

# THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

## How to Develop the Circular Economy in Vietnam

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### **Abstract:**

*In the context of international economic integration, promoting the application of the concept of circular economy is a strong tendency in many countries over the world, especially when the world's resources are increasingly exhausted because it helps to better solve the problem of resolving the relationship between the economic growth and the environmental pollution control. Circular economy is a closed production cycle, the resources and wastes of the previous production process are reused, recycled, or salvaged, and the waste streams are turned into inputs for the new production cycle. In Vietnam, the process of accelerating industrialization and modernization has brought remarkable economic development achievements. However, it has to face serious challenges with resource depletion, environmental pollution, and climate change. That reality requires a new approach, i.e., a transition from a linear economy to a circular economy. This article is based on secondary data that has mentioned the benefits of the circular economy, the manifestations as well as the opportunities and challenges for the development of the circular economy in Vietnam, thereby proposing some recommendations for stakeholders to develop an economy that ensures the harmony between economic benefits and environmental protection, economic growth in parallel with reducing the harmful effects of climate change.*

**Keywords:** Circular Economy (CE), sustainable development, environmental pollution, climate change

### **1. Introduction**

Transition to CE is a global trend supported by many countries over the world due to:

- Increasing demand for raw materials for industrial inputs while this source is increasingly depleted, especially for mineral resources because they are not renewable but overexploited, leading to terrain subsidence, resulting in several ecological consequences,
- Dependence on other countries, especially for the country that is dependent on the supply of raw materials, leading to political tensions that tend to escalate globally,
- Impact on climate change, greenhouse cause, accelerating the process of climate change, causing increasingly serious consequences on the environment and negative impacts on everyone's life and health. Environmental pollution caused by industrial waste is a very painful global problem that requires countries to join hands to reduce emissions. The transition to a CE with sustainable energy use will reduce the process of climate change,
- Create business opportunities, especially for organizations and sciences in the field of innovation, design, recycling, and creativity, to utilize available resources with lower input costs.

Therefore, CE is increasingly interested in reusing waste for economic development and limiting the exploitation of natural resources. Achieving a CE is a difficult task, requiring the worldwide efforts of individuals, businesses, and governments. Vietnam is no exception to that trend. Together with the process of national industrialization, modernization, and international economic integration, it has brought about important achievements in socio-economic development. However, the high economic growth rate has directly put great pressure on the environment, requiring more breakthrough steps to gradually transform all sectors of the economy towards a CE. Ramla Khalidi (2022), Chief Resident Representative of UNDP in Vietnam, emphasized that CE is an opportunity for Vietnamese businesses. It is not simply about overcoming negative impacts from the external environment but also an economic transition that preserves and regenerates the natural capital on which people, communities, and economies depending on research shows that the transition to a CE offers \$4.5 trillion in economic opportunity globally by reducing waste, stimulating innovation and creating jobs (*qnd.vn*). Based on secondary data, this paper will generalize about the benefits of the CE, opportunities, and challenges for CE development in Vietnam, and then will propose some recommendations for stakeholders to speed up the CE in Vietnam to keep up with the trend of international economic integration.

### **2. Methodology**

The study uses secondary data from published books, articles, documents, related policies, and laws to show the

benefits of developing a CE and an overall picture of the current situation of CE development in Vietnam under the process of international economic integration. Based on those sources, the authors have synthesized and analyzed them to point out several opportunities and challenges to transform from a linear economy to a circular economy in Vietnam. Then some recommendations to stakeholders are proposed to develop CE in Vietnam in the context of the increasingly volatile global business environment.

### 3. Benefits and Situation of Circular Economy in Vietnam

#### 3.1 Benefits of Circular Economy Development in the World

Pearce and Turner (1990) introduced the first formal concept of CE, which is a new economic model based on the basic principle of 'everything is an input to something else,' quite unlike the view of the traditional linear economy.

