International Journal of Scientific Research in Education, JUNE 2020, Vol. 13(3), 497-516.

International Journal of Scientific Research in Education (IJSRE)
ISSN: 1117-3259

Moving Beyond Take-Make-Dispose to Take-Make-Use for Sustainable Economy

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Abstract

Our consumption and resources use pattern has lead to our environment unsustainable with our traditional practice of take-make-disposal (linear economy). It is on this backdrop that this study is aimed at highlighting the need to move beyond take-make-disposal (linear economy) to take-make-use (circular economy) as to make our environment and economy sustainable. The study went further to reveal the basic principles' of the circular economy; waste equals food, use renewable resources and build resilience through diversity as well as its component strategies like; reuse, redesign, reduce and recycle and types of recycling; primary, secondary and tertiary. Opportunities of the circular economy where mentioned, like; waste collection, inorganic waste processing, paper, plastic, metal, rubber, textiles and organic waste processing (composting), while, benefits of the circular economy to an economy, environment, and business where examined which includes; the circular concept fosters wealth and employment generation against the backdrop of resource constraints, Circular supply chains are up and running and they have gone global, substantial resource savings, economic growth, increase in employment rate, reduction in greenhouse emission, critical soil, air and water bodies, stable material supply, etc. Few leakage points of the circular economy where identified; Institutional, economic Barriers and consumers behaviour pattern while, institutions streamlining, economy boosting and awareness creation where proposed as way forward for a smooth circular economy.

Keywords: Linear Economy, Circular Economy, Environment, Sustainable Economy.

Reference to this paper should be made as follows:

Elisha, O. D. (2020). Moving beyond take-make-dispose to take-make-use for sustainable economy. *International Journal of Scientific Research in Education*, *13*(3), 497-516.

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INTRODUCTION

Our global society is not sustainable and the challenges we are facing are known to us, like; waste, pollution, climate change, resource scarcity, loss of biodiversity. At the same time, we want to sustain our economies and offer opportunities for a growing nation population. Today's

‘take-make-dispose economy has long relied on inputs of cheap and available resources to create conditions for growth and stability (Circle Economy, 2019). Within the past decade, however, businesses have been hit by an increase in commodity prices that has effectively erased the (average) decline of the entire preceding century. Coupled with this, we expect three billion more middle-class consumers by 2030. This unprecedented rise in demand for a finite supply of resources calls into question our current predominantly linear economic system.

According to WE Forum (2017), the concept of the circular economy is rapidly capturing attention as a way of decoupling growth from resource constraints. It opens up ways to reconcile the outlook for growth and economic participation with that of environmental prudence and equity. It is inspiring businessmen, politicians, engineers, designers and the next generation of leaders. We are now observing the evolution of circular business models as leading companies drive innovation across product design, development of product-to-service approaches and new materials recovery methods. These are demonstrating potential to disrupt the linear economy. A deeper and broader understanding of how to capture commercial value across supply chains from a very practical perspective is needed to accelerate and scale this trend.

The World Economic Forum (2017) reported that accelerating the scale-up across global supply chains’ plays a crucial role in market evolution by exploring how businesses can use the circular economy to drive arbitrage opportunities across complex, global supply chains. While examples of circular business models are emerging, significant materials leakages still persist. This report provides practical guidance on how businesses can address these leakage points to capture the value of the circular economy together with their partnerswhether suppliers or wholesales/retailers and consumers. The initiative outlined in this report, aims to make practical steps towards capturing this opportunity through the facilitation of pure materials flows, an important first move in the shift to a new economic model (World Economic Forum, 2017).

Our current economic model relies on the traditional linear economy, which follows the pattern of creation, consumption and disposal of products (Mentink, 2014). However, this linear economy is not sustainable. It leads to an increasing pressure on finite resources and generates significant waste and emissions. Instead, the concept of a “circular economy” was devised with the aim of minimizing waste and pollution and making the most of resources by keeping products and materials in use as much as possible, and by recovering and regenerating products and materials at the end of each service life (WE Forum, 2017). The transition from linear economy to circular economy can put economic growth on a sustainable pathway, by reducing finite resources consumption and minimizing waste and environmental impacts.

Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital implementation of circular economy is guided by three principles according to the Ellen MacArthur Foundation (2014, p. 201):

Waste Equals Food: Redefining the purpose of end-of-life products can extend their durability and reduce the environmental impacts of manufacturing new products. Within a closed loop, appropriate maintenance, reuse, refurbishment and recycling can extend the life cycle of products. These products are no longer to be considered as waste, but as essential inputs to manufacturers and service providers.

Use Renewable Resources: By increasing the utilization of renewable or waste-derived resource and energy, circular economy model could create new types of jobs and reduce environmental impacts, including carbon emissions.

Build Resilience Through Diversity: In order to achieve the reduction of virgin material consumption and waste generation, supply chains need to be developed to reorient products from one manufacturing process into another. Therefore, designing a circular economy model requires bringing together various companies and stakeholders, which serve different functions within a circular economy system.

