CIRCULAR ECONOMY APPROACH TO SOLID WASTE MANAGEEMNT: CASE FOR A BUSINESS PERSPECTIVE

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WHAT IS SOLID WASTE

- **Solid waste** is any **garbage**, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded materials including **solid**, liquid, semi-**solid**, or contained gaseous material, resulting from industrial, commercial, mining and agricultural operations and from community activities

WASTE CATEGORIES

- **Solid waste** can be **classified** into different types depending on their source:

  a) Household **waste** is generally **classified** as municipal **waste**,

  b) Industrial **waste** as hazardous **waste**, and.

  c) Biomedical **waste** or hospital **waste** as infectious **waste**.

- Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes.
- With rising urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly and its composition changing.

WASTE CATEGORIES

- **The Four broad categories of Garbage**

  a) Organic waste: kitchen waste, vegetables, flowers, leaves, fruits.

  b)Toxic waste: old medicines, paints, chemicals, bulbs, spray cans, fertilizer and pesticide containers, batteries, shoe polish.

  c) Recyclable: paper, glass, metals, plastics.

  d) Soiled: hospital waste such as cloth soiled with blood and other body fluids

WHY CONCERN WITH WASTE

- Increase in Urban Population: The world's urban population increased to more than 50 per cent of the world's total population in 2015 and will rise further to approximately 70 per cent of the total by 2050. Most of this population growth will be concentrated in developing countries. The urban population in Africa is projected to treble from 470 million in 2015 (UNDEA, 2014) to 1.2 billion in 2050, making Africa the continent with the highest urban population growth (UNDEA, 2008).

- Increase in Municipal Waste in Cities: Cities produce an ever-growing amount of municipal solid waste (MSW). Globally, the World Bank estimates that the amount of MSW generated by urban areas is growing even faster than the rate of urbanization. By 2002, there were 2.9 billion urban residents who generated about 0.64 kg of MSW per person per day (0.68 billion tons per year) (World Bank, 2012). In 2012, there were about 3 billion urban residents each generating 1.2 kg per day (1.3 billion tons per year), and with the urban population projected to reach about 4.3 billion by 2025 and with each resident generating about 1.42 kg of MSW every day total MSW will reach 2.2 billion tons by then (World Bank, 2012)..

WHY CONCERN WITH WASTE

- In many low-income countries, MSW disposal is a neglected area, and a major environmental health hazard.
- The cost of disposal of large quantities of waste is often beyond the financial capacities of cities and municipalities.
- There is poor institutional capacity and low political will to address the problem.
- Many low-income countries lack the facilities for safe disposal of MSW and the most common MSW disposal practice in these countries is uncontrolled dumping.

WHY CONCERN WITH WASTE

- Badly managed waste also has negative consequences in terms of greenhouse gas emissions. The waste sector was the third largest contributor to global emissions of non-CO2 greenhouse gases in 2005, accounting for 13 per cent of total emissions. In the waste sector, the two largest sources of emissions are land filling of solid waste and wastewater, which together contributing 92-93 per cent of emissions throughout the 1990 to 2030 period.

EXAMPLES

- INDIA: In 1947 cities and towns in India generated an estimated 6 million tonnes of solid waste, in 1997 it was about 48 million tonnes. More than 25% of the municipal solid waste is not collected at all; 70% of the Indian cities lack adequate capacity to transport it and there are no sanitary landfills to dispose of the waste. The existing landfills are neither well equipped or well managed and are not lined properly to protect against contamination of soil and groundwater.

WHY CONCERN WITH WASTE

KENYA

- Nairobi, the capital of Kenya, exemplifies the problems of a dysfunctional waste management system. Nairobi produces around 2,400 tons of waste per day. While 93 per cent of Nairobi's waste is potentially reusable, only 5 per cent is actually recycled and composted. Moreover, only 33 per cent of waste produced is collected for disposal at Nairobi's single official dumpsite, Dandora (JICA, 2010). The rest is tipped on hundreds of illegal dumpsites, left next to houses or burned. The official dumpsite, and even more so the illegal ones, are operated in an unsystematic, unplanned and highly unsanitary way. As a result, poorly managed and not properly disposed of solid waste pollutes the air, water and soil, causing significant health and environmental problems. This is especially true in slums and other low-income areas, where high population density, paired with lack of infrastructure and service provision, only aggravates these problems.
- With the urban population growth continuing, these problems will only worsen.