The Ellen MacArthur Foundation (2012) describes the CE as an industrial system that restores or regenerates by intent and design. CE is turning the output waste of one industry into an input resource of another industry or circulating within an enterprise/organization: contributing to adding value to businesses, reducing exploitation of natural resources, reducing waste treatment costs, and minimizing environmental pollution. CE is based on three principles:

- Elimination of waste and pollution,
- Circulating products and materials at their highest value, and
- Natural reproduction

It's a system that is resilient to business, people, and the environment. It is a framework for systemic solutions to address global challenges such as climate change, biodiversity loss, waste, and pollution.

According to Wikipedia (2022), CE is an economic model in which design, manufacturing, and service activities aim to prolong the life of materials, eliminating negative impacts on the environment. Cyclic systems apply reuse processes through sharing, repair, refurbishment, remanufacturing, and recycling to create closed loops for resources used in the economic system to reduce the minimum amount of resources used for inputs and the amount of waste generated, as well as the level of environmental pollution and emissions. The goal is to prolong the life of products, equipment, and infrastructure to increase the productivity of these resources.

Thus, CE is a closed production cycle, the resources and wastes of the previous production process are reused or recycled, and the waste streams are turned into inputs for further production export. This activity has been driven by rapid urbanization, climate change, scientific and technological progress, and the growing need for limited natural resources, with benefits that include (*tontoton.com*):

- Reduce the use of non-renewable resources

Through the CE, activities such as reusing resources and refurbishing old products instead of disposing of them are the norm, contributing to less use of non-renewable resources. Making the most of waste for other production processes will be a smarter way to use usable resources.

- Reduce carbon emissions

According to the European Environment Agency, managing materials (such as the production and disposal of materials) contributes to two-thirds of greenhouse gas emissions. However, the CE will help reduce that as its entire model revolves around more efficient and sustainable materials management through reusing products and materials, encouraging the use of renewable resources, maintaining sustainable operations, and more.

- Zero-waste target

From the importance of reusing resources and products, using resources to avoid waste will benefit everyone. Zero waste means less plastic on the ocean's shores, less trash in the ocean, and less landfill. It contributes to reducing the need to exploit limited natural resources, instead reusing them to create useful and environmentally friendly products. The CE model really encourages a balance between the goal of economic growth and the protection of the ecological environment - an ideal goal for industries, individuals, and governments in the more fiercely competitive environment.

- Bring benefits to consumers

Reusing materials hold the promise of increasing disposable income because it encourages activities such as buying used goods, leasing, or subleasing instead of owning and other economic activities. A major concern worldwide is that many environmental acts can deprive some employment opportunities, such as coal mining or other jobs revolving around non-renewable resources, jobs that this has not only been replaced by other opportunities but more so by the emergence of several other recycling industries.

- Open up new opportunities for organizations, such as refurbishing old items, collecting used resources like secondhand clothing or electronics, etc.

Existing companies can also benefit from a more secure supply of resources by reusing existing resources rather than depending on finite resources that reduce the input costs and facilitate companies to operate more efficiently. Moreover, with a social commitment to green initiatives, it will attract and maintain the trust of customers in the new era, helping organizations to expand their market share and reputation and increase customer loyalty to the organizations.

#### 3.2. Circular Economy in Vietnam's Policies and Laws

With the characteristics of a developing economy in the transitional period of accelerating economic industrialization and modernization under the direction of the Communist Party and the State, Vietnam's economy has made certain prosperity recognized by the world. However, Vietnam's vulnerability to climate change easily shows that the transition to sustainable consumer production is a significantly important task. Being well aware of this in recent