Strategy Components of the Circular Economy (Stahel, 2010)

- **Redesign:** Redesigning the catering services to separate the waste correctly;
- **Reduce:** Reducing the mass of food packaging and switching manuals from hard copy to digital;
- **Reuse:** Reusing the seats and on-board entertainment systems in other systems; and
- **Recycle:** Recycling the reusable equipment, including trays, drawers, blankets and trolleys, etc

Linear consumption is reaching its limits and our environment and economy is not sustainable which gave rise the circular economy with its operational benefits as well as strategic, on both a micro and macroeconomic level and also embedded limitless opportunity, huge potential for innovation, job creation and economic growth **(**Stahel, 2010).Again because the nation population is growing and this is affecting the environment and to ensure there is enough food, water and prosperity in 2050, we need to switch from a linear to a circular economy.

Wastes are unwanted or unusable materials. Waste is any substance which is discarded after primary use, or is worthless, defective and of no use. A by-product by contrast is a joint product of relatively minor economic value. These wastes are unwanted domestic, agricultural or industrial products and substances are disposal through dumping, burning, burial at landfill sites or at sea, and recycling. These unnecessary dumping and burring of waste as a result of improper on-site waste management, thereby contribute to environment threats and hazard. In the long-term, landfills leak and pollute ground water and other neighboring environmental habitats making waste management very difficult. They also give off potentially unsafe gases.

Soil, water and air pollution can all be a result of improper waste disposal and occurs when either of them becomes contaminated with hazardous materials. Not only does this contribute to the creation of a greenhouse gas effects but also causes significant harm to human, marine and wildlife. To reduce its effect on human health, society and the environment, it therefore require proper waste management which involves the collection, transporting, treating and disposing of waste, together with monitoring and regulation of the waste management process a to safe human health and the environment.

Disposed waste can be managed in different forms; waste source reduction and reuse, animal feeding, recycling, composting, fermentation, landfills, incineration and land application. Other waste prevention techniques available, and that is commonly summarized are the so-called 4Rs: reduction, reuse, recycling and recovery. Reduction, reuse and recycling are known in the industry as the 3Rs.

For the purpose of this study, the recycling method is considered. Recycling is the process of converting waste materials into new materials and objects. It is an alternative to "conventional" waste disposal that can save material and help lower greenhouse gas emissions and to avoid its adverse effect over human health and environment. Meanwhile, recycling is very important as waste has a huge negative impact on the natural environment as harmful chemicals

and greenhouse gasses are released from rubbish in landfill sites and its recycling that helps to reduce the pollution caused by waste.

Getting the best out of waste is the most important way one can contribute to the environment. Materials that are popularly used for best out of waste projects are newspapers, cords, and threads, buttons, candy sticks, recycled bulbs, plastic bottles, any old furniture that can be revamped, etc. For instance, Cyclus located in Elmina, a coastal town south of Accra, the country's capital collects, processes and recycles waste from households, hotels, restaurants and industries. The end product is supplied to different manufacturers who use it to make jeans, carpets, tennis balls and several other stuffs that find their way back to our markets as new products.

It is on this background that this study seeks the need to move beyond linear to circular economy which primarily is concern with waste to wealth.

CONCEPTUAL CLARIFICATION

Take-Make-Disposed (Linear Economy)

A linear economy traditionally according Ellen MacArthur Foundation (2012) follows the "take-make-dispose" step-by-step plan which implies that raw materials are collected, and then transformed into products that are used until they are finally discarded as waste. Value is created in this economic system by producing and selling as many products as possible**.** Linear economy also implies that raw materials are used to make a product, and after its use any waste (e.g. packaging) is thrown away (SITRA, 2018). In an economy based on recycling, materials are reused. For example, waste glass is used to make new glass and waste paper is used to make new paper. To put it simply, in a linear economy we mine raw materials that we process into a product that is thrown away after use.

A linear model deals with raw materials in an inefficient way, because the emphasis is not on their conservation. Accenture (2016) added that in a circular economy, other business models are also used in a circular economy, with more emphasis on services rather than products. An example of a model that facilitates the transition to the circular economy is a product-service combination (Product-As-A-Service System), which is seen as a model to integrate products and services.

Take-Make-Use (Circular Economy)

A circular economy is an economic system of closed loops in which raw materials, components and products lose their value as little as possible, renewable energy sources are used and systems thinking is at the core. In a circular economy, manufacturers design products to be reusable. For example, electrical devices are designed in such a way that they are easier to repair. Products and raw materials are also reused as much as possible, for example, by recycling plastic into pellets for making new plastic products (Ellen MacArthur Foundation, 2013). While Jordans (2016) added that in a circular economy we treat our surroundings responsibly, for example, by preventing litter on streets or in the natural environment.

