does not support any activity for circularity in buildings, it provides for local materials acquisition and local techniques. Further legislation and revisions should take the circular economy into consideration to promote this initiative and take advantage of the circular economy for affordability and sustainability in housing and general architecture.

3.5.3. Non-Government Organizations (NGOs)

The contribution of NGOs in the building sector of the Circular economy is much needed for awareness, publicity, and community development projects. These projects and programs will enable educating people on the importance and need for circularity in all sectors [12]. Some of the existing organizations that support Circular Economy initiatives in Kenya include the following:

The Kenya Association of Waste Recyclers (KAWR): KAWR is the umbrella body for the private sector industry involved in the materials recovery from waste by retrieval, repair, refurbishment, recycling, remanufacturing, composting, power generation, or any other initiative aimed at extracting value from material that

would otherwise be discarded.

Kenya Green Building Society (KGBS): KGBS is more involved in Circular Economy in the Building industry. KGBS aims at transforming the built environment in Kenya toward environmentally sustainable buildings, promoting a healthy and efficient built environment. They also advocate for the use of recycled material for construction.

Kenya Association of Resident Associations (KARA): KARA is an apex body mandated to facilitate the formation of residents' associations and coordinate their activities with a view to tackling service delivery challenges in a structurally unified voice. They can play a pivotal role in the coordination of waste segregation and collection activities within residential areas.

Ministry of Environment Kenya: The ministry has been at the forefront of the transition to a circular economy in Kenya by involving and partnering with the private sector in the policy formulation process.

Kenya Private Sector Alliance (KEPSA): KEPSA is the apex body of the private sector in Kenya with a membership of over 500,000 businesses. KEPS is a key player in championing the interests of the Kenyan business community in trade, investment, and industrial relations.

Kenya Association of Manufacturer (KAM): KAM represents business members of the manufacturing industry. Keen on catalysing recycling in Kenya, KAM led the development of the Kenya Action Pan and collaborated with SIB-K in forming a PRO among other initiatives.

Sustainable Inclusive Business Kenya (SIB-K): The knowledge centre under the Kenya Private Sector Alliance, focusing on the Circular Economy, People Power, Biodiversity, and New Business Values. SIB-K hosts the annual Circular Economy conference, bringing together various stakeholders to champion the swift shift to a sustainable economy in the country. SIB-K also contributed to the Sustainable Waste Management Bill 2019, the EPR regulations, Kenya's first PRO, and is the Kenyan lead of the Kenya Plastics Pact.

National Environment Management Authority (NEMA): This agency was established under EMCA in 1999 to ensure sustainable management of the environment through exercising general supervision and coordination over matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment, most notable, the plastic carrier bag ban.

These organizations can do more with all the necessary local and international support, to seek promotion for circularity, gather data on people's perceptions about circularity, and work with Government officials towards improving circularity.

3.5.4. Architects/Designers

The roles of Architects and Designers are key to the actualisation of circularity in the building industry. A workshop by [17] where a representative of MASS DESIGN Rwanda outlined their attempt to use local materials and produce fur-

niture components from the available construction wastes. More of these initiatives can be improved by organizing workshops and training for architects and designers on the need for circularity and areas of application in the building industry.

3.5.5. Contractors/Developers

The construction industry in Kenya contributed about 4.9% to the 2011 Kenya Gross Domestic Product (GDP) according to the Kenya Bureau of Statistics this can be due to the Government's investment in Infrastructure as reported by African Economic Outlook and Investments in the real estate sector [19]. The real estate industry across Africa is on the boom. This is due to urbanisation and growing population [23]. Contractors and Developers play a key role in this real estate venture which is targeted towards a small portion of the populace who can afford the prices. While the housing deficit in Kenya is currently at 2 million expected to increase by 10% annually [24]. The construction industry led by contractors/developers is also regarded as a major contributor to waste that is discarded as solid waste [25]. Solid waste management remains a problem in Kenya, especially in the capital city of Nairobi, about 2400 tons of waste are produced and only 38% are accounted for [26]. This is a general phenomenon across the African continent, construction waste is reported to reach 516 million tonnes by 2050, where more than 90% are deposited in uncontrolled dumpsites and landfills[3] [27]. Ethically it will be a moral obligation for these contractors and developers to take into consideration their impact on waste production and their role in improving circularity in the industry which can provide alternative use to the construction waste. More also consider providing affordable housing for the growing population.