WHAT ATTEMPTS HAVE BEEN MADE?

- Most Prominent Model in use to manage waste is based on Disposal involving county governments(public sector) and waste collection companies(Private sector)

- The **public sector** struggles to run an effective and efficient waste management system. The resources available to Nairobi City County (NCC) are insufficient. Commonly cities in developing countries spent 20-50 per cent of their budgets on waste management. NCC spends only US$5 million of its US$300 million budget on waste management, representing not even 2 per cent of the total (Institute for Social Accountability, 2014). NCC has around 20 functioning waste collection trucks at any time. This, combined with contract private companies, only allows for collection of waste in the city centre and public markets.

- The **private sector waste management** companies only collect waste for the purposes of disposal; and their services are too expensive for the majority of Nairobi's population.
- Private sector waste collection companies collect waste from households and businesses for disposal at Nairobi's only official dumpsite, Dandora or at various illegal dumpsites. As a consequence, very little of the collected waste gets recycled.

CHALLENGES WITH THE MODEL

- First, not recycling collected waste has immense opportunity costs: Revenues from selling recyclable materials would help in lowering collection fees.
- Second, disposal at Dandora dumpsite (or at the illegal dumpsite) is extremely inefficient and time consuming, involving long queuing, getting stuck due to lack of roads and inefficient manual off-loading. Thus, Nairobi's waste companies can only do one collection trip per truck per day. This level of inefficiency then results in high collection charges.
- As a result, existing private sector companies in Nairobi collect waste only in middle to higher income areas, while not engaging in any recycling of organic waste. This leaves two thirds of residents without any proper waste management services.

CHALLENGES WITH THE ATTEMPTS

The key challenges of solid waste management in Nairobi.

- The **public sector is in a state of** struggle to run an effective and efficient waste management system. The resources available to Nairobi City County (NCC) are insufficient. Commonly cities in developing countries spent 20-50 per cent of their budgets on waste management. NCC spends only US$5 million of its US$300 million budget on waste management, representing not even 2 per cent of the total (Institute for Social Accountability, 2014). For a city of 3.5 million inhabitants, NCC only has around 20 functioning waste collection trucks at any time. This, combined with contract private companies, only allows for collection of waste in the city centre and public markets.
- Current **private sector waste management models** do not offer a solution to this problem either. This is because (1) waste collection companies only collect waste for the purposes of disposal; and (2) their services are too expensive for the majority of Nairobi's population.

CHALLENGES WITH THE ATTEMPTS

- Private sector waste collection companies collect waste from households and businesses for disposal at Nairobi's only official dumpsite, Dandora or at various illegal dumpsites. As a consequence, very little of the collected waste gets recycled.

INTERVENTION BY NAMA

- Against this background, Nationally Appropriate Mitigation Action (NAMA) proposed a Circular Economy Municipal Solid Waste Management Approach for Urban Areas.
- The NAMA model seeks to improve urban waste management in developing countries. In the case of Nairobi, it seeks to transform its waste sector from a disposal-driven one to one of recycling and composting.
- The Intervention aims to enhance:

  -Affordable waste collection services to all income areas

  -Increase the amount of waste collected and recycled

  -Improve health at household levels

  -Reduction in GHG emissions

  - Direct and indirect job creation

  -Increase in the application of compost to improve agricultural soil fertility

WHY A GREEN ECONOMY CIRCULAR MODEL

- A **circular economy** is a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing energy and material loops; this can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, **recycling**, and upcycling
- A circular economy is an alternative to a traditional linear economy (make, use, dispose)
- The linear economy is no longer a tenable model within the limits of our planet.
- The disadvantages of the linear economy outline the urgency for an alternative model, which can be interpreted as opportunities for the circular economy. The main disadvantages of a linear economy are found in the lack of solutions for the growing shortage of materials, increased pollution, increased material demand and the growing demand for responsible products.