Jordans (2016) went further to affirm that the circular economy economic activity are builds and rebuilds overall system to be healthy. The concept recognizes the importance of the economy needing to work effectively at all scales for large and small businesses, for

organizations and individuals, globally and locally. Transitioning to a circular economy does not only amount to adjustments aimed at reducing the negative impacts of the linear economy. Rather, it represents a systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits. The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible (Bocken, Bakker, & Pauw, 2015). In this way, the life cycle of products is extended**.** In practice, it implies reducing waste to a minimum. When a product reaches the end of its life, its materials are kept within the economy wherever possible. These can be productively used again and again, thereby creating further value**.**

Andersen (2006) affirmed that the circular economy also refers to an economic model whose objective is to produce goods and services in a sustainable way, by limiting the consumption and waste of resources (raw materials, water, energy) as well as the production of waste. It is breaking with the model of the linear economy, based on a take-make-consume-throw away pattern, by proposing to transform waste into recycled raw material for product design or other uses. The circular economy model fits directly into the more general framework of sustainable development. It is part of a global strategy that also uses, among other things, the principles of the green economy, industrial ecology, eco-design or the economy of functionality.The circular economy is aimed to change the paradigm in relation to the linear economy, by limiting the environmental impact and waste of resources, as well as increasing efficiency at all stages of the product economy (Ellen MacArthur Foundation, 2015).

Sustainable development requires disruptive changes in the way our societies and businesses are organized. The circular economy (CE) model offers a new chance of innovation and integration between natural ecosystems, businesses, our daily lives, and waste management. According to Andersen (2006)**,** the circular economy, is a system where waste and other raw natural resources are taken, transformed into products rather than get disposed of, with circular economy model that is designed to close the gap between cycle of production and the natural ecosystems' cycle, as human ultimately depend on them. It also, eliminating waste-composting biodegradable waste or, if it is a transformed and non-biodegradable waste, reusing, remanufacturing and finally recycling it. On the other hand, it also means cutting off the use of chemical substances (a way to help regenerate natural systems) and betting on renewable energy.

The World Economic Forum's (2017) sees the circular economy as an industrial system that is restorative or regenerative by intention and design. It replaces the end-of-life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse and return to the biosphere, and aims for the elimination of waste through the superior design of materials, products, systems and business models.

Looking beyond the current take-make-dispose extractive industrial model, a circular economy aims to redefine growth, focusing on positive society-wide benefits (Ellen McArthur Foundation, 2015). It entails gradually decoupling economic activity from the consumption of finite resources and designing waste out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital. It is based on three principles: design out waste and pollution, keep products and materials in use and regenerate natural systems.

Circular Economy Principles

The circular economy encompasses a very large number of sectors of activity which can be broken down into complementary patterns of production and consumption, which when combined, make sense and reinforce each other:

- ***Sustainable procurement:*** development and implementation of a responsible purchasing policy;
- ***Eco-design*****:** process of reducing the environmental impacts of a product or service throughout its life cycle;
- ***Industrial and territorial ecology*****:** search for eco-industrial synergies at the scale of a business area - the waste of one company can become the resources of another one;
- ***Economics of functionality:*** collaborative economy that favors use over possession and thus tends to sell services related to products rather than the products themselves;
- ***Responsible consumption:*** rational consumption and choice of products according to social and ecological criteria;
- ***Extending the duration of use:*** through repair, reuse and repurpose; and
- ***Recycling:*** treatment and recovery of the materials contained in collected waste.

Different Between Circular Economy and Linear Economy (Kirchherr, Reike, & Hekkert, 2017)

A circular economy is fundamentally different from a linear economy. To put it simply, in a linear economy raw materials that are process into a product are thrown away after use while, in a circular economy, raw materials and finished used products are recycles and put into use again and the process requires much more than just recycling. It changes the way in which value is created and preserved, how production more sustainable and which business models are used.

These aspects are explained in more detail below;

From New Raw Materials to Value Preservation

The circular system and the linear system differ from each other in the way in which value is created or maintained. A linear economy traditionally follows the "take-make-dispose" step-by-step plan. This means that raw materials are collected, and then transformed into products that are used until they are finally discarded as waste. Value is created in this economic system by producing and selling as many products as possible.

What else is there in a circular economy? According to Andersen (2006), a circular economy follows the 3R approach: reduce, reuse and recycle. Resource use is minimized (reduce). Reuse of products and parts is maximized (reuse). And last but not least, raw materials are reused (recycled) to a high standard. This can be done by using goods with more people, such as shared cars. Products can also be converted into services, such as spotifysells listening licenses instead of CDs. In this system, value is created by focusing on value preservation.

From Eco-Efficiency to Eco-Effectiveness

The perspective on sustainability is different in a circular economy than in a linear economy. When working on sustainability within a linear economy, the focus is on eco-efficiency. This is to minimize the ecological impact for the same output. This will extend the period in which the system becomes overloaded (Jordans, 2016). Within a circular economy, sustainability is sought in increasing the eco-effectiveness of the system. This means that not only the ecological impact is minimized, but that the ecological, economic and social impact is even positive (Mathews& Tan, 2016).

In a linear economy, the production of beef is made more sustainable by changing the way cows are fed, so that they emit less methane gas for the same amount of meat. This makes production more eco-efficient. In a circular economy, production is made more sustainable by not making beef from cows, but by imitating it as a meat substitute. For the beef substitute, plants are then grown that contribute to biodiversity, employment and landscape management. In this way, the ecological, economic and social impact of the same production of 'beef' is increased.In order to achieve eco-effectiveness, residual flows must be reused for a function that is the same (functional recycling) or even higher (upcycling) than the original function of the material(Mathews& Tan, 2016). As a result, the value is fully retained or even increased. For example: concrete is ground into granules that are used to produce the same or a stronger wall again.

