

# CIRCULAR ECONOMY IN INDUSTRY FOR SUSTAINABLE ENVIRONMENT AND ENERGY IN INDONESIA: ECO-QURANIC PERSPECTIVE

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## **CIRCULAR ECONOMY IN INDUSTRY FOR SUSTAINABLE ENVIRONMENT AND ENERGY IN INDONESIA: ECO-QURANIC PERSPECTIVE**

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### **Abstract**

This article explores the circular economy concept applied in industry for sustainability of environment and energy in Indonesia. Some studies have weaknesses in its application in the economy and business, because of the value of products, materials, and resources that are maintained in the economy on a continuous basis. However, this process does not pay attention to environmental ethics which can cause new problems for humans, especially for sustainable environment and energy. With the eco-Quranic perspective as an approach formulated from the Islamic economic viewpoint, the circular economy is an important part of solving environmental and renewable energy problems in Indonesia. This paper concludes that a circular economy implemented in a circular business model that reuses products, materials, and resources for industrial purposes is the duty of every consumer in making religious values the principle of implementing a circular economy in every production chain in the industry towards sustainability of environment and energy.

**Keyword:** Circular economy, sustainable environment, sustainable energy, business model, eco-Quranic.

### **1. Introduction**

The paradigm of a circular economy (CE) is one solution to improve the sustainability of the economic system. Various sectors have utilised the reuse, repairs, and recycling of products that have been used so that companies also have an interest in this CE (Elia et al., 2017). Environmental development with the resulting impact has put great pressure on the environment nature makes this CE the right choice in terms of the **macro-scale** (for example, ecological parks) and the **micro-scale** (for example, manufacturing products) with the risk of **ignoring the impact and potential of the individual building of the mesoscale** (Ghisellini et al., 2016; Pomponi & Moncaster, 2017).

The development of a national strategy for the Indonesian government through the Ministry of National Development Planning (Bappenas) on CE as a new economic model is expected to increase growth, create new jobs, and tackle climate change. This national strategy aims to increase competitiveness through investment from the private sector and facilitate partnerships between the public and private sectors in implementing CE, thereby supporting the achievement of the Sustainable Development Goals (SDGs), specifically SDG 12 on sustainable consumption and production (Kurniawan, 2020).

In the developing of CE, raw materials can be used many times for various product life cycles, so that the extraction of raw materials from nature is far more effective and efficient, as well as the position of manufacturing as a leading sector and broad impact in transforming

the national economy into a circular economy. The CE does not recognise waste because it continues to spin, so natural resources are used more effectively and efficiently, and encourage the use of alternative energy (Anggraeni, 2019). With the CE business model, this environmentally friendly economic system can maintain the value of the product so that it can be used repeatedly, without producing waste (zero waste) through the way of recycling or remanufacture. From an economic standpoint, waste is a commodity that has the potential to be developed because the value of this waste business reaches Rp 35.5 billion in 2015 and the growth of the waste business reaches 7.2% annually (Hartriani, 2016).

The model of CE will facilitate the transition from a natural resource-based economy and the main solution to achieve zero pollution and an environment free of toxic waste when Indonesia starts an industry and service-based economy in the next decade. Transitioning to CE is an important step towards sustainable development to reduce the consumption of natural resources and think more intelligently with the resources that have been used (Kurniawan, 2020).

Change and innovation in realising sustainable development especially in large industries require integration between sustainability and business development through the CE model. Some obstacles were found in the form of financial, structural, operational, attitude, and technological aspects (Ritzen & Sandstrom, 2017). A collaborative approach that focuses on business-oriented resource efficiency known as Industrial Symbiosis (IS) is used in the CE framework as a new approach to sustainability and sustainable development today (Cecchin et al., 2020).

The development and sustainability of CE are in great demand by academics, industry, and policymakers (Geissdoerfer et al., 2017), because of ways to address production and consumption models based on sustainable growth and increased resource yields, increasing efficient use of resources that focus on urban and industrial waste, and to achieve a better balance and harmony between the economy, the environment, and society (Ghisellini et al., 2016). The framework for innovating sustainable circular business models (CBM) by adding important perspectives in the form of recognising trends and drivers at the ecosystem level, understanding the value for partners and stakeholders in the business; and evaluating the impact of sustainability and circularity (Antikainen & Valkokari, 2016).

The trend of CE is characterised by the recovery and circularity of product components in response to inefficient resource management in traditional linear models. The new business model developed is a Product Service System (PSS) that integrates products and services to meet customer needs so that companies achieve resource efficiency through CE (Michelini et al., 2017).

In the CE, projects must focus on improving resource productivity and eco-efficiency comprehensively, especially optimising industrial structures or products, developing and implementing new technologies, improving equipment, and improving management. CE is an economic model that replaces LE and solutions to environmental damage, social justice, and long-term economic growth, or in other words, this CE is a tool for sustainable development.

This CE emphasises the redesign of process and material cycles that contribute to sustainable business models (Millar et al., 2019; Yuan et al., 2006).