WHY A GREEN ECONOMY CIRCULAR MODEL

- Under the circular model, we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.
- It is based on three principles:

  a)Design out waste and pollution

  b)Keep products and materials in use

  c)Regenerate natural systems

WHY A GREEN ECONOMY CIRCULAR MODEL

- The model distinguishes between technical and biological cycles.
- Consumption happens only in biological cycles, where food and biologically-based materials (such as cotton or wood) are designed to feed back into the system through processes like composting and anaerobic digestion.
- These cycles regenerate living systems, such as soil, which provide renewable resources for the economy. Technical cycles recover and restore products, components, and materials through strategies like reuse, repair, remanufacture or (in the last resort) recycling.

WHY ADOPT A CIRCULAR MODEL?

- A circular economy is an economic system where products and services are traded in closed loops or 'cycles'. A circular economy is characterized as an economy which is regenerative by design, with the aim to retain as much value as possible of products, parts and materials. This means that the aim should be to create a system that allows for the long life, optimal reuse, refurbishment, remanufacturing and recycling of products and materials.

- A more circular economy will:

  -reduce waste

  -drive greater resource productivity

  -deliver a more competitive economy.

  -position the economy to better address emerging resource scarcity issues in the future.

  -help reduce the environmental impacts of production and consumption

CIRCULAR ECONOMY APPROACH: SOURCES OF OPPORTUNITIES IN MSW FOR KENYA

- Opportunities arise from the challenges facing the supply chain MSW in Nairobi. These challenges include the following.

1) Lack of awareness on the part of both the residents who generate the waste and most actors in the MSW management supply chain. All the actors need to be made aware of the need for and benefits of enhanced recycling and composting.
2) The MSW management supply chain service providers' lack of various capacities, such as financial resources, improved equipment for recycling, knowledge of efficient waste collection, waste recycling and composting, and the organizational and governance structures to manage the MSW supply chain.
3) Lack of access to land for recycling points and composting facilities and lack of financial capacity to purchase land near where the waste is generated.

SOURCES OF OPPORTUNITIES

4) Lack of access to improved technologies for composting to increase the quality of compost and lack of access to new markets to increase demand for composting.

5) Lack of formal technical and management training among most of the MSW management supply chain service providers in handling solid waste

6) Inadequate infrastructure for effective MSW management, such as a sufficient number of recycling points and composting facilities.

7) A strong political will and commitment to enact, coordinate and support enforcement of appropriate laws.

THE BUSINESS OPPORTUNITIES

- They arise from Recycling and Composting as a Potential Solution to MSW based on the following:

1) Waste is a resource and has considerable economic value. Organic waste, which constitutes 69 per cent of Nairobi's waste, can be converted into compost. Recyclable waste such as paper, plastic, glass and metal (16 per cent of waste) is used by industries for manufacturing new products (JICA, 2010). For these waste-to-value products, there exist large underserved markets in Kenya.

2) The market for compost has enormous potential in Kenya because of the nature of our soils. In contrast to Europe, tropical soils have less soil fertility, texture and organic matter content. Soil conditioners such as compost are, therefore, essential to improve soils (AGRA, 2016). By improving the soil's organic matter content, compost helps increase its capacity to retain nutrients and water; supplies nutrients and helps suppress soil-borne diseases; and stabilizes soil pH-levels. It is estimated that the current demand for compost is in excess of 100,000 tons/year and growing (Lachlan Kenya Ltd., December 2011. Production of compost in Kenya currently stands at less than 10,000 tons/year. Meanwhile, Kenya imports around 1,500,000 tons/year of chemical fertilizer.

THE BUSINESS OPPORTUNITIES

3) The market for recyclable materials is growing, as many raw materials become more expensive. Kenya has one of the biggest manufacturing sectors in sub-Saharan Africa outside South Africa. There are recycling industries for plastic, paper and metal waste. This leads to a strong demand for recyclable materials, as using them lowers production costs. However, this demand is largely underserved, as industries face the challenge of sourcing clean inputs. Recovery of recyclable waste is done by "junk shops" and waste pickers from mixed waste. This leads to high contamination. Recycling industries thus incur high cleaning costs, making the recycling of most materials economically unattractive. Consequently, only 10 per cent of potentially recyclable materials are currently recovered for recycling.
4) Composting and recycling are not only beneficial in themselves. First, the more waste is composted and recycled, the less waste needs to be disposed of. This can reduce costs for waste collection significantly by reduced disposal fees, reduced time losses at dumpsites and reduced distances to often far-away dumpsites. Second, selling recyclable materials to recycling industries generates additional revenues in the waste management value chain. This in turn can help reduce the costs of waste collection. Hence, promoting composting and recycling can help make waste collection more affordable. This in turn makes it possible to increase the waste collection coverage to low-income areas.