3.5.6. Local Craftsmen

The role of local craftsmen also called Jua Kali in the Kenyan community. The Jua Kali furniture makers had about 115, 000 artisans that source materials locally [10]. Besides Furniture makers, Masons, Welders (Metal workers), Plumbers, and Electricians all make up the Kenya craftsmen that can be categorized in the informal sector. These informal craftsmen would be important to the success of the Circular Economy in Kenya, literature [15] suggested that discarded furniture from the Netherlands be transported to Kenya and refurbished by Local Craftsmen and sold at lower prices. Is it then important for the Craftsmen to declare the components appropriate as refurbished furniture, and not sold as new products being truthful to the public about these components? More importantly, the local craftsmen should be obliged to source for means to produce more affordable components circularity could be one of the means.

3.5.7. General Public

The responsibility of the public towards circular economy determines the overall

[3]This report by Footprint Africa derives the need to reuse, reclaimed building materials or components.

success. The acceptance of refurbished components for the greater good about climate change, and affordability. The willingness to know more and participate in awareness campaigns that could be organized by organizations and agencies. The willingness to reuse components and build on the culture of reusing and re-purposing of products. The literacy level in Kenya is improving [9] and likely to purchase products or components based on sustainability.

3.6. Ethics of Consent for Prospect Project on Circularity

The attributes of consent in ethics as related to the individuals or the public in this case of Circular Economy is more toward consequentialism towards promoting the well-being of the general public for the greater good. These attributes can be sub-divided into:

The individual judgement for their interest, letting people decide for themselves to maximise for their well-being. This is more on the people to be willing for the possible alternatives of circularity that could be presented in building components, and towards achieving affordability in Housing.

Making own decisions, exercising own autonomy or individuality, the important of individual well-being. This more focused on households, middle class, and the low-income class to take advantage of the new initiatives, and projects that could enable them to achieve an affordable house of theirs and afford components while also impacting positively the environment in which most of the population is involved in agricultural activities. It is important to note that the traditional Kenyan ethnic groups have their cultures rooted in the conservation of nature. Therefore, the ethics of circularity which improves the conservation of nature is a valid point for individual consent to being convinced.

Willingness to participate in a socially valuable research project. If individuals of Kenya Are Ethically convinced of the importance of circularity which could promote their well-being, it is, therefore, important to participate in activities, awareness campaigns, community workshops, and events that aim to promote the Circular Economy in Kenya willingly.

3.7. Design Ethics in the Field of Circular Economy

The ethical requirement from professionals in the building design or engineering industry of Kenya remains critical for the growth of the Circular Economy. Professional responsibility can be referred to be based on one's role as a professional as far as it stays within the limits of what is morally allowed. Also, the aspect of Role responsibility is the role one plays in certain situations [28]. The literature of Mark Bovens mentions some active responsibilities, ideal for engineers that include adequate perception of threatened violations of norms, consideration of the consequences, autonomy ability to make own independent moral decisions, displaying conduct that is based on a verifiable and consistent code and taking role obligation seriously [28].

Therefore, it is paramount for architects and engineers in Africa, particularly

Kenya to observe the guidelines for green building design strategies, the Revised National Building Code emphasizes using local materials and strategies that incorporate circular economy strategies in building design, particularly for Africa, one of which is provided by the Ellen MacArthur Foundation.

The designers can also push policies and legislative support for the implementation of Circular Economy strategies in the Building Industry.

3.8. Technological Assessment on the Implementation of Circular Economy

The use of technology gadgets is on the rise in Africa. One of the frameworks for circular economy implementation is the aspect of digitization to enable digital sharing of information. More also technological devices can be introduced in production or manufacturing that would production faster, cheaper and less harmful to the environment. But for a context of Kenya in Africa, it is also important to avoid overusing devices that would affect the human capital of the growing population.

Not to have Technology replace humans but to assist humans in delivering better services [28]. This should be the focus and goal for African context. Since the economy is still regarded as an emerging economy.

4. Conclusions/Recommendation

This literature review on ethical aspects of the Circular Economy in Africa reveals the importance of moral values, moral responsibilities and moral obligations that should be considered when implanting initiatives, projects, and research focusing on the building industry. Is it clear that the need to understand the cultural context and the risk and harm that could be associated with Circular Economy in those contexts will determine the responsibility of all the stakeholders including the Government, Architects/Designers, Organizations, and The General public? All stakeholders should also be willing to grant consent when needed on initiatives that aim to promote circularity. Overall, the benefit of a circular economy seems to reveal greater good about climate change, and sustainability, could enable affordability and improve local manufacturing. For this reason, individual well-being can be promoted, and this requires the ethical support of individuals as well.

Lastly, recommendations on the application of co-designing to engage the consent of the public, and mutual use or mutual adaptation of both the principles of consequentialism and deontology towards achieving the greater good, for the benefit of the public.

Conflicts of Interest

The author declares no conflicts of interest.

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