However, some constraints arise due to technological or cost issues, so CE still needs studies from various aspects (Yuan et al., 2006), does not have an inherent social dimension in sustainable development that limits its ethical dimension, and some consequences that are not desirable (Murray et al., 2017), even lacking scientific content, quite shallow, and disorganised, so CE is only a collection of ideas that are vague and separate from several fields and semi-scientific concepts (Korhonen et al., 2018a), as well as the concepts of CE and SD, have not been thoroughly defined or explored, so there is inconsistency in various literature about how CE as a tool for elementary school and incomplete understanding of its long-term effects that are different from the effects of CE itself (Millar et al., 2019).

CE is built on the concepts of environmental efficiency and eco-effectiveness (de la Torre et al., 2021), an eco-friendly economy that limits production flows to sustainable use of natural resources and energy (Korhonen et al., 2018a) so that the relationship between CE and renewable energy for environmental protection (Olabi, 2019). Through CE, resource management requires sustainable management of the industry, because CE contributes to SDG 6, 7, 8, and 13 (water, energy, economic growth, and climate change) (Geng et al., 2019) or SDG 6, 7, 8, 12, and 15 (Clean Water and Sanitation, Affordable and Clean Energy, Decent Work and Economic Growth, Responsible Consumption and Production, and Life on Land) (Schroeder et al., 2019).

CE is concerned with the transition from fossil fuels to renewable energy through the greater absorption and transition of renewable energy (Mutezo & Mulopo, 2021), a new development strategy that aims to reduce the contradiction between rapid economic growth and shortages of raw materials and energy (Christis et al., 2019), even the adoption of CE livestock waste as potential use of renewable energy (Islam et al., 2021). Therefore, CE as an economic system that minimises resource input into and waste, emissions, and energy leakage from the system is expected to reduce negative impacts without jeopardising growth and prosperity (Geissdoerfer et al., 2018).

CE is a new economic system that aims to increase the efficiency of resource use to achieve an increase in the existing balance between the economy, environment, and society (Ghisellini et al., 2016), and the flow of closed materials and the use of raw materials and energy through a reduction phase, reuse, and recycling of materials and energy (Gan et al., 2013).

The purpose of this article is to fill gaps in CE studies and analysis of environmental and energy sustainability from an eco-Quranic perspective in Islamic economics. Development issues that have an impact on environmental damage and energy used up, and produce waste will be analysed from the perspective of the al-Qur'an (eco-Quranic) economy which contains ethical responsibilities in achieving environmental and energy sustainability goals.

In the beginning, we will discuss Islam and sustainable environment and energy: the eco-Quranic for the circular economy. The second part will analyse from CE to circular business

practices in industrial and social institutions. The third part, the policy of CE and its Implementation for the industry in Indonesia.

## 2. Literature review

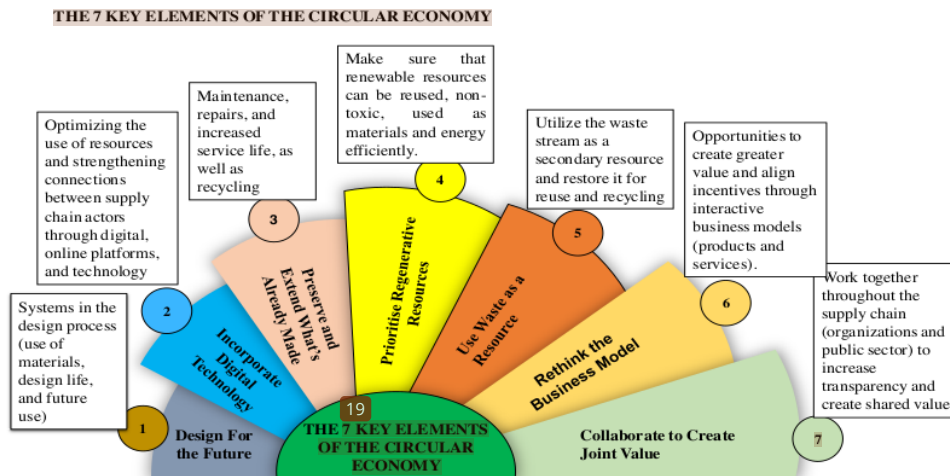
### 2.1. The concept of circular economy

The CE as a popular idea in business policy and advocacy groups is only done at the practical and technical level of the actual physical flow of materials and energy in consumption-production systems. This concept still requires exploration of aspects of the values of social structure, culture, the underlying worldview, and paradigmatic potential (Korhonen et al., 2018b).

The CE is rooted in ecological and environmental economics and industrial ecology. The CE aims to be promoted as a top-down national political goal (China), a tool for designing waste management and environmental policies from the bottom up (European Union, Japan, and the United States), the adoption of cleaner production patterns at the company level, increasing the responsibility and awareness of producers and consumers, the use of technology and renewable materials (where possible) and the adoption of policies, tools that are suitable, clear and stable. Meanwhile, the main objective is to separate environmental pressures from economic growth (Ghisellini et al., 2016).