years, the Communist Party and State have put into action application guidelines and policies to gradually realize the role of transition to CE. Directive No.36/CT-TW dated June 25, 1998, of the Politburo on strengthening environmental protection in the period of the country's industrialization and modernization clearly stated the need to "promulgate tax and credit policies to support the application of clean technologies" and "applying clean technologies with low waste, low consumption of raw materials and energy." Resolution No.41-NQ/TW dated November 15, 2004, of the Politburo, clearly stated, "Encouraging the recycling and use of recycled products" and "Step-by-step applying measures to force production facilities to importers must recall and handle used products." Directive No.29-CT/TW 2009, Strategy for Socio-Economic Development period of 2011-2020; Resolution No.24-NQ/TW dated June 3, 2013, on Proactively responding to climate change, strengthening resource management, and environmental protection also continue to emphasize and detail the above tasks. Resolution No.27/NQ-CP dated June 12, 2009, of the Government also soon set out solutions for the development of the environmental industry, guiding the implementation of cleaner production, applying clean and environmentally friendly technologies, changing the industrial production model towards sustainability, and orienting to a green industry. The Law on Environmental Protection 2005 and 2014 stipulate a number of articles on environmental protection, including exploitation, rational and economical use of natural resources, promotion of recycling, reuse, and reduction of waste. Vietnam Sustainable Development Strategy period of 2011-2020, Environmental Protection Strategy to 2020 and vision to 2030, Green Growth Strategy period of 2021-2030, Decree No.38/2015/ND-CP, Decision No.16/2015/QĐ-TTg and especially Decision No.491/QĐ-TTg on Adjusting the National Strategy on Integrated Solid Waste Management in 2018 are typical policies, demonstrating policy shifts continuously towards CE tendency of Vietnam (Tran Hong Ha, 2019).

CE is officially indicated as a solution for effective management, allocation and use of resources, environmental protection, and response to climate change in the Socio-Economic Development Plan 5 years 2021-2025, and the Socio-Economic Development Strategy 2021-2030, with a vision to 2045, including building a roadmap, mechanisms, policies, and laws to form and operate the CE model; encourage the development of the CE model for integrated and efficient use of the outputs of the production process. Article No.142, Law on Environmental Protection 2020 (Quoc hoi, 2020), for the first time, introduces the concept of CE, together with the responsibilities of ministries, ministerial-level agencies, and People's Committees of provinces implement integration CE right from the formulation of strategies, plans, programs, projects for development, management, recycling and reuse of waste,... (Lai Van Manh, Nguyen Trong Hanh, Nguyen Thi Thanh Huyen, 2022).

The national program on economic and efficient use of energy for the period of 2019-2030 emphasizes the goal of mobilizing all social resources to implement all solutions for the economic and efficient use of energy to achieve the goal to:

- Achieve an energy saving level of 5.0 to 7.0% of the total national energy consumption in the period of 2019-2025 by 2025,
- Reduce power loss to less than 6.5%,
- Reduce the average energy consumption for industries/sub-industries compared to the period 2015-2018.

The program also sets out the goal of building a Vietnamese energy data center and at least two national training centers on the economic and efficient use of energy, along with the establishment of a fund to promote the economical use of energy effectively and efficiently through socialization, sponsorship and cooperation of individuals and organizations at home and abroad (Thu tuong Chinh phu, 2019).

### 3.3. Manifestations of Circular Economy in Vietnam

In fact, the concept related to the CE model has existed in Vietnam since the years the 1980s, such as the VAC model (garden - pond - barn) or VRAC (garden - forest - pond - shack) applied quite successfully in the field of agriculture - rural areas, where the population of Vietnam still accounts for nearly 80%. In addition, the concepts of 'eco-industrial park,' 'cleaner production,' 'zero emissions,' recycling, reuse, and remanufacturing - part of CE - are also mentioned a lot in the past (iced.org.vn).

