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Promoting Green Skill and Green Vocational Education for A Circular Economy: A Literature Review

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Abstract

This study analyzes the green skills needs of vocational students with four focuses: the status of vocational students' green skills and their introduction into the curriculum, and the relationship between students' green skill indicators and business cycles. The purpose is the approach used in this study is qualitative. Data was collected via an internet browser from articles from Google Scholars, ResearchGate, ScienceDirect, Sinta, and Scopus. and analyzed using thematic analysis techniques. The results showed that the green skills of vocational students cannot meet the labor market challenges because the green skills aspects are not fully introduced into the curriculum. Green skills can be measured using indicators that value the technical skills, knowledge, and attitudes workers need in a green economy. The results of this study are expected to influence the vocational training process to focus more on green competencies, as required by DUDIKA in the implementation of the Economic Circular.

Keywords: Green skill; green vocational; education; circular economy

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INTRODUCTION

The circular economy is an actual theme in the context of Indonesia, which is currently considered the second largest waste producer in the world after China. Data from the United Nations Environment Program (UNEP) states that Indonesia is the second largest producer of plastic waste in the world after China. Every year, there are 3.2 million tons of unmanaged plastic waste. Currently, the linear economic culture of ``make, use and throw away'' is still widely practiced by the majority of Indonesian people. In fact, this culture can have a negative impact on many aspects, starting from the ecosystem, society, to the growth of the Indonesian economy. Therefore, solutions are needed to reduce and prevent problems that arise, in the form of developing and implementing a circular economy in society. In this case, the involvement of the principal as a leader of the educational community is very important in the change process to become an agent of change.

Quality education is one of the target areas of the Sustainable Development Goals (SDGs), a global project that combines the principles of universality and integration and leaves no one behind: The Sustainable Development Agreement. This global project emphasizes the integration of all parties and pays attention to humanitarian rights in its implementation. The fourth SDG of the 2030 Education Agenda is interpreted as a form of agreement with education as a central aspect, with a focus on inclusive education, equality without harming any party, and lifelong learning opportunities (McGrath & Powell., 2016; McGrath, Alla-Mensah & Langthaler, 2018).

The Education Vision 2030 is a commitment to developing the potential of students amidst the turmoil and uncertainty of the global situation, so as to create an order that guarantees the collective prosperity of students in the future (OECD, 2018). In the context

of the SDGs project, several green concepts have emerged to revive the SDGs development direction. The SDGs do not reject progress, but ignore all notions of injustice, inequality and socially harmful practices.

One of these goals is the SDGs focus on economic growth and the creation of decent jobs through sustainable production patterns (McGrath, Alla-Mensah, Langthaler., 2018). The green dimension of the economy in the context of sustainable development provides evidence that the green economic transition can produce and encourage economic development (Ramsarup & Bangsal, 2017). The term green is not only associated with economic concepts; This is implicitly embedded in the pedagogical mechanisms that produce high-quality resources. Demands for changes in the economic climate based on the concept of a green economy must be supported by human resources which ultimately have an impact on developing students' skills and competencies through vocational training. The term "green" is not only associated with economic concepts, but may also be implicit in educational mechanisms that produce high-quality resources. The demands for changes in the economic climate in the green economy concept must be supported by human resources which ultimately have an impact on developing students' skills and abilities through vocational education (Pavlova, 2017).

Indonesian students' professional skills actually prepare them to enter the world of work. However, what happened was just the opposite. This condition actually shows that vocational school graduates make the biggest contribution to the high unemployment rate, partly due to the inability of vocational school graduates to meet the needs of the job market with lifelong skills (DPSMK, 2019). According to the Organization for Economic Cooperation and Development (OECD) survey results in 2016, 4.7% of workers in Jakarta were considered to have low work skills (OECD, 2016). These results fully reflect that there is still a gap between graduate skills and job market needs.

Based on the results of the 2023 World Competitiveness Ranking, Indonesia's competitiveness ranking rose to 34th out of 64 countries in the world, and Indonesia's competitiveness will remain in 44th place in 2022. For your information: This research was conducted by the Swiss Institute of Management Development (IMD) and the Institute of Management (LM) Faculty of Economics and Business Administration, University of Indonesia (FEB UI). In the Asia-Pacific region, India ranks 10th out of 14 countries, ahead of Japan, India and the Philippines.