This is different in a linear economy. An eco-efficient system typically works on downcycling: a (part of a) product is reused for a low-grade application that reduces the value of the material and makes it difficult to reuse the material flow again. For example: concrete residues are processed in asphalt in the road surface (Bocken, Bakker & De Pauw, 2015; Ellen MacArthur Foundation, 2014).

Other Business Models

A linear model deals with raw materials in an inefficient way, because the emphasis is not on their conservation. In a circular economy, this is the focus. This means that other business models are also used in a circular economy, with more emphasis on services rather than products. An example of a model that facilitates the transition to the circular economy is a product-service combination (Product-As-A-Service System), which is seen as a model to integrate products and services (Mentink, 2014). A widespread example of a product-service combination is the Xerox printer system, in which companies receive a printer free of charge and pay per copy. This system fits well within the circular economy, because as a manufacturer, Xerox has an interest in ensuring that the printer will last a long time, by being able to repair and update it. In the linear sales system, the manufacturer often benefits if the product breaks down quickly so that it can sell a new product.

Table 1: The Difference between a Linear and a Circular Economy

Economy	Linear	Circular
Step plan	Take-make-dispose	Take-make-use
Focus	Eco-Efficiency	Eco-Effectiveness
System boundaries	Short term, from purchase to sales	Long term, multiple life cycles
Reuse	Downcyclying	Upcycling, cascading and high grade recycling.

A circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the end-of-life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse and return to the biosphere, and aims for the elimination of waste through the superior design of materials, products, systems and business models.

Materials Circulate in a Circular Economy

In a circular economy, materials circulate in two separate cycles: the bio-cycle and the techno-cycle. The distinction between these cycles helps to understand how materials can be used in a long-lasting and high quality way. A general rule of thumb is that the less process steps a material has to go through for reuse, the higher the quality of the material it can contain. A bio-cycle is the cycle through which energy and essential substances are transferred among species and between the biotic and abiotic segments of the environment, such as;

Technical and Organic Materials

Organic materials, such as coffee, plant fibres, chitin, wood, and bamboo grow, exist and decompose in the ecosystem by means of biological processes. In a circular society, material consumption should be a circular process in which renewable resources and waste streams are used for new bio-based materials. In such a society, bio-based materials are also reused, repaired, recycled, and remanufactured. The materials on display are great examples of that; made of renewable sources or waste streams man never expected.Organic materials follow a different reuse process than technical materials. Technical materials are also called synthetic materials. Because of this difference in the reuse process, it is important that after use, organic and technical materials can be properly separated from each other after use. Technical materials such as fossil fuels, plastics and metals have limited availability and cannot easily be recreated. In the techno-cycle it is important that stocks of such finite materials are properly managed. In a circular economy, these materials are only used instead of being consumed. After use, materials are recovered from residual flows at their original value.

Organic materials such as wood, food and water can be incorporated into the ecosystem and re-generated through biological processes. In the bio-cycle it is important to let the ecosystem do its work as well as possible. Consumption may take place during this cycle (fertilization, food, water) as long as the streams are not contaminated with toxic substances and ecosystems are not overloaded. Renewable organic raw materials can then be regenerated (Ellen MacArthur Foundation, 2015a).

Techno-cycle is the use e-waste recycler, and electronics refurbisher/resellertechnical materials, for businesses, individuals, and community such as plastics, metals, concrete and glass are finite and cannot be renewed. In the techno cycle, it is important that the finite stock of

materials is properly managed. ‘Using’ materials replaces the ‘consumption’. By focusing on value retention, materials are recovered from residual streams after use. These materials on display are all recycled and show that itis possible in many ways;

The Inner Circle

Within the techno-cycle there are different levels of reuse. The rule of thumb is that the smallest or inner circle is preferable to larger cycles, because these require less processing, labour, energy and new material to be of original value again (Ellen MacArthur Foundation, 2015a).

The different reuses within the techno-cycle are:

- ***Maintanance and repair:*** Repair and maintenance during use to extend the lifespan.
- ***Reuse/redistribution***: Direct re-use by re-marketing a product.
- ***Refurbish/Remanufacture:*** The thorough refurbishment and repair of a product by the manufacturer.
- ***Recycle:*** Retrieving parts or materials from the product for reuse.

Re-Use in Cascades

Within the bio-cycle, reuse takes place in cascades. Cascading means ‘using (part of) a product for another application’. When a product is no longer able to perform its initial function, it is passed on for reuse. During cascading, the quality of the material is reduced and energy is consumed (Ellen Macarthur Foundation, 2013a).

Cascading differs from ordinary re-use and recycling in that it changes function and the extent to which the product is processed. A cotton T-shirt can serve as an example. When reused, a worn T-shirt is sold in a second-hand shop. When recycled, the T-shirt is shredded into cotton fibres, which are then spun into new yarn. Cascading is the use of old T-shirts as cushion filling.