Moreover, in rural areas, the model of using post-harvest straw for cattle and buffaloes is also popular, producing straw mushrooms and building materials. Some craft villages use agricultural by-products such as corn husks and rice straws to make handicrafts. In industry, handicrafts, the CE model is also applied in many fields and businesses, such as:

- In the field of renewable energy development, many businesses have invested in developing solar power and wind power. The number of registered solar energy projects increased sharply in the period from 2018 to 2020, mainly in the South Central provinces. Wind power also has great potential for development when more than 8% of the area is rated as having good wind potential, which can generate 110GW of electricity, mainly concentrated in the Central Coast, the South, and the Central Highlands. Despite difficulties, wind power is still developing step by step. Vietnam also has the potential to develop biomass electricity with the source of wood waste, agricultural by-products, municipal waste, livestock waste, and other organic matter. However, currently developing biomass energy is still difficult.
- The model of making use of waste products and by-products in production is applied in many enterprises, such as waste products of the sugarcane industry, to make alcohol and generate electricity, ash, and slag from thermal power plants as building materials, etc.

In consumption, many green consumption models were born in the direction of using renewable and energy-saving products as many consumers tend to eliminate the use of plastic straws and plastic bags to organic products; green housing design, using wind and natural light (Bui Van Huyen, Nguyen Ngoc Toan, 2021).

Furthermore, there are many fast-growing recycling craft villages, which play an essential role in closing the life cycle of a product through the collection of scrap from the junkyard, scrap yard, or from other sources imported and recycled into raw materials for further production or finished products and then re-sell them on the market. Forms of operation are diverse from individuals, households, or businesses, with or without business registration. Currently, the recycling craft village is divided into three basic groups:

- Paper recycling,
- Metal recycling, and
- Plastic recycling

Among the three groups mentioned above, paper recycling is one of the handicrafts developed on a large scale, mainly in Bac Ninh. The group of metal recycling villages is concentrated in handicraft villages producing iron and steel, such as Van Chang village, Xuan Tien village (Nam Dinh), Da Sy village (Hanoi), Da Hoi village (Bac Ninh), La Khe village (Binh Dinh), etc. Along with the development of metal recycling craft villages is the development of 80 small mechanical craft villages, reusing recycled iron and steel products such as Duc Tu village (Dong Anh), Cau Vuc village (Thua Thien - Hue), etc. According to the report on the current state of the environment in Vietnam from these scraps, each year, hundreds of thousands of tons of construction iron and steel are sold to the domestic market, especially in the northern region as well as fine art products, utensils, household tools, etc. The group of plastic recycling villages is concentrated in the North, such as Minh Khai (Hung Yen), Trang Minh (Hai Phong), Phu Xuyen (Ha Tay), Trieu Khuc, Trung Van (Hanoi), etc. Besides recycling production households, there are also households involved in collecting, sorting, and transporting raw materials and products. That are the villages of Phu Xuyen (Hanoi), Trang Minh (Kien An, Hai Phong), Trung Van (Tu Liem, Hanoi), villages of Tao Phu, Te Lo (Vinh Phuc), etc. Plastic raw materials are collected from many places and localities through a network of waste collection from provinces and cities across the country. These wastes, after being collected, are usually classified into HDPE, PP, PS, PET, etc. (Mai Chi, 2022).

The basic feature of recycling craft villages in Vietnam is that due to economic motivation and job creation, production technology is manual, people's awareness is still low, and input materials are mostly raw materials. Scraps are not cleaned, and most production facilities do not have measures to control pollution, waste treatment, and necessary labor protection. Therefore, recycling craft villages have been causing many serious environmental problems (Tran Hong Ha, 2019). Among them, the biggest polluter is metal recycling craft villages. The process of recycling, processing, surface treatment, spray painting, product surface polishing, calcination, drying, bleaching, forging flue gas, etc., generates dust and emissions such as SO<sub>2</sub>, NO<sub>2</sub>, acid, and alkaline vapors often exceed permissible standards. A typical example is a Man Xa scrap aluminum recycling craft village (Van Mon commune, Yen Phong district, Bac Ninh province). According to experts in the field of environment, in Van Mon, on average, about 30-40 tons of solid waste is generated every day, including waste aluminum slag and coal slag from the metal casting process, which has not been processed through collection yet. The air quality monitoring results also show that the analytical criteria (noise, dust, SO<sub>2</sub>, NO<sub>2</sub>) exceed the allowable standards by 1.2-1.8 times. The results of surface water quality monitoring shows that the analytical parameters (pH, BOD5, COD, SS, Fe, Cu, Ni, Pb, grease) are 1.5-16 times higher than the allowable standards, etc. (Mai Chi, 2022).