Based on the assessment and teaching of 21st century skills, it is stated that learning and skills are needed that combine complex thinking with communication and collaboration, ignoring the concept of memorization skills. For this reason, Vocational High Schools (SMK), especially in the fields of business and management, must meet the demands of the 21st century. Skills development in education is realized as civil rights both at school and in the workplace (McGrath & Powell, 2016). Sustainable development skills are a group of skills consisting of skills that support the concept of a green economy and environmentally friendly employment.

Vocational education is a priority in overcoming the challenges of the 21st century, integrating environmentally friendly skills to help reduce poverty and encourage economic growth (Ismail et al., 2017). With the introduction of the application of green skills in competency-based learning in vocational schools, it is hoped that it can increase students' in-depth understanding of the material through problem-based learning and inquiry-based learning. Some countries are promoting the expansion of green skills to promote vocational education. For example, training in South Africa focuses on the demand for green skills in the labor market, and staff training and education needs are also increasing to meet the need for green jobs (Lethoko, 2014).

Learning green skills not only prepares students to be aware of environmental problems, but provides students with skills that can reduce unemployment and poverty. to

create jobs in their environment. The purpose of this paper is to explain how the concept of green skills is applied in 21st century vocational schools. Using case studies on national projects that integrate circular economy thinking and education into all levels of the Finnish education system. The urgency of this research is related to several previous works by Dlimbetova, Zhylbaev, Syrymbetova, Aliyeva (2016). The study found that most working graduates are aware of the need for green skills but do not understand their application in an eco-friendly society. Meeting the demands of a green environment requires 21st century green skills. Economic change can only occur if graduates are able to adapt to boring jobs in fields and move to new industries (Jassel, 2018; McCoy, O'Brien, Novak, & Cavell, 2012).

METHODS

Literature Review A literature review was conducted on the main concepts and phenomena described in the article. More detailed research was carried out with a focus on 4 (four) things, namely the condition of vocational school students' green skills and their implementation in the curriculum, indicators of students' green skills, and the interconnectedness of circular economics from a circular economic education perspective. Keyword research is conducted on drivers and barriers to change generally and within the subject area. Certain basic resources, such as publications from Google Scholars, ResearchGate, ScienceDirect, Sprott, Scopus, PBB and IPCC, are used to define various concepts and phenomena regarding green skills and the circular economy.

RESULTS & DISCUSSION

Results

Circular Economy and the Impact of Climate Change on the Economy

A circular economy is an economic model that aims to generate economic growth by preserving the value of products, materials and resources in the economy for as long as possible, thereby minimizing the social and environmental damage caused by a linear economic approach. Circular economy is a circular economic system that maximizes the usefulness and added value of raw materials. The main principle of a circular economy is the 5Rs, namely Reduce, Reuse, Recycle, Recovery and Repair.

Some of the benefits of a circular economy include:

1. Reducing waste generation and prioritizing the use of renewable energy
2. Supporting efficient use of natural resources
3. Minimize social and environmental damage caused by a linear economic approach
4. Maximizing the use value of a product and its components so that no resources are wasted.

A circular economy also includes a broad set of interventions across all economic sectors, such as resource efficiency and carbon emission reduction. In the supply chain, the circular economy foresees a balanced relationship between quality economic growth and an equally important consumption system.

Impact of Climate Change on the Economy

Climate change can have a negative impact on economic growth. The climate crisis is taking a toll on gross domestic product. A recent study (BA Bastien-Olvera, F Granella, FC Moore, 2022, Persistent effect of temperature on GDP identified from lower frequency

temperature variability', Environmental Research Letters, 17 (8): 084038) found that about a quarter of the countries studied are sensitive to such impacts.