Long-Term Cycles

For both the bio-cycle and the techno-cycle, the lifespan of a product must be made as long as possible. The lifespan of products can be extended by:

- Ensuring that a product is used longer, thereby ‘slowing down’ the process, for example by focusing on emotional attachment to a product, lasting fulfilment of a need and adaptability of the product, so that it can keep up with the times.
- To ensure that multiple consecutive cycles of direct reuse are followed, by facilitating the interchangeability of products and by properly maintaining products so that they can be used for a long time without repair (Ellen MacArthur Foundation, 2015a; Bocken, Bakker & De Pauw, 2015).

Pure Flows

For both the bio-cycle and the techno-cycle, residual flows that are not contaminated with other materials are the easiest to collect and re-use. By ensuring that materials are easily separated

from each other after use and that residual flows are collected in such a way that they are not contaminated with toxic substances, residual flows are the most useful (Ellen MacArthur Foundation, 2015a).

Types of Recycling

There are three types of recycling, known as primary, secondary and tertiary. Primary recycling means that the recyclable material/product is recovered and reused without being changed in any way and usually for the very same purpose. Secondary recycling means that the material/product is reused in some other way without reprocessing, while tertiary recycling refers to a process that involves chemical altering of the material/product in order to make it reusable.

Primary

In order for the material/product to be classified as primary recycled, it must not be changed in any way. In a way, primary recycling can be defined as secondhand use - reusing yourself, donating to a friend, family member or charity organization, or/and selling, for example at an online auction.

Secondary

This type of recycling involves some sort of modification of the material/product without the use of chemical processes. Examples include cutting the egg box in half to use it as a seed starter, cutting the upper half of a plastic bottle to use it as plant pot, cutting and reshaping various waste products to make arts and crafts, cutting envelopes into smaller pieces to use them as scrap paper, etc.

Tertiary

If a material/product has been tertiary recycled it means it has been reprocessed either by a chemical process or heat. Examples include melting metals, chemically treating old paper and breaking down plastic bottles in order to make brand new products. Tertiary recycling can be external or internal. If it is external, it means that the recycled materials/products were recovered and reprocessed. Waste sorting and putting it in recycling bins are to be collected and transferred to reprocessing facilities. Internal recycling means that the materials/products were recovered without public participation, for example within factories and manufacturing facilities.

The Opportunities on How to Make Money from Waste

There are a number of opportunities entrepreneurs can exploit in Africa’s large and growing waste market. We shall at all the interesting but under-tapped segments of this market and how you can start taking advantage of them.

Waste Collection

Many individuals, households and businesses are very willing to pay waste and refuse collectors to get rid of their full (and often overflowing) garbage bins and cans. Most collectors charge a flat monthly fee for the service or charge customers every time a collection is made. The

common way of collecting solid waste from neighbourhoods or business premises is to use a waste collection vehicle like a garbage truck (or dustbin lorry).

Unlike in the past when most people found it easy and convenient to dump their garbage in authorized dumpsites which end up blocking drains and causing environmental hazards, some African countries are becoming more environmentally responsible. Due to stronger health, hygiene and sanitation laws in many African cities, the illegal dumping of refuse has become much harder for most people. More households are now willing to pay local waste collectors to get rid of their garbage.

Inorganic Waste Processing

Waste that cannot decay and be reused by nature is considered inorganic. This includes plastics, rubber, glass, metal and textiles. Most of the domestic and commercial waste collected by garbage trucks is sent to a land fill (where they are buried in the ground) or to a waste processing facility. At these facilities, all the waste collected is sorted, cleaned, processed and recycled into some form of final or semi-final end product. The most popular recyclable materials that are highly sought after by manufacturers and industrial processors include:

Paper: This usually makes up a large portion of the waste collected. Waste paper (like newspapers, magazines, cardboard and old books) can be used to make paper bags, cardboard and carton boxes for new electronic equipment. With many developed and developing cities banning the use of plastic and nylon bags, recycled paper is becoming the top choice for producing biodegradable paper bags used for shopping. Potential buyers of processed waste paper are: pulp and paper mill, market vendors, paper dealers and middlemen.

Plastic: This is arguably one of the most common forms of waste in developed and developing cities. Waste plastic such as plastic bottles, used plastic tins and containers and shopping bags can be melted and formed into an amazing range of new and reusable products. Potential buyers of processed plastic include: plastic product manufacturers, industries, and middlemen.

Metal: Scrap metal, auto wrecks, aluminum (beverage) cans, used copper wires and used metal sheets can be melted to produce new metal products. Potential buyers of scrap metal include aluminum and metal Industries, scrap dealers and foundries.

Rubber: Used tyres, old rubber shoes and other waste material made of rubber can be sold to home industries that make shoes, sandals, mats and carpets. Tyre making factories (like Dunlop), and industries that use boilers (like cement makers) are also top buyers of rubber waste.

Textiles: Old clothes can be recycled and used for the production of doormats, cushions, mattresses, children's underwear, homemade caps and duster coats, stuffing dolls and several other products. Textiles are also used in the production of high quality paper. While sorting and cleaning collected waste may require significant labour, processing the waste materials will require an investment in machines and processing equipment such as hoppers, extruders, aggregators and rollers.