CHALLENGES TO TAPPING THE OPPORTUNITY

1) **Lack of proper waste sorting centers** :Staff on waste collection trucks try to sort some materials on the way to the dumpsite. This leads to a low quality of sorting. The few materials that they do sort, are sold to small-scale "scrap yards". Scrap yards lack the space and systems to sort large quantities of waste in a reliable manner. Moreover, as they receive largely mixed waste, most of the waste is too contaminated to sell to recycling companies.

- Waste pickers scavenge for recyclable materials on dumpsites. As the waste getting to the dumpsite is mixed and heavily contaminated, waste pickers can only sort out a small fraction of the recyclable materials. Waste pickers on dumpsites also suffer from terrible health and sanitary conditions.

2) **Lack of a market for organic waste**. Arises due to low capacity in composting organic waste in Nairobi. As organic waste represents around two thirds of Nairobi's waste, this poses a major barrier to reducing waste disposal in Nairobi. This can be attributed to two main factors. The lack of clean organic waste. The collection of mixed waste makes it difficult to obtain clean organic waste on any scale.

- Unlike in Europe and the USA, a composting business in Nairobi does not receive income from tipping (offloading) fees. This means that its needs to generate all its revenues from sales of compost. This is challenging due to the underdeveloped market for compost. Most farmers are not aware of the benefits and applications of compost. Compost is often confused with chemical fertilizer.
- Other technologies for recycling organic waste, such as terra-preta (charcoal fortification of compost) and insect based protein production still require further testing to be fully commercialized.

3) **The lack of a market for certain inorganic waste fractions**. While there are numerous recycling industries in Nairobi for many inorganic waste fractions, there are certain specific fractions that currently have no matching recycling industries (e.g. Styrofoam, low-grade plastics).

REQUIREMENTS TO TAP THE OPORTUNITY

- In order to tap the opportunity under the existing circumstances, the following need to be addressed:

1)Establish waste sorting centers

2)Install Compost facilities

3)Develop the market for compost products

4)Promote recycling industries

5)Testing of organic waste technologies

THE NEED FOR AN ENTERPRENEURAL PERSPECTIVE

- The OECD Green Growth Strategy (OECD, 2011a) recommends that green growth policies should encourage innovation, as this can enhance efficiency in the use of natural capital and foster new economic opportunities from the emergence of new green activities.
- The rapid and wider diffusion of "eco-innovation" can have a leveraging effect on environmental, as well as on economic and social improvements, by enabling win-win synergies both in OECD and non-OECD countries.
- Increasing the market potential for more radical and systemic eco-innovations is becoming of particular importance to enable a long-term transition and transformation towards a greener economy.

THE NEED FOR AN ENTERPRENEURAL PERSPECTIVE

The developments in urbanization can tap into this extant potential to integrate an entrepreneurial perspective for adoption so as to address this problem

- Investment in MSW by private sector organizations/indivinduals is therefore likely to unlock the identified potential in creating jobs, reducing poverty levels,
- Enterpreneurship can be integrated into the area of MSW to address the growing concerns for enhancing sustainability of urban Centers.
- In my view, Entrepreneurship provides the motivating factors that can marshal the needed collaboration of various stakeholders towards an increased role in MSW urban with an accompanying economic benefit

WHY ENTERPRENEURSHIP

- Need for Infusion of an entrepreneurial perspective into urban based Issues in a way that presents the challenges of urbanization as viable business opportunities that relevant stakeholders need to support in order to realize sustainable urban development.
- The proposed approach for Enterpreneurship for MSW management is build on the pillar of ***"Purpose Driven Urban Enterpreneurship Model"*** proposed by Cohen and Munoz (2015).
- The model is based on the current developments gaining the attention of scholars arising from the need to give attention to social, environmental and sustainable Enterpreneurship based on the creation of value for the economy, society and the environment.
- The background of the model was characterized by: the need to venture into urban environments, tackle city challenges, open the field to new cross disciplinary streams of research, need to apply entrepreneurial behaviour in urban life, and need for theory development.