	Temperature rise scenario, by mid-century			
	Well-below 2°C increase	2.0°C increase	2.6°C increase	3.2°C increase
	Paris target	*The likely range of global temperature gains*		*Severe case*
Simulating for economic loss impacts from rising temperatures in % GDP, relative to a world without climate change (0°C)				
World	−4.2%	−11.0%	−13.9%	−18.1%
OECD	−3.1%	−7.6%	−8.1%	−10.6%
North America	−3.1%	−6.9%	−7.4%	−9.5%
South America	−4.1%	−10.8%	−13.0%	−17.0%
Europe	−2.8%	−7.7%	−8.0%	−10.5%
Middle East & Africa	−4.7%	−14.0%	−21.5%	−27.6%
Asia	−5.5%	−14.9%	−20.4%	−26.5%
Advanced Asia	−3.3%	−9.5%	−11.7%	−15.4%
ASEAN	−4.2%	−17.0%	−29.0%	−37.4%
Oceania	−4.3%	−11.2%	−12.3%	−16.3%

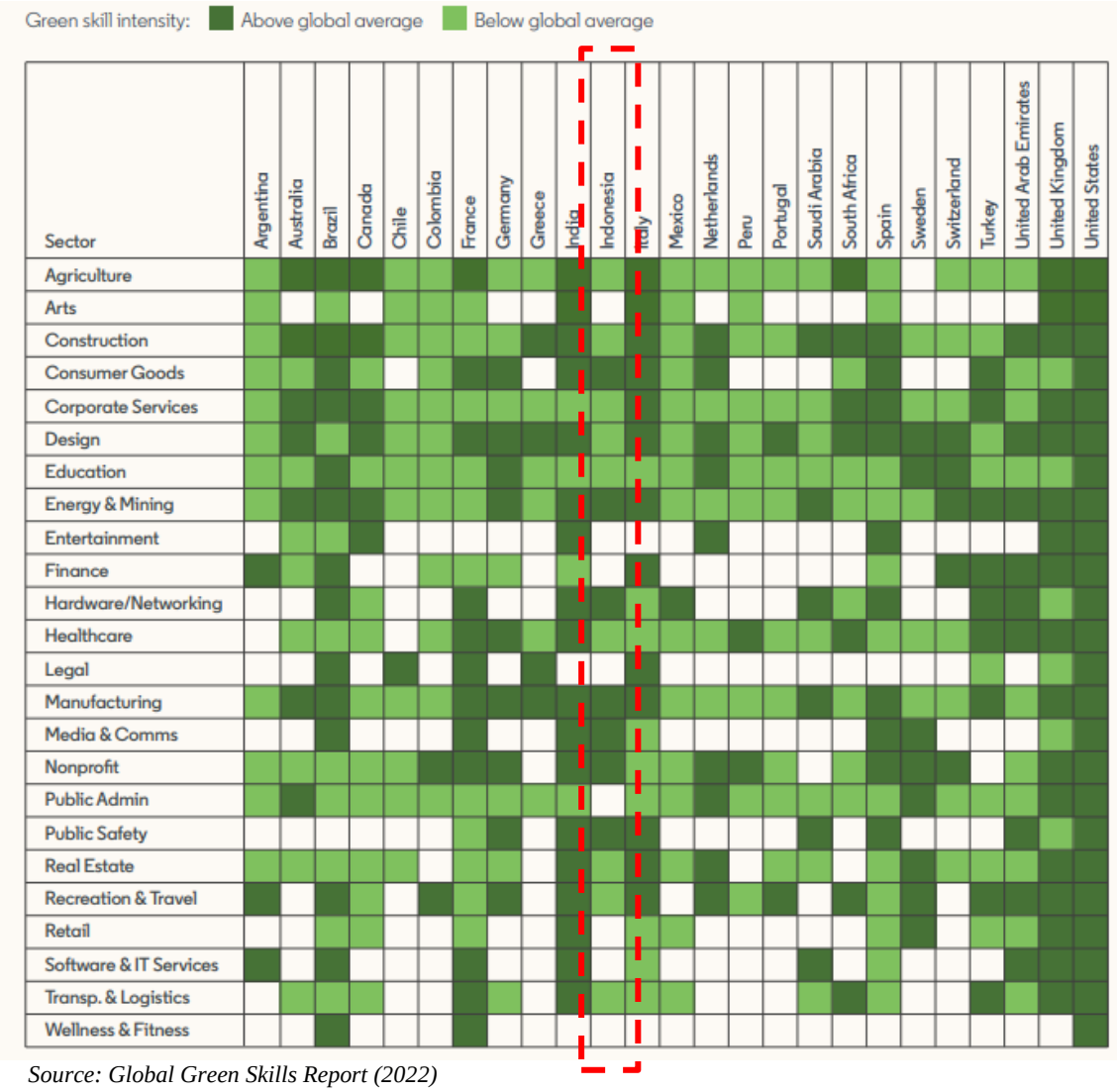
Source: Swiss Re Institute: The economics of climate change (2021)