Organic Waste Processing (Composting)

Most of the waste collected from households, restaurants, bars and hotels are organic and biodegradable (can decay) such as kitchen waste and leftover food. Other forms of organic waste include: yard waste, vegetable market waste, grass, plants and animal waste. Composting is the natural process of converting organic waste into a stable product (compost) under controlled conditions. Compost is a natural product that is rich in several essentials nutrients which makes it a great and widely popular organic fertilizer. It contains huge amounts of humus (the stuff that remains when organic things fully decay) which is great for growing plants. Compost is considered a much cheaper alternative to common but expensive inorganic fertilizer.

Compost is also preferred by vegetable and flower farmers because it allows the soil to breathe (more air) and hold more water. This makes it a favourite in hot and humid climates (like Africa's) where the rate of decay can be really fast. The composting process takes between 21-28 days to complete during which a heap of organic waste is turned and wet with water every 5 days. As soon as the compost is mature, it can be packaged and sold as organic fertilizer. Most people in the compost business often use worms, heat and moisture regulators to speed up the process. For a step-by-step guide on making compost, society should use this very detailed resource.

The number of entrepreneurs and businesses involved in waste management in developed and developing nations will increase quite rapidly in the future. As resources like wood become scarcer and climate change remains a strong global challenge, developed and developing nations will need to reduce waste and recycle more. Waste is everywhere; it only requires a bit of creativity and hardwork to create wealth out of it.

BENEFITS OF CIRCULAR ECONOMY

Wealth Creation and Employment Generation: Circular business models will gain an ever greater competitive edge in the years to come because they create more value from each unit of resource than the traditional linear 'take-make-dispose' model **(**Stahel, 2010). Circular economy gives room for wealth creation and job opportunities for any society that decides to go circular economy. Accelerating the scale-up promises to deliver substantial macroeconomic benefits, as well as open up new opportunities for corporate growth. The materials saving potential alone are estimated at over a trillion dollars a year. The net employment opportunity is hard to estimate, and will largely depend on the labour market design. But even today, the job creation potential of remanufacturing globally and recycling in developed already running to millions.

Circular Supply Chains are up and Running and they Have Gone Global: The global secondary fibre stream for paper and cardboard is one example. The economics of such arbitrage opportunities are expected to improve as raw materials prices rise and the costs of establishing reverse cycles decline. Trends favouring lower costs and making it possible to close the reverse loop include urbanization, which concentrates demand, allowing tighter forward and reverse cycles. Advanced tracking and treatment technologies also boost the efficiency of both forward and reverse logistics. Governments have started to provide stimuli, too: higher charges for landfill increase the competitiveness of circular products, and thus the arbitrage opportunities of setting up reverse cycle options.

Supply Chains are the key Unit of Action, and will Jointly Drive Change: In its most extreme manifestation, the national economy is a massive conveyor belt of material and energy from resource-rich countries to the manufacturing powerhouse China, and then on to destination markets in Europe and America where materials are deposited or to a limited degree recycled. This is the opposite of a loop. The materials leakage points and barriers to mainstreaming the new model of circular material flows in a globalised economy must now be addressed and overcome. This requires better understanding of the archetypes into which supply chains fall, and the three main barriers to change: geographic dispersion, materials complexity, and linear lock-in. Analyzing the most advanced business cases confirms that a supply chain management approach which balances the forward and reverse loops and ensures uniform materials quality is critical to maximizing resource productivity globally. The transition can begin once the hinge points are identified and acted upon in a concerted effort across companies, geographies, and along the supply chain.

***Defining Materials Formulations is the key to Unlocking Change*:** The materials list is exploding. A wide range of new additives is introduced each year, making post-use valorization ever more demanding. The key is to tame materials complexity by defining and using a set of pure materials stocks at scale, designing out the leakages that hamper classification from the start. Reorganizing and streamlining flows of pure materials will create arbitrage opportunities that generate economic benefits and make investments in reverse cycle setups profitable.

Economic Benefits of the Circular Economy

Circularity has several advantages for the economy. Nationally, the economy would benefit trillions of naira a year from more effective resource management. This is because the cost of raw materials will decrease substantially, while promoting employment and innovation.

Substantial Resource Savings

While the attention for the circular economy is increasing, the extraction and prices of primary raw materials are still increasing. According to Circle Economy calculations, 9% of all raw materials were fully recycled by 2019. In 2018, this percentage was slightly higher at 9.1% (Circle Economy, 2019). In theory, in the circular economy, 100% of all raw materials are fully recycled, and no new virgin raw materials are needed. It will take a very long time for this scenario to be achieved, because methods will have to be found to fully recycle materials that are currently used in products (Ellen MacArthur Foundation, 2015).

Economic Growth

An important principle of circular economy is to decouple economic growth from the consumption of raw materials. As a result, the economy is not hampered by the shortage of raw materials to grow. It is assumed that a move towards the circular economy will promote economic growth. The United Nations Environmental Plan (UNEP) calculated that in 2050 the global economy would benefit from more effective resource use by $2 trillion a year (UNEP, 2017). In a circular economy, this gain would certainly be achieved through increased turnover from new circular activities well as through the creation of more functionality from the same

number of materials and means of production. The development, production and maintenance of these circular products require a specialized workforce, which will increase these jobs. On the other hand, there will be less demand for the extraction and processing of raw materials, which will reduce the number of less specialized jobs. This will increase the value of labour, which is good for employment and GNP (WE Forum, 2017).