The CE as a transitional economic system arising from natural resources is experiencing severe depletion due to the social system of LE caused by-product disposal at the end of product life. The new economic model called CE is called for by several governments and institutions, such as the European Union and The Ellen MacArthur Foundation. One of them is the Europe 2020 strategy which states that the European Union has no choice but to transition to a circular economy with efficient and regenerative resources (Michellini et al. 2017). The term of CE can be classified into 7 key elements as shown in Figure 1:

19  
Figure 1: The 7 key elements of the circular economy



1  
The concept of CE is as a new economic model that aims to encourage sustainable economic growth, increase global competitiveness, and generate new jobs. To make the mainstream of the circular economy, radical and systemic innovation is needed (Antikainen & Valkokari, 2016). This theoretical approach about CE, its strategy and implementation case is discussed in a variety of approaches and underlying principles for developing CE (Bocken et al., 2017). With the umbrella concept, CE serves as a catalyst in sustainable waste and resource management to extend resource use and the relationship between existing strategies (Blomsma & Brennan, 2017).

This CE can also be utilised as a CBM based on remanufacturing and reuse with an emphasis on significant cost savings and a radical reduction in environmental impacts. However, many product-service system variants that facilitate backflow control in the CBM actually exacerbate the potential negative effects of reducing the failure of uncertainty, due to increased capital commitments (Linder & Williander, 2017).

Although this CE provides a new business model that produces resources that are efficient and sustainable, 16 has weaknesses due to the absence of social and ethical dimensions. Therefore, this CE can be updated as an economic model with planning, resources, procurement, production, and reprocessing designed and managed, both as a process and as a result, to maximise the functioning of ecosystems and human well-being (Murray et al., 2017).

## 2.2. Circular economy for sustainable environment and energy

The basic dimensions of CE can be used to assess the sustainability of the artificial environment that emphasises the key role of interdisciplinary research and bottom-up and top-down initiatives in facilitating the transition to 'circular buildings' (Pomponi & Moncaster, 2017). There is a relationship between CE and IS with its concept and application in sustainable development (SD) in the form of a social component of sustainability, especially the potential role of IS in achieving the SDGs target. The IS is a collective approach to competitive advantage in separate industries by creating a network of cooperation to exchange materials, energy, water, and/or by-products, IS plays a role in the transition to sustainable development through the solution of the problem of resource depletion and waste and pollution management (Baldassarre et al., 2019). This CE and IS principles can be applied in different geographical contexts and scales to improve the sustainability of the PR pattern reduction in a country (Cecchin et al., 2020).

So far, every product development process in industrial activities follows a linear economic model based on design, manufacture, use, and final disposal. The CE model as the main strategy to improve overall product sustainability performance includes a strategy to increase the useful life of the product and close material flow in a circular path (Mesa et al., 2018) and is characterised as a restorative and regenerative economy with the use of digital technology that enables the formulation of multiple PSS with economic, environmental and social benefits that support the transition to CE (Pagoropoulos et al., 2017). The PSS has become one of the most effective instruments for moving society towards a circular economy with efficient resources and creating a revolution in the resources that are urgently needed (Tukker, 2015).

CE aims to reduce new material inputs and waste output by closing the economic and ecological loops of resource flows. A socio-metabolic approach to assessing the circularity of global material flow shows that strategies targeting the output side (pipe end) are limited given the proportion of current flow, while the shift to renewable energy, significant reductions in the growth of community stock, and the decisive environmental design needed for forwarding to CE (Haas et al., 2015). Meanwhile, sustainable behavior that starts from every individual in achieving environmental goals is very important to face the threat of climate change, plastic collection in the world's oceans, and loss of biodiversity that causes damage to ecosystems (Joshi & Seay, 2019).

To embed various concepts and approaches into the framework of a green economy towards sustainability, one of which is related to a circular economy that can provide environmental and economic benefits (Loiseau et al., 2016). LE with the 'take-make-use-dispose' consumption model originating from the industrial revolution and the global economy, various social, economic, and environmental factors are no longer sustainable. However, CE as a new model has not been widely practiced so it requires educational facilities for sustainability and enhancing work skills (Andrews, 2015).

The three pillars of sustainability in the form of environment, economy, and society become an integral part of every economic behavior of producers and consumers, in addition to monetary incentives in development. This sustainability behavior is in the form of urban solid waste management by applying the principles of Locally Managed Decentralised Circular Economy (Joshi & Seay, 2019).

The transition in business from a linear economy to CE brings various practical challenges for companies (Bocken et al., 2016). Producers have responsibility for the disposal of products released by the company to the market that encourages initiatives in designing disposal by adopting the concept of a circular economy (Tyler & Han, 2020). CE provides opportunities to optimise and promote sustainable production and consumption through new models based on sustainable growth and unlimited resources. However, studies on the drivers, barriers and implementation aspects that are linked to the perspective of stakeholders or the government in terms of the supply chain do not support the achievement of its objectives, especially promotion through the law, policy, risk reduction (through tax collection), and others (Govindan & Hasanagic, 2018).

There are three alternative environmental concepts that are used in transdisciplinary research and described epistemologically and practically, namely CE, environmental science, and elementary school. The latter two concepts are in conflict with the CE (Sauve et al., 2016). The CE is connected to the concept of sustainability by providing an operational way of implementing it at the environmental and economic level, but social and institutional implications are often overlooked. CE practices focus more on cleaner production with the aim of reducing environmental impact and waste production throughout the life cycle of a product, optimising performance and process efficiency (Merli et al., 2018).