Figure 1. Global Temperature Rise in Several Regions of the World

The impact of climate change is a loss or gain due to climate change that can be measured or calculated directly, whether physically, socially or economically. Estimating the impact of climate change can be done by analyzing current and future climate conditions using information about climate variables such as rainfall and temperature. Mapping of areas and/or sectors affected by climate change is carried out through discussions between stakeholders, taking into account information regarding certain areas and/or sectors that are vulnerable to disasters related to climate change, and determining priorities for certain areas and/or sectors of concern (flooding). , drought, landslides, strong winds), contribution to Gross Domestic Income (GRDP), national policy, or direction of regional leadership/development programs. The potential impact of climate change on food, water, energy and health could reduce GDP from 0.66 % to 3.45% in 2030. When considering national economic growth of 5.4 to 6.0 percent per year which aims to reduce poverty, reducing unemployment and inequality, and improving community welfare, these potential impacts need to be taken into account in practice. The negative impacts of climate change can disrupt economic growth goals and ultimately hinder development goals.

Green Skills as an Advantage for Vocational Education Graduates

Economic transition can only occur if graduates are able to adapt and move from boring jobs in fields to new industries (Jassel, 2018; McCoy, O'Brien, Novak, & Cavell, 2012). Efforts to increase environmental awareness among students are considered important. In an increasingly complex era regarding environmental sustainability, educational institutions need to start paying more attention to the training of educators and students in environmental management skills known as green skills. Green skills are one of the 21st century skills required to adapt products, services and processes in an environmentally friendly way. The development of green skills as a life skill (life skill/transferable skill) must be carried out through education.



Source: Global Green Skills Report (2022)

Figure 2. Top 25 countries with the higher number of sectors with green skills

This aims to support an efficient and sustainable society. At the end of 2009, the Department of Business, Innovation and Skills (BIS) announced a series of initiatives to respond to environmental change aimed at sustainable development (Education for Sustainable Development, sustainable development policy plan) ESD). In 2011, the UK Government published Skills for a Green Economy, a skills development report linked to the Skills for Sustainable Growth recommendations. Indonesia is one of the countries that has signed several climate change agreements, including the UN Framework Convention on Climate Change and the Kyoto Agreement. Indonesia has adopted several policies regarding environmental technology related to energy regeneration, carbon impact, as well as industrial and educational development. ESD practices must be applied at all levels and learning situations. However, UNESCO emphasized that ESD development is still carried out on a small scale in the form of projects over a certain period of time. UNESCO's findings show that there is no clear policy, perspective or vision regarding the role of ESD in learning and its contribution to improving the quality of graduates, including vocational training. There are still few educational policies for sustainable development in developing countries. Indonesia needs an education policy that supports education in sustainable development programs as the key to a sustainable society and social balance in life.

Green skills are the foundation of the green transition and the key to unlocking the human capital that will drive it. In new job opportunities, there are many opportunities for those with environmentally friendly skills. We must improve the skills of workers who currently do not have those skills. And we need to ensure that environmentally friendly skills are ingrained in us as skills for future generations. Environmentally friendly skills are needed to produce more environmentally friendly fuels for work. To measure the current status and recent evolution of green skills, we used LinkedIn's new green skills taxonomy to measure the extent to which different countries, sectors and jobs use these skills. We call this green skill intensity