Over the years, the cleaner production model has been promoted. According to statistics from the Ministry of Industry and Trade, about 400 enterprises and production facilities have been supported for rapid assessment, and nearly 100 enterprises have been supported for cleaner production and become model points. Some typical models in the direction of CE in the field of economic and efficient use of energy have been actively deployed by the Ministry of Industry and Trade in the past time. These models include:

- Building and implementing models of energy use, piloting alternative forms of energy and energy-saving household models,
- Applying the energy management model in industrial facilities,
- Building, disseminating, and replicating the alternative energy use model at business establishments across the country

In addition, the movement of households to use energy economically and efficiently is widespread in Hanoi, Ho Chi Minh City, Can Tho, Ba Ria - Vung Tau, Dong Thap, Binh Thuan, Can Tho, Tien Giang, Bac Ninh, etc. (Chau An, 2021).

According to Nguyen Quang Vinh, General Secretary of VCCI, Secretary General, Executive Vice Chairman of the Business Council for Sustainable Development (VBCSD), over the years, with the efforts of the Government, relevant agencies, and pioneering businesses, the concept of CE has become much closer. CE provides a new perspective on using raw materials more efficiently and economically while constantly reminding people to effectively use limited resources in terms of water, energy, raw materials, and food with a longer life cycle, achieving higher value than current methods. Representative of Coca-Cola Vietnam Company, Nguyen Thi Thu Hang, Director of External Communication and Sustainable Development, said that raising consumer awareness about packaging collection and recycling is part important in the Strategy 'For a world without waste' that Coca-Cola is implementing. The goal is:

- By 2030, to collect and recycle 100% of the packaging that Coca-Cola sells globally,
- By 2025, achieve 100% recyclable packaging, and
- By 2030, use at least 50% recycled materials in the company's product packaging

The General Director of La Vie Company said that both La Vie Company and Nestlé Vietnam Company and members of the Nestlé Group have been committed to implementing plans to reduce the amount of first-time plastic (virgin plastic) in product packaging, reducing plastic footprint at the source and contributing to initiatives to collect the same amount of packaging put on the market by 2025. Currently, almost all La Vie products have 100% recyclable. In early 2021, La Vie became the first mineral water brand in Vietnam to use bottles made from recycled plastic (rPET) that met

food packaging standards, encouraging domestic enterprises to invest in rPET production to accelerate the CE model, creating a chance to regenerate bottles. Nestlé Vietnam and La Vie are also founding members of PRO Vietnam (Ngoc Quynh, 2021).

The construction industry consumes the most manpower and raw materials: 30% of resources, 40% of energy, and 12% of water. The construction industry generates 40% of global CO<sub>2</sub> emissions. While applying the CE model, it will reduce CO<sub>2</sub> emissions by 38%. In fact, this is an industry that has many advantages in developing the CE with the main areas of work:

- Supply design, which includes flexibility, modular design, durability, design for dismantling and removing waste, and supplying green materials,
  - Development of standards: prevention of waste reduction, reuse of by-products and recycling, off-site production,
  - Operation and use, including standards such as maintenance including digitized information, equipment, space sharing, recycling,
  - Renovation and repair, including renovation and smart equipment, creative reuse,
  - Dismantling, including pre-dismantling options, dismantling technique selection, sorting, reuse, and recycling
- Finally, the production of building materials: durable products that are repairable and recyclable.