### 3. Methods

Conceptually, CE has a variety of meanings and studies that are related to economic, social, and environmental dimensions. This CE is a solution to the environmental problems that are part of achieving the SDGs. However, a special study of CE from an Islamic economic perspective has a philosophical basis built from the Qur'anic paradigm of creating the universe by God for human life that requires responsible management while maintaining its sustainability. God created this cycle of life from a barren, dry land to green and prosperous people. Therefore, economic and business activities that have religious values in religion are not only aimed at increasing economic growth but also prioritising environmentally-friendly management or so-called eco-Quranic, so that life on earth continues. This study is to fill the gap or emptiness of literature about the concept of CE, sustainability, and the environment which is reviewed from an Islamic economic perspective.

The author uses the following stages: first, analysing the current literature on concepts, strategies, and implementation of CE related to SDGs; secondly, formulating the views of the Qur'an regarding the principles of CE, economic morals, and the role of humans in creating environmental sustainability; third, analyse the concept of CE and its application in industry, especially waste management in Indonesia; fourth, interpret comparatively about CE, SDG,

and environmental relations based on the main concepts formulated by the Qur'an and integrate them to find solutions to current environmental problems; and fifth, drawing conclusions from the previous discussion.

#### 4. Result and discussion

##### 4.1. Islam and sustainable environment and energy: the eco-Quranic for circular economy

The Quran as a holy book of Muslims provides guidance in creating a green environment. This book not only teaches the values of monotheism, worship, and spirituality, humanity and ethics but also positions the environment as part of God's creatures that must be managed and preserved by humans for the sustainability of their lives on earth (Table 1).

**Table1: The concept of circular economy in the eco-Quranic perspective**

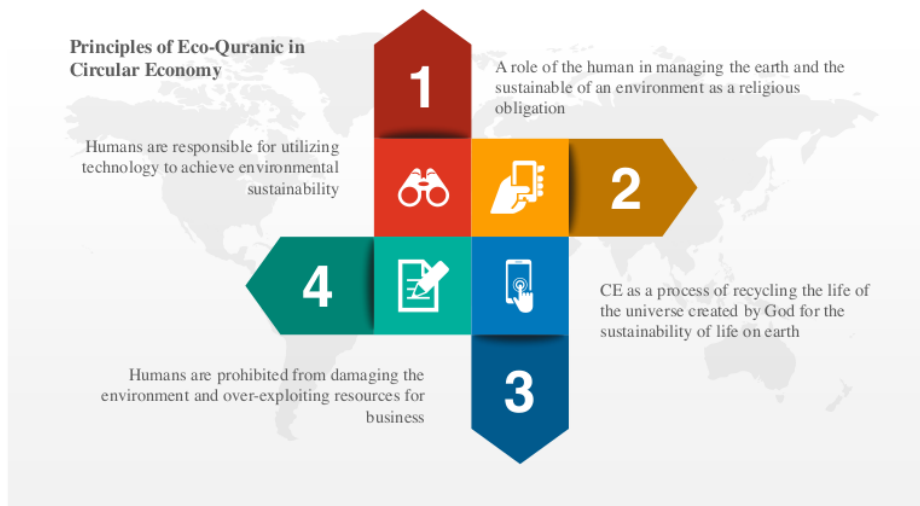
No	The principle of eco-Quranic	Surah and Verses in the Quran	The concept of circular economy
1	Anti-Corruption Police	Al-Qashash. 28: 77	God forbids humans to do damage on earth, including corruption.
		Al-Rum, 30: 41	The destruction of land and sea by humans and God will give them punishment to return to the truth.
2	Call Yourself A Human?	Al-Ahzab, 33: 72	Humans bear the mandate and trust in managing nature and the environment.
		Al-An'am, 6: 165	Humans as caliphs who have intellectual advantages who are responsible for the welfare of all beings on earth.
3	Ending Poverty	Al-Fajr, 89: 16- 20	Humans are miserly and wasteful lives that do not share with fellow human beings in managing labor, resources, and funds to end poverty.
4	Preservation of Water	Al-Nahl, 16: 65	God sends rain from the sky and gives life to the earth that previously died for humans (the concept of a circular economy)
		Qaf, 50: 9	God has rained down and grown all the trees and plants that humans can harvest.
5	Gardens of Paradise	Al-An'am, 6: 99	To end poverty by providing clean water and saving behavior is needed in its use because water is the source of life for all living things.
6	Treating Animals with Dignity	Al-An'am, 6: 38	God sends rainwater from the sky that grows all kinds of plants and green plants and produces fruits, and biodiversity as a resource for human life. This diversity can be produced for human welfare.
		Al-Nahl, 16: 68-69	God created animals as the same community as humans. This animal as a resource that can be utilised for human welfare.
		Al-Maidah, 5: 4	God created bees that can produce honey for food, drinks, and medicine as a resource that can be