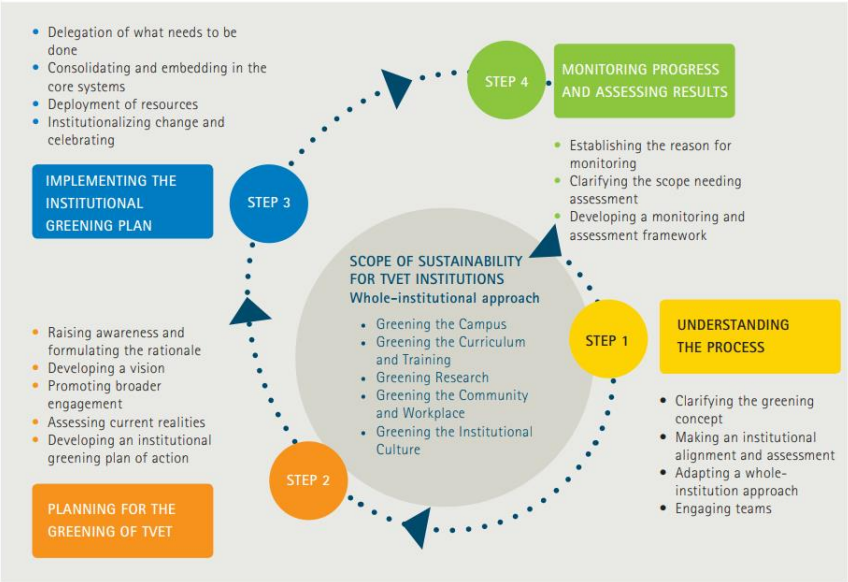
Implementation of Green Vocational School

The application of green skills to vocational education offers several benefits, including environmental sustainability, cost savings and competitive advantages. Employees with green skills can identify cost-saving opportunities, such as reducing energy and water use, and help businesses stay ahead of changing regulations and consumer preferences. This can lead to better profits and a competitive advantage in a rapidly changing economy. Additionally, integrating green skills in vocational education can contribute to workforce development that supports sustainable social, economic, and environmental outcomes. Additionally, it can improve employee morale and attract environmentally conscious individuals. Overall, the application of environmentally friendly skills in vocational education is very important to create a more sustainable workforce and environment, while providing benefits to the world of business and industry.

The implementation of Green Vocational School aims to develop environmentally friendly skills (green skills) in vocational education. The following are several steps that can be taken to implement green skills in vocational education:

1. Identifying the application of green skills: Determining important aspects in vocational education that need to be considered to develop environmentally friendly skills.
2. Optimizing the four other types of education: Combining vocational education with the other four types of education (Language, Culture, Business and Social) to create a more inclusive and environmentally friendly learning environment.
3. Using the citizen project model: Using the classroom action research (PTK) method to improve understanding and skills of green skills through projects carried out by them.
4. Develop environmental care skills**: Increase skills and awareness about the importance of protecting the environment by developing programs that target the sustainable use of natural resources and reducing waste.
5. Integrating green skills in the curriculum: Combining the vocational education context with an environmentally friendly context to create a curriculum that is more holistic and relevant to everyday needs.
6. Increase skills and awareness about green skills: Develop training programs and professional education courses for teachers and students to better understand and develop green skills.

In the context of vocational education, the application of green skills aims to develop individuals who are more environmentally friendly and ready to face the challenges faced by rapid development and change in the environmentally friendly era.



Source: https://unevoc.unesco.org/up/gtg.pdf

Figure 3. Green Vocational School Stages

Discussion

The Urgency of Green Skills and Strengthening the "Greening" of Vocational Education

Implementation of the 2030 Sustainable Development Agenda (Sustainable Development) is one of UNESCO's strategies for 2016-2021 regarding TVET (Technical and Vocational Education and Training) or Vocational Training. Another strategy is to make vocational education more relevant, improve students' skills in the world of work, and support the efforts of UNESCO Member States to achieve decent work, entrepreneurship and lifelong learning. UNESCO has established three pillars of priority areas related to the vocational training strategy for the 2016-2021 period. (2) Promotion of gender equality. (3) Promoting the transition towards a green economy and a sustainable society through the development of environmentally friendly skills, a cross- sectoral approach and encouraging the use of digital technology by UNESCO Member States (UNESCO, 2016).