Increase in Employment Rate

In a circular economy, labour is valued more than raw materials. As a result, employment is growing. These jobs will expand for labour-intensive recycling and high-quality repairs; jobs in the logistics sector through local product take-back; new enterprises through innovation, service economy and new business models (WE Forum, 2017).

Innovation Motivation

Circular economics challenges innovative solutions based on a new way of thinking. That means thinking about circular rather than linear value chains and striving for optimizations for the entire system. This results in new insights, interdisciplinary cooperation between designers, producers and recyclers and therefore also in sustainable innovations (Kirchherr.,Reike., &Hekkert, 2017).

Change in Demand

A final important factor in the economic benefits of circular economy is the change in and better understanding of the demand side. How companies deal with their customers and the role they play throughout their lives ultimately leads to less use of raw materials, less waste generation and changing production (WE Forum, 2017).

Environmental Benefits of the Circular Economy

The initial goal of the circular economy is to have a positive impact on the ecological systems, which will not deplete or overload them. This is reflected in the ecological benefits of the circular economy. For example, a circular economy emits less greenhouse gases, the soil, air and water remain vital and nature reserves are preserved.

Reduction in Greenhouse Emission

By following the principles of the circular economy, greenhouse gas emissions are automatically reduced on a global scale. Climate change and the use of materials are closely linked. According to Circle Economy calculations, 62% of global greenhouse gas emissions (excluding those from land use and forestry) come from the extraction, processing and production of goods to meet society's needs; only 38% are emitted in the supply and use of products and services (Circle Economy, 2019). For example, emissions from industry in the European Union would fall by 56% in 2050 if the circular economy were to become a reality (SITRA, 2018). The reduction in emissions measured on a global scale will be even greater, because the European Union will no longer import primary raw materials from countries outside the Union, which will also reduce greenhouse gas emissions in those countries.

Significant Soil, Air and Water Bodies

The application of circularity in the economy creates vital ecosystems such as soil, air and water bodies. These ecosystems provide services such as cleaning, products such as fertile farmland, pollination and clean drinking water. In a linear economy, these services are ultimately depleted by constant withdrawal of products or overburdened by the dumping of toxins. If these products are used in a cycle and the services are not burdened by toxic substances, the soil, air and water bodies remain resilient and productive (Stahel, 2012).

A good illustration of this is the agricultural system, which is highly dependent on ecosystem services such as water cleaning, nutrient recycling and pollination. In Europe, for example, a circular approach to our food systems can lead to an 80% reduction in the use of artificial fertilizers. This restores the natural balance in the soil (Ellen MacArthur Foundation, 2016). For this reason, the Ministry of Agriculture, Nature and Food Quality presented its Vision on Agriculture, Nature and Food: Valuable and Connected in 2018. The vision states that the future of our food supply can only be secured if we switch to recycled agriculture.

Conservation of Nature Reserves

The extraction of raw materials and the dumping of waste have a negative impact on nature reserves (Andersen, 2006). These nature areas are important for the preservation of ecosystem services (as explained above), natural and cultural heritage. At the moment, many governments and organizations are mainly involved in protecting nature from extraction and the dumping of raw materials and waste. In order to systematically preserve nature, this extraction and dumping must stop in general. This is achieved within the circular economy (Stahel, 2012).

Circular Economy Benefits for Businesses

The benefits of the circular economy translate into opportunities for entrepreneurs. This creates new profit opportunities, a more stable supply of materials, a growing demand for certain services, and strengthened customer relationships. These benefits are explained below. While circular entrepreneurship brings benefits, there are still often barriers that entrepreneurs encounter.

Latest Profit

As a result of the transition to the circular economy, companies are reducing material costs and developing completely new markets where profits can be made. In many sectors, raw materials are a high cost item. The extraction of new raw materials and the uncertainty about their supply in a linear economy are driving up the price of these materials. Circularity can therefore offer new profit opportunities through lower costs, increased security of supply of raw materials, tighter chain cooperation and a more robust supply chain. In addition, the organization's image is strengthened by showing that sustainability is being put into practice (Vermunt et al., 2019).

Stable Material Supply

A circular economy ensures that the company uses fewer new raw materials and more recycled raw materials, and that the value of these raw materials is maximized over their entire life cycle. As a result, an entrepreneur will incur relatively lower material costs than labour costs, which means that the costs and availability of materials have less influence on the stability of the business model. With more stability, a company can make more favourable and targeted long-term investments (Vermunt et al., 2019).

Growing Demand for Services

Within a circular economy there is a demand for new services, where there are opportunities for employees and entrepreneurs. These new jobs and services are according to the Ellen MacArthur Foundation (2015a):

- Reversed logistics companies that collect, transport, repair and redistribute products after use in order to be reintroduced into the market;
- Marketers and sales platforms that facilitate longer product life and higher utilization rates;
- Experts in remanufacturing and product repair who facilitate reuse and repair.