7	Eating Wholesome	Al-Baqarah, 2: 60	produced by humans in agriculture or plantations. God provides sustenance to humans in the form of water resources for life and humans are prohibited from doing damage on earth.
8	Patching The Ozone	Al-Anbiya', 21: 32	God made the sky and all of its contents well preserved. Humans are prohibited from polluting air that destroys ozone and raises the temperature of heat on earth.
		Ghafir, 40: 64	God made the earth as a place for human life and the sky as a roof, and provide good fortune. Humans are forbidden to do damage to the earth and sky by doing pollution. The atmosphere that forms the boundary between earth and sky must be well maintained. One thing that can be done is to apply <sup>10</sup> concept of CE.
9	Understanding The Creation	Al-Zumar, 39: 21	God sends rain from the sky and makes it flow like springs (and rivers) on earth, then grows diverse plants, dries and turns yellow, then dies, and so on as a CE concept in the ecosystem of living things.
		Al-Nahl, 16: 15	God planted a mountain so that the earth does not shake, creating rivers and roads as a guide that can be used by humans.
		Al-Rahman, 55: 19-20	God created two seas that flow side by side and there are boundaries that do not exceed each. This sea as a resource for human welfare that should not be over-exploited.
		Al-A'raf, 7: 57	God blew winds that brought cloudy clouds as a sign of rain so that the barren land became fertile and grew a variety of fruits for human welfare.
		Al-Rum, 30: 48	God sends a wind that moves the cloudy clouds so that the rain as a resource for human welfare.
		Al-Ra'd, 13: 12	God created lightning that makes it cloudy, so it rains that grows plants. <sup>10</sup>
10	Respecting The Creator	Al-Isra', 17: 110	Humans are ordered to praise the name of God who created the universe and everything in it. This is the basis of the concept of eco-Quranic which underlies human actions in managing resources on earth and in the sky by not doing damage to it.

Source: Modified from Zaufishan (2013).

The principle of CE in the Qur'an which forms the main basis for realising environmental and energy sustainability can be seen in Figure 2:

**Figure 2: Principles of eco-Quranic in circular economy**

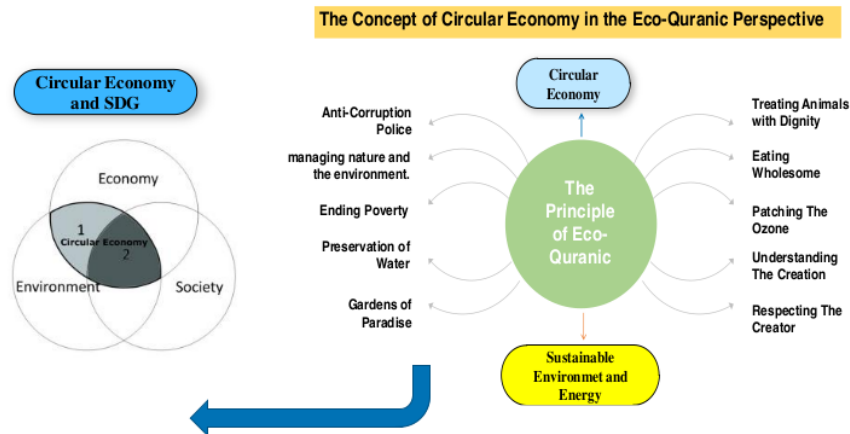


Source: Authors.

In the context of eco-Quran, the earth and the environment as resources given by God to humans for the sustainability of the welfare of life require good management to avoid wasteful behavior on energy and other resources, behavior that causes environmental pollution, extreme climate change and guarantee its sustainability in the future (Figure 3). Because of this, all these resources should be utilised to end poverty, solve social problems and reduce social inequality (Firdaus, 2012; Nuridin et al., 2021) with an efficient system of resource and wealth management for the sustainability of human life (Aziz & Mohamad, 2016).

Renewable and sustainable energy development in an effort to support the transition to a low-carbon future and achieve global emission targets (Klemes et al., 2019). CE can help increase resource productivity and environmental efficiency, reform environmental management, and achieve sustainable development (Ramon et al., 2020).

Figure3: Relationship between circular economy with sustainable environment and energy from eco-Quranic perspective



Source: Authors.

The focus of SDG is on the need for responsible and clean energy consumption, climate change mitigation, and sustainable economic growth through biomass energy that can mitigate CO<sub>2</sub> emissions to create environmental sustainability (Gyamfi et al., 2021). Therefore, there are seven operational principles of CE for SDG's namely adjusting input to system rate to regeneration, adjusting the output from the system to absorption rate, shutting down the system, reducing value in the system, system size, designing for CE, and educating for CE (Suarez-Eiroa et al., 2019).

Carbon-free policies with renewable energy sources to emphasise the bioenergy life cycle during the production process are very important in sustainable development (Ozturk, 2016). The utilisation of greener energy sources for SDG 7 (Onabote et al., 2021). Conservation of energy by carrying out energy-saving campaigns, determining energy conservation laws, and establishing an Energy Conservation Center, and utilising renewable energy sources, such as the use of water, wind, biomass, biodiesel, biogas, and other sustainable energy sources (Faizah & Husaeni, 2018; Jaelani et al., 2017), energy conservation as part of the national energy policy in Indonesia is carried out by applying energy management to the industrial sector as a religious obligation in energy consumption behavior because energy is the main source for the sustainability of human life (Jaelani et al., 2020).