The green skills required for green jobs include three things. First, there are technical skills, but depending on the industry and type of job, specialized skills may also be included. Second, cross-sectoral skills, including special skills. Third, civic skills for all citizens refer to awareness and behavior that respects the environment. The global economy is now transitioning to an environmentally friendly economy, which requires environmentally friendly jobs and environmentally friendly skills. A green economy leads to increased human well-being and social equality, while significantly reducing environmental risks and ecological scarcity. National surveys agree that building economic recovery after the Covid-19 pandemic will prioritize tackling climate change. Environmentally friendly jobs (green jobs) were born from this agreement.

The International Labor Organization (ILO) defines green jobs as jobs that reduce negative impacts on the environment and ultimately lead to businesses and economies that are environmentally, economically and socially sustainable. Meanwhile, green skills are skills and knowledge that workers can use to prevent, monitor and clean up environmental pollution as well as optimize the management and conservation of natural resources that companies use to produce goods and services. There are more jobs in the green economy

than in the traditional economy. So how are green jobs measured, here are several instruments related to this:

Tabel 1. Green Job Measurement Instrument

Author	Instrument
Pavlova (2018)	Generic green skills indicators are measured in 1) cognitive competence, 2) technological competence, 3) interpersonal competence, and 4) intrapersonal competence
Ismail, Thursday, Kob, Kiong, & Womb (2017)	There are 10 elements of green skills in the development of vocational education in Malaysia, namely (1) communication skills; (2) intellectual skills; (3) interpersonal skills; (4) self-management skills; (5) learning skills; (6) career development; (7) environmental awareness skills; (8) environmentally friendly practice skills; (9) STEM skills; and (10) entrepreneurial skills
Sern et al (2021)	Green skills have dimensions, namely 1) data collection skills, 2) management skills, 3) problem solving skills related to environmental issues, 4) investigating environmental phenomena, 5) analytical skills, 6) green technology exploitation skills, 7) interpretive skills about environmental phenomena
Hamid et al (2019)	Green skill elements include soft skills and hard skills. Soft skills include non-technical skills (attitudes and abilities). Hard skills include technical knowledge and skills in the era of sustainable development.

Indonesia faces several limitations in developing skills that can support the development of green industry, including the following: 1) The majority of the Indonesian workforce are elementary school graduates. 2) Educational development mainly focuses on formal and theory-based methods, thus requiring curriculum redesign and changes in teaching methods. 3) Inadequate management systems hinder the improvement of green skills and the development of green industries. In addition, the Ministry of Education is also aware of the mismatch between the skills needed and the skills currently available in Indonesia. Green knowledge and skills have not been integrated in the development of Indonesian human resources (Gunawan and Fraser, 2013). CEDEFOP (2012) states that the concept of green skills does not receive enough attention because the current young generation views green jobs as unimportant and unpopular jobs.

Determinant Factors for Implementing a Circular Economy

Currently, the government is focusing on implementing circular economy practices in five priority sectors in Indonesia which include food and beverage (F&B), textiles, construction, wholesale and retail trade, and electronic equipment (electronic equipment). These five sectors were chosen because in 2019, these five sectors contributed 1/3 of Indonesia's GDP and employed more than 43 million people. It is believed that implementing a circular economy can provide great benefits for Indonesia in 2030, seen from the aspect of the 3P approach: Profit (economic), namely in the form of additional GDP of IDR 593–638 trillion; Planet (environment), namely by reducing waste by up to 52% in 5 potential sectors and reducing emissions by up to 126 million tonnes or the equivalent of 9% of current emissions output levels; and People (society) by creating 4.4 million new jobs (net), including 75% of them for women

Circular Economy is a model of resource efficiency. In the context of waste management, circular economy practices can be realized through practices of waste reduction, redesign, reuse, reproduction and direct recycling. This is achieved through technology transfer and the implementation of new business models. Since 2015, the Ministry of Environment and Forestry has begun utilizing B3 waste into new resources as part of implementing a circular economy. However, in the field, there are still illegal waste recycling practices and the activities do not comply with environmental standards, thus potentially causing pollution and risks to the environment and human health.