Optimized Customer Relations

The circular economy offers new business models and opportunities to retain customers. The transition from product delivery to services, leasing models and rental creates a long-term relationship between customer and supplier, because there is more contact during the life of the product (Vermunt, 2019). When the supplier remains responsible for the delivered product, interim service, maintenance, repair and good communication can not only result in customer satisfaction but also customer loyalty, which ensures that the customer will buy products again after the contract expires (Kraaijenhagen, Van Oppen & Bocken, 2016).

An example is the company BMA-ergonomics that provides a residual value guarantee for the sale of its office chairs. After the period of use, the office chairs are bought back and collected from the company that bought them. This gives BMA ergonomics the advantage of being able to refurbish and resell the office chairs. Equally important, the buy-back guarantee means that the customer automatically contacts BMA ergonomics again when they have to buy new office chairs (BMA ergonomics, 2019).

Leakage Points of the Circular Economy

Many systemic barriers are present in the current linear economy. These include a lock-in in a resource-intensive production model, the absence of true pricing, and opposition by vested interests.

Institutional Barriers

- ***Absence of a level playing field*****:** The current economic system is geared towards the demand of the linear economy. Circular entrepreneurship is thus at a disadvantage;
- ***Vested interests*****:** The transition to the circular economy leads to transaction costs, uncertainty and therefore opposition. Additionally, new, circular business models (e.g., the sharing economy) may clash with current rules, regulations and agreements on labor conditions;
- ***Focus on traditional value chain*****:** To close loops new alliances outside traditional value chains are necessary;
- ***Short term perspective:*** Many companies have, for a wide variety of reasons, a short term perspective;
- ***GDP limited as an index*****:** GDP does not take into account costs for society (externalities). Potential for social welfare are therefore underappreciated;
- ***Limitations on annual reporting***: Traditional annual reports and profit and loss statements only cover a portion of social value. *Integrated Reporting*, as well as environmental and social profit and loss accounts complements this.

Economic Barriers

- ***Price ratio virgin secondary resources*****:** Prices of raw materials are fickle. At low prices alternative, secondary resources (of good quality) are not competitive;
- ***Absence of true pricing (externalities)*****:** By not incorporating social and environmental costs in prices economic decisions are based on incorrect market signals;
- ***Limitations on circular business models*****:** Circular business models are more difficult to develop, for instance because financing is more difficult to obtain;
- ***Future investments*****:** Circular business models sometimes require upfront investments, while returns are uncertain or spread out over a longer period. Costs and benefits are often unequally spread over the supply chain due to market power;
- ***Insufficient market demand*****:** The demand for circular propositions is still limited, hindering the business case;
- ***Insufficient qualified personnel*****:** In a growing economy shortages may arise in certain professions needed for a circular economy, for instance professionals with technical or ICT knowledge;
- ***Complexity business processes*****:** In circular business relations are closer and more intense, both inside a company as with external parties.

Way Forward to a Healthy Circular Economy

Functional Institution

Rules and regulations need to be adapted to encourage and promote the development of the circular economy, both nationally and internationally. In fact, strengthening local governmental policies to support its implementation, as well as bringing clear legislation are key to promote the transition towards circular economy business models.

Boosting the Economy

Business transformation is costly. Therefore, financial incentives are essential to achieve circular economy. Lowering VAT on recycled products and increasing tax on virgin raw materials are examples of solutions that could be adopted to accelerate the uptake of circular economy initiatives

Set up global reverse networks

The full potential value of the circular economy goes well beyond simply recycling used materials whether down- or upcycling them. This value is embedded in the reuse, maintenance, refurbishment, and remanufacturing of components and products, so it is equally important to strengthen these reverse setups and capabilities.

Reorganize and streamline pure materials flows

Materials represent the greatest common denominator, and the most universal assets across industries and geographies: they will ultimately require closed loops at a global level to achieve full potential. The key will be to tackle materials complexity and create pure materialsstocks at scale that will generate sufficient economic benefits for participants.

The next generation of ideas

The innovators of the next decades are today's school pupils and university students, so ensuring they are given the opportunity to learn technical and creative skills required is essential.

Setting credible benchmarks

Targets on resource use could be established at global, national and city levels. At the global level this could be an absolute target. Resource intensity targets may be more appropriate in the short term for the emerging economies. As has been seen with carbon emissions, accounting for resources used in imported and exported products is a key political and methodological challenge when developing national targets. Countries and companies need metrics for processes that go beyond incremental resource efficiency improvements and capture more transformative actions, including designing out waste and using sustainable materials. While a credible technical approach is crucial, international experience of developing eco-indicators at national and city levels suggests that the process for agreeing approaches will be equally important to encourage widespread adoption of a methodology

COLNCLUSION

The circular economy offers a transformational agenda that aims to redesign global production and consumption systems. In other words, the concept is all about changing human and society reasoning from mere disposing waste after resources use to take make use after use (recycling). Many of the ideas are decades old, but a combination of environmental and resource price pressures, technological advancements and changes in consumer demand is finally building momentum. Both the private sector and governments increasingly recognize that future

competitiveness will depend on leadership in resource related innovation.Sustainable development requires disruptive changes in the way our societies and businesses are organized. The circular economy (CE) model offers a new chance of innovation and integration between natural ecosystems, businesses, our daily lives, and waste management. The study also highlights the principles, benefits, and barriers to a circular economy.

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