#### 4.2. From CE to circular business practices in industrial and social institutions

The practice of LE is clean production aimed at reducing the environmental impact and waste production throughout the life cycle of a product, and optimising process performance and efficiency. As for the CE with a strategy for social and institutional change, which is able to change the upstream process of production and consumption. CE also adopted a business model strategy that focused on the strategy of closing round materials, while slowing down loops, which required radical changes in consumption and production patterns, only little was included with respect to CE implementation. CE is a developing concept that still needs development to consolidate definitions, boundaries, principles, and practices (Merli et al., 2018).

The CE emphasises converting material and linear and semi-circular flows into a circular flow and obtaining better sustainable benefits. In this case, Industrial Ecology with its tools can assist in the transition to CE (Saavedra et al., 2018). CE strives to restore materials and restore them to productivity, and design pollution, maintain materials for reuse and become regenerative, not conventional discharges in LE. However, for CE to be successful, waste materials need to be returned efficiently for proven production and reuse, recovery, and recycling processes (Tam et al., 2019).

The CE aims to address the linear pattern of production and consumption of take-make-dispose by proposing a circular system that positions the value of products, materials, and resources maintained in the economy as long as possible. This CE study can be identified on three main lines of action taken to change social and economic dynamics at the macro and administrative level, support companies in the implementation of circular processes at the micro-level by disseminating new forms of consumption and product design, and develop at the meso-level to discuss experiences industrial symbiosis (Merli et al., 2018). The application of CE principles is more important related to consumer behavior in the acceptance of remanufactured products and using products as services to encourage the adoption of CE practices (Patwa et al., 2020).

The CE promises sustainable economic growth while scientifically reducing the level of waste production. The basic idea of CE is that all industrial processes can be designed so that the flow of related material is fully consistent with natural cycles. However, this critique of the concept of CE from the philosophy of 'cradle-to-cradle' (c2c) has two design principles that describe the same waste as food and use solar energy today (Braungart & McDonough, 2009). In other words, the design of material flow is used in economic processes or dispersed as natural nutrients to the environment and all energy for the economy comes from 'solar income'. This system can prevent waste and energy or man-made climate problems (de Man & Friege, 2016). The existence of metrics that measure the progress of CE also needs to be made, for example, the use of material quality indicators that include the environmental dimensions of CE with the use of energy from recycled products compared to components produced from primary material inputs only (Steinmann et al., 2019).

The CE as a strategy for sustainable development in the industry by conceptualising the integration of economic activity and environmental welfare in a sustainable manner, such as China which has utilised it in policy formulation and economic development (Murray et al., 2017). In theory, ecological and economic consolidation has contributed to CE as a new economic model that can effectively solve resource and environmental problems. Therefore, China has a core policy for the development of CE in the form of energy savings and pollution reduction (Yong, 2007).

In addition, the CE is a solution to the problem of waste generation, scarcity of resources, and maintaining economic benefits. However, the concept of circularity is applied through activities such as reuse, remanufacturing, or recycling (Lieder & Rashid, 2016). Though the concept of CE is related to the economy of greening and sustainable development. However, this idea has not been much criticised even though its actual implementation is limited and fragile, such as industrial symbiosis and extended product life. For the record, this CE is largely achieved through a global recycling network which is the main means of recovering waste as a resource (Gregson et al., 2015).

Restoration of resources through a global recycling network is considered dirty and illegal trade which is prohibited in European policy. This CE is borne by politically created market conjunctures, material properties and morally determined material circuits. Thus, the recovery of resources in CE is framed by moral economics, driven by the discourse of ecological modernisation, environmental justice, and resource security. In this case, Islamic economics prohibits all recycled products originating from waste containing hazardous materials and can damage human life or the environment when recycled. This not only contains a dangerous chemical, but will also be seen from the types of materials that are legally prohibited, such as dirty or unclean materials, containing elements from the contents of pigs, or animals that are not slaughtered according to the Shari'a. As for unclean or dirty items for certain purposes, such as animal waste which is used for fertiliser plants are allowed as long as it does not stick to the body, clothes used, or materials used as supplies for a Muslim when performing his prayer obligations.

As for the development of Industrial Symbiosis (IS) to encourage more circular and sustainable practices in the manufacturing sector. Domenech et al. (2019) explained that the types of waste streams exchanged with various networks are chemicals, biomass and agricultural by-products, wood and wood pellets, plastics, reusable construction materials, equipment, inert waste and water (different qualities including industrial water), residual heat and steam. This IS contributed to the transition to CE in Europe.

A circular business model to prepare companies that have limited resources in the future, help companies understand customer behavior and preferences in new ways and provide a competitive advantage in the short term. Lacy and Rutqvist (2015) asserted that the adopted circular principle can dominate the market and attract segments of customers. Meanwhile, the problem of the spread of three levels in the form: inter-enterprise circulation, regional circulation, and social circulation has given birth to the concept of CE which is under various cycles of material and energy flow, along with technological advances in wastewater

treatment, organic waste management, development agrarian, and food waste (Kyriakopoulos et al., 2019).