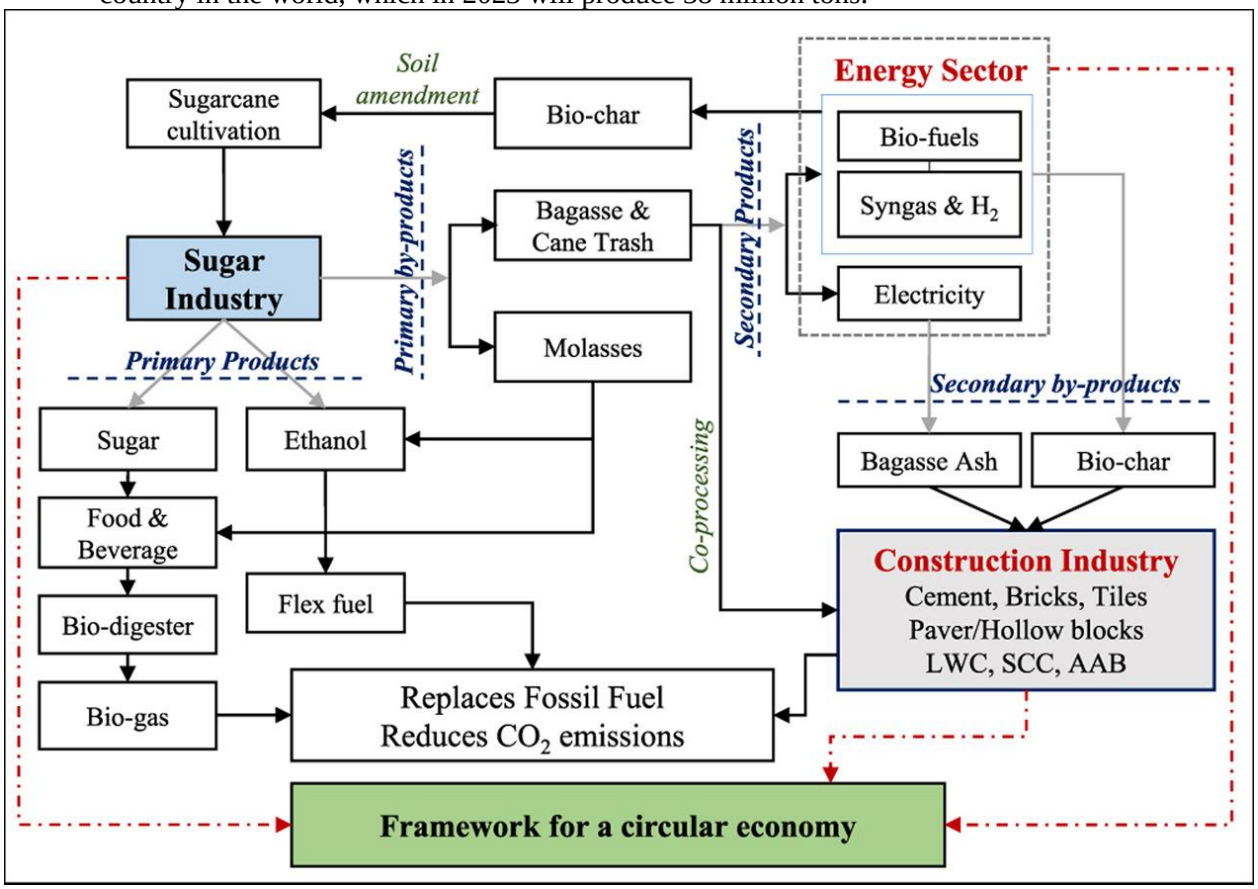
Some examples of circular economy innovations are the use of coffee skins for textile materials. Innovation does not always require huge costs to have extraordinary benefits. That way, selling side output (which is usually called byproducts) can also be a source of income so that productivity increases. Increased productivity in producers who implement circular economy practices has been described empirically in one piece of green research. The results of research conducted on companies in Indonesia show that circular economy practices positively influence company productivity, but at different levels between economic sectors. Apart from that, other productivity determining variables show that companies that implement circular economy practices are more resilient than other companies in general in line with the implementation of circularity and short supply chain principles and designs.