Currently, Vietnam's construction industry is also focusing on recycling all kinds of waste in construction, designing buildings in an environmentally friendly way and encouraging the production and use of environmentally friendly building materials market, promoting the development of secondary markets for building materials, promoting innovation in resource use, and effectively solving material-intensive problems (Dinh Hong Ky, 2023).

### 3.4. Opportunities and Challenges for CE Development in Vietnam

According to Kristin Hughes (2022), Vietnam has experienced strong and rapid economic growth in recent years. However, the growth is accompanied by problems related to consumption and pollution consequences, such as the annual production of about 3.7 million tons of plastic waste from consumption. However, government organizations, industry, and civil society participate actively. Implementing a CE is very useful for environmental purposes. Especially when compared with the current linear economy, which has been exploiting resources from the natural environment, constructing a CE will bring more jobs and reduce environmental pollution. In December, a series of countries around the world approved an agreement to help oceans and rivers, which outlines what needs to be done, and Vietnam has also made its commitments. Vietnam has shown its leading role in this common process of the world, helping the world get international agreements (vneconomy.vn).

From the perspective of the legal corridor and the performance of the CE in the different fields of Vietnam in the past time, it can be seen that Vietnam has certain opportunities and challenges when converting to CE. Vietnam participates in bilateral and multilateral free trade agreements and new-generation free trade agreements. Most of these agreements have regulations and agreements on sustainable development, environmental protection, and response to climate change and must comply with emission, waste, and emission standards. This is the premise to promote Vietnam to accelerate its transformation to the CE model. Moreover, the policy of CE development has been affirmed in the Document of the 13th National Congress of Deputies in the Socio-Economic Development Strategy 2021-2030. The legal system is gradually being perfected. The participation of ministries, branches, localities, and the business community in implementing the policy on CE development is getting stronger and stronger. The development of science and technology creates new and more successful business models. Moreover, increasingly demanding consumers also put pressure on businesses to pay attention to clean production and provide more environmentally friendly products.

However, the policy framework for the development of the CE model has not been completed, and there is a lack of mechanisms and policies to promote the CE, such as:

- Regulations on specific responsibilities of enterprises for recovery and resources from used products,
- Economic tools and policies such as resource tax and environmental protection fees

There is limited awareness of CE and the need for a transition to the development of a CE model. Resources for the implementation of the transition to circular economy development are still weak because the circular economy must be associated with scientific innovation, access to advanced technology, and increased application of 4.0 revolution achievements. There is no set of criteria to identify, evaluate, summarize, and provide an accurate classification of the level of development of the circular economy in sectors, fields, and localities. Besides, developing CE requires a team of good experts to solve problems well, from the beginning to the end of the whole process. There is still a lack of enterprises that are capable of technology for recycling and reusing used products. It is difficult to immediately change the production and consumption habits of the whole society today from many easy-to-use products such as plastic bags and disposable plastic products to using only recyclable materials and products fully reusable. SMEs find it difficult to invest in technological innovation (Bui Quang Trung, Pham Huu Nam, 2020). That requires real coordination and sharing associated with economic benefits among stakeholders, so using economic incentives and market mechanisms to connect stakeholders to realize CE is a big challenge.

## 4. Conclusion and Recommendation

Shifting from a linear economy to a circular economy is a common trend in countries around the world, and Vietnam is not an exception to that trend. That is the best way to harmonize the relationship between economic growth and environmental protection in order to achieve sustainable development. The opportunity to implement the circular economy model in Vietnam comes from the current state of extensive international economic integration and participation



in bilateral and multilateral free trade agreements with regulations and agreements. Sustainable development, environmental protection, response to climate change, and compliance with waste and emission standards have created the necessary premise to promote Vietnam's transformation from a linear economic model to CE. Moreover, the application of 4.0 technology makes this process faster and more efficient. However, there are still challenges posed in the process of transitioning to the CE