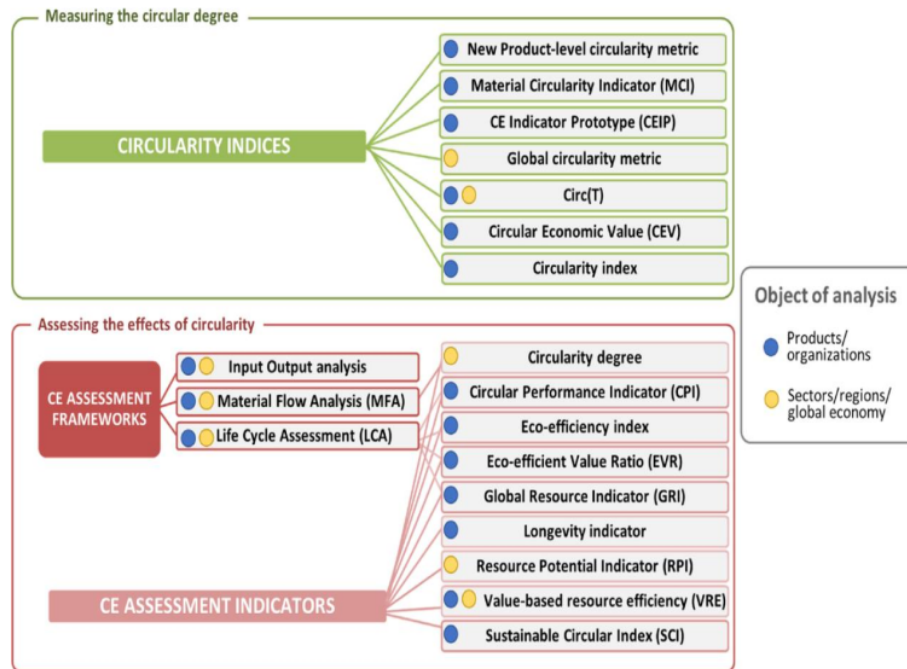
CE operates at four levels: product, company, network, and policy. First, products need to be designed to be recyclable and reusable, based on a green supply chain and manufactured using clean methods. Second, companies need new business models to create private and public value. Third, networks of companies and customers that manufacture and consume key products, such as cars, need to be linked. Fourth, policies are needed to support the market (Geng et al., 2019).

Circularity metrics in CE are important for measuring the circularity of products and services in design, policy and business strategies, and prioritising sustainable solutions on recycling benefits allocated between primary and secondary products (Figure 4) (Corona et al., 2019). On another aspect, sustainability performance by integrating CBM and circular supply chain management is needed to implement the concept at the organisational level towards sustainable development (Geissdoerfer et al., 2018).

Validity requirements to be used for the evaluations of CE metrics. CE validity requirements:

1. Reducing input of resources, especially scarce ones
2. Reducing emission levels (pollutants and GHG emissions)
3. Reducing material losses/waste
4. Increasing input of renewable and recycled resources
5. Maximising the utility and durability of products
6. Creating local jobs at all skill level
7. Value-added creation and distribution
8. Increase social wellbeing

Figure 4: Classification of circularity metrics



Source: Corona et al., 2019.

In Islamic economics, the change of business paradigm from linear to circular can be implemented through an integrated institutional framework for business endowments as a socio-economic institution for the welfare of society, for example, to create successful small businesses and design financial contracts to lend to responsible businesses that switch to equity shares for endowments in terms of defaults (EaD) by replacing collateral and foreclosure requirements (Khan, 2019).

Khan (2019) provides the view that waqf institutions aim to promote responsible small businesses including human development, services to the community, and preservation of the ecological environment and other species. Utilisation all of these waqf resources to change the business paradigm from waste-oriented LE to a zero-waste <sup>23</sup>. This endowment institution can increase business awareness and responsibility to be more inclusive of the environment and other species.

#### 4.3. The policy of CE and its implementation for industry in Indonesia

SDG and CE in various aspects is the main concern of the Indonesian government. This concept of CE has five main concepts: Reduce, Reuse, Recycle, Recover, and Repair (5R). The 5R principle is in accordance with the implementation of the Making Indonesia 4.0 road map with one of the priority programs in the form of accommodating sustainability standards. The principle of 5R is also applied through reducing the use of raw materials from nature through the optimisation of the use of reusable materials, and the use of materials resulting from the process of recycling and the process of recovery, or by making improvements (Anggraeni, 2019).

The Ministry of Industry through the Center for Research and Development of Green Industries and the Environment encourages national manufacturing industries to implement green industries through the Green Industry Certification program. This program is for industrial companies so that their industrial processes can meet Green Industry Standards. In 2010–2018, there were 877 companies from the small, medium, and large industry categories who voluntarily participated in the green industry awards, and 85% or 740 companies had qualified for the green industry. This activity aims to enable industrial companies to synchronise company policies with the principles of the green industry as an initial step towards the application of SIH through green industry certification schemes. The government will also provide fiscal super-deductible tax incentives for industries conducting research and development on the use of the latest energy by providing tax relief incentives of up to 300% of the total investment poured<sup>20</sup> to research on CE and renewable energy use (Anggraeni, 2019). In this case, although a high level of economic growth can lead to high levels of energy consumption and vice versa, the policy of reducing emissions will harm economic growth (Ozturk & Salah Uddin, 2012), so that the green industry policy is considered very appropriate.