On the other hand, a circular economy not only offers zero-waste (carbon neutral), but also offers the potential for re-absorbing pollution that has been released freely in the air (carbon sequestration) as well as improving biodiversity, especially in the agricultural and livestock sectors. Learning from various green MSMEs assisted by Bank Indonesia, the motivation for implementing circular economy practices by MSMEs varies. Difficulty getting subsidized chemical fertilizer (organic rice). Seeing an opportunity to turn waste into money (water hyacinth, seashells). Or simply because this practice is a practice passed down from ancestors. In fact, Indonesian local wisdom really respects the natural cycles of the environmental ecosystem. Call it the culture of planting holidays in a planting area to provide rest time for the land, which exists among indigenous Papuan communities and indigenous communities on other islands in Indonesia.

Moreover, the emergence of green economy issues has encouraged many countries to start enacting regulations that require economic activities including import, export and investment activities to implement green economic patterns and sustainability. Bank Indonesia's support in green economy and finance (including green MSMEs, digital farming in the context of adaptation and mitigation in the face of climate change) is in line with BI's vision to become the leading digital Central Bank that contributes significantly to the national economy and is the best among emerging market countries for Advanced Indonesia. The manifestation of this concept is the application of the 5R principles in economic activities, namely Reduce, Reuse, Recycle, Recover, and Revalue (provide added value) (Davis, 2020). The implementation of a circular economy in the form of a recycling industry is projected to have the potential to create 1,000 new companies and more than 3 million employment opportunities throughout Indonesia, and can contribute US$ 14 billion or the equivalent of Rp200 trillion to GDP in 2030. As well as reducing waste by 50 percent and reducing greenhouse gas (GHG) emissions by 29-41 percent by 2030.

The application of the circular economy concept is closely related to the achievement of Sustainable Development Goals (SDGs), especially target 6 (ensuring the availability and sustainable management of clean water and sanitation for all), target 7 (ensuring access to affordable, reliable, sustainable energy, and modern for all), target 8 (promote inclusive and sustainable economic growth, productive and comprehensive employment opportunities, and decent work for all), target 12 (ensure sustainable production and consumption patterns), and target 15 (protect, restore and increase sustainable use of

terrestrial ecosystems, manage forests sustainably, stop desertification, reverse land degradation and stop biodiversity loss). The following is an example of the application of the Circular Economy approach to the sugar industry in Brazil, the largest sugar producing country in the world, which in 2023 will produce 38 million tons.



Source: Bappenas (2022)

Figure 4. Framework for Circural Economy

There are several external and internal driving factors for the circular economy. External driving factors include consistent policies to support the implementation of a circular economy, good tax regulation, and consumer specifications. Meanwhile, the internal driving factors include corporate responsibility, shareholder pressure, competitiveness, and good culture and behavior. Apart from that, there are also external and internal obstacles to implementing a circular economy. External obstacles include unsupportive government policies, lack of consumer demand, limited supply chains, and limited technology and infrastructure. Meanwhile, from the internal side, there is a very commercial business model and a culture and attitude that does not support it. Paola revealed that in Indonesia there are obstacles in the recycling sector, including lack of regulation and implementation, cultural misperceptions regarding waste, lack of household participation, and lack of demand for recycled products.

However, in Indonesia there have been several initiatives to support a circular economy, such as using eco blocks or environmentally friendly construction blocks made from plastic waste to build a school in Lombok. Then, there is also a plastic bank to help reduce plastic waste in the sea and have an impact on the environment and society. In the future, regarding the implementation of a circular economy, it can be said that contributing to the implementation of a circular economy can start from oneself. The circular economy

has the slogan reducing, reusing, and recycling which leads to reducing consumption, which means that waste from a production or consumption process can become input to be used in the next process and continue continuously. This is different from a linear economy which has the slogan "take, make, and dispose".

CONCLUSION

The transition towards a circular economy is a future reality that must be addressed by preparing the quality of Indonesia's human resources. Especially in the secondary education sector, especially vocational youth unemployment has become a big problem in Indonesia because it contributes more than 20 percent of total unemployment in Indonesia. Vocational training is an efficient method to reduce unemployment through economically empowering young people by training them to use their hands to create employment opportunities for themselves. If they were trained in one trade or occupation, they would set up small-scale industries that would make them self-employed. There is a gap between the skills workers have today and the skills they need to participate in a circular economy fit for the future. Without improving the quality of vocational schools and appropriate skills retraining, we risk not only leaving workers behind but also limiting our ability to achieve environmental goals in the circular economy era.

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