WHY ENTERPRENEURSHIP

- The approach is supported by a breed of entrepreneurs who seek to generate sustainable impacts through venturing in urban environments as evidenced by alliances between entrepreneurs, private and public sector actors whose aim is to solve unique interconnected city challenges and improving the quality of life of civil society and opening up the field to new cross disciplinary streams of research.

- It considers complexities and challenges emerging in the urban context where by cities are viewed as systems of systems that entail interconnected systems associated with communication, transportation, business, city services, energy, food, water and social system of citizens and tourists. Its components include: sources of opportunity, embeddedness, venture development.

WHAT IS ENTERPRENEURSHIP

- The term entrepreneurship has been used to refer to someone who takes risks and starts something new (Hirsch *et.al*, 2009).
- An Entrepreneur was connected with reforming and revolutionalizing the pattern of production by exploiting an invention.
- Entrepreneurship entails the process of creating something new and assuming the risks and rewards. As the interest in Entrepreneurship continues to grow, the concept of innovation has gained more prominence in the literature.
- The concept of innovation appears to be at the center of the growing interest in entrepreneurship due to its role in the enterpreneurship process
- Defining Features of Enterpreneurship are Based on three components:
  - Innovativeness
  - Risk taking and
  - Proactiveness

WHAT IS ENTERPRENEURSHIP

- Entrepreneurship process entails the creation of value by bringing together a unique package of resources to exploit an opportunity
- It has the following Phases:

➢ Identification and evaluation of the opportunity

➢ Development of the business plan;

➢ Determination of the required resources

➢ Management of the resulting enterprise

WHAT IS ENTERPRENEURSHIP

- Three Pillars:

  -Invention

  -Innovation

  -Commercialization

Invention:

- Invention involves initiating and constituting change in the structure of business and society, change accompanied by growth and increased output which allows more wealth to be divided by the various participants.

- Invention involves initiating and constituting change in the structure of business and society, change accompanied by growth hence increased output

- The invention is initiated by the inventor who is considered as an individual who creates something for the first time,

WHAT IS ENTERPRENEURSHIP

Characteristics of Inventors are:

- Highly driven & motivated individuals
- Highly creative
- Well educated
- Problem solver
- Ability to reduce complex problems to simple ones
- Willing to take risks
- Ability to tolerate ambiguity and uncertainty.

Innovation :

- The key for developing new products for the market and stimulating investment interest in new ventures being created

Commercialization :

- Process of making invented products and services available to the market.

THE CIRCULAR APPROACH AND OPPORTUNITIES

Entrepreneurs are driven by opportunities to make products/services which they sell to earn extra revenue as they solve societal problems

Potential Revenues come from several sources:

- Waste collection fees (earned by collectors)
- Sales of recyclable materials and tipping fees (earned by recycling points)
- Sales of compost (by composting businesses)
- Sales of new products (by recycling industries).

RECYCLING CATEGORIZATION

- **Recycling of plastics**

-PET bottles
-Hard HDPE plastics
-Low-grade plastics
-HDPE plastic bags
-Bio PP bags
-PP bags
-LDPE plastic bags
-Milk sachets
-PVC plastics

- Recycling of paper Cartons

-Paper
-Newspaper
-Tetrapak

RECYCLING CATEGORIZATION

- Recycling of glass Bottles in all colours

Broken glasses in all colours

- Recycling of metals Aluminum

Other metals

- Recycling of e-waste
- Recycling of textiles Shoes

  Clothes

- Composting of biodegradable/organic material.
- Recycling of all other waste fractions as residual waste through cement kilns

CONCLUSION

- MSW is a societal problem that needs urgent attention in our cities
- The Green Circular Approach proposed by MAA and highlighted in the waste management strategy by the government requires a multidisciplinary and stakeholder support to realize its promise.
- An Entrepreneurial approach offers the best avenue by which to mobilize stakeholders and resources to address the problem as we consider MSW as an opportunity not only to create revenue but also employment for youth and empowerment of women.
- It is hoped that the stakeholders will consider aspects of the Purpose Driven Enterpreneurship Model to embed Enterpreneurship into MSW management in Kenya.

THANK YOU