The policy of government through this national circular economic strategy will emphasise<sup>7</sup> the economic, social and environmental benefits of the transition to CE, and the potential for joint action between the public and private sectors that require policy changes, the creation of new business opportunities and the creation of new types of jobs for the workforce in Indonesia. This is done to reduce problems in energy use and global warming in the industry. Economic growth is a development priority whose achievements do not cause damage to the environment because energy<sup>20</sup> density and economic growth (globalisation) can increase CO<sub>2</sub> emissions. In other words, economic growth can be encouraged at the expense of the environment itself (Shahbaz et al., 2013).

This innovative dimension of a partnership between UNDP and the Government of Indonesia supported by the Danish government will adopt a very comprehensive approach that goes beyond waste recycling and covers all CE economic, social, and environmental dimensions (Kurniawan, 2020). In this case, the Indonesian government has provided a budget to solve the problem of waste that is inc<sup>13</sup>asingly damaging to the environment. Therefore, financial stability needs to be realised to improve the quality of the environment, although increasing economic growth, energy consumption, and population density are seen as damaging

environmental quality in the long run, so the government needs to design comprehensive financial, economic and energy supply policies to minimise adverse impacts. environmental pollution (Nasreen et al., 2017).

In the third Indonesia Circular Economy Forum, 11 and 12 November 2019, aims to accelerate the implementation of the circular economy in Indonesia, strengthen the commitment of stakeholders, and produce recommendation documents. Circular economic policy can grow the economy in the waste management sector worth Rp 101 trillion or equivalent to 4.1% of the Anggaran Pendapatan dan Belanja Negara/State Revenue and Expenditure Budget 2019 which has a positive impact on environmental quality. This policy can be integrated with the economic, environmental, and social fields, as well as part of efforts to realise the SDGs (Pambudi, 2019).

In Indonesia, the principle of CE is applied through waste reduction from the source. One of them is by studying the creation and utilisation of bioplastics that can decompose themselves in nature, such as in plastic bags that can be converted into biodegradable materials. Waste management efforts are also directed to strengthen the waste management ecosystem by involving partners to manage integrated and sustainable waste. Waste handling infrastructure such as waste banks and Reuse, Reduce, Recycle (TPS-3R) Waste Management Places need to be optimised so that waste packaging that has value can be managed well, then it can be sorted and absorbed by the recycling industry. On the same side, involving the recycling industry can increase waste management to become something of value through a circular economy. This requires a balance between production and market or consumer demands through the ability of the industry to produce goods using responsible materials, because not all plastic is dangerous so that its utilisation can be optimised. In this case, the paradigm of production-consumption flow needs to be changed from linear to circular (Pambudi, 2019).

Indonesia has a garbage collection system through the Waste Bank as a business opportunity from the results of household waste disposal. At present, the number of garbage banks in Indonesia is approximately 5,244, spread across 34 provinces and 219 districts or cities which have contributed enough to reduce national waste by 1.7% from the existing waste generation. This garbage bank as an implementation of the CE principle that can be developed also becomes a source of energy in the future.

The success of waste management is done by redesigning products, packaging, and processes so that they are suitable for input into the value chain (Scheinberg, 2010). Likewise, the success of a sustainable waste management strategy can be done through providing information and education about waste recycling programs from households, cooperation and partnerships in processing waste into compost or plant fertiliser, mastering the science of composter fields that utilise technology in waste management, reward programs in reducing waste, and eco-labeling that characterises product content that can be recycled to be environmentally friendly (Roseland et al., 1998).

Thus, waste recycling becomes part of the application of CE principles that have a business contribution to the condition that it can create environmentally friendly results that are not

harmful to humans. Islamic economics itself has a concept of environmental protection by implementing CE as part of sustainable development which is based on moral, ethical, and social responsibility, and business for human welfare (Hassan, 2016). Thus, environmental ethics emphasises that the supplier's value chain through customers or consumers and the management of production through technology that recycles considers the whole process as environmentally friendly. In this CE, the value of products, materials, and resources is maintained in the economy as long as possible by taking into account the ethical and environmental values that are implied in religious norms about the management of environmentally friendly products (eco-Quranic).

## 5. Conclusion

CE is a new paradigm in creating environmental sustainability through the reuse of resources that have been used by humans. In an eco-Quranic perspective, CE is conceptualised in the form of recycling of life on earth that was created by God for human welfare that emphasises environmental and energy sustainability. As for its implementation, CE which focuses on the value of products, materials, and resources is maintained in the economy and is not allowed to pursue business profits alone, but must pay attention to environmental ethics by focusing on environmental and energy sustainability. One of the methods used to implement the CE concept in Indonesia is the use of renewable energy and resources which are applied in a CBM for the welfare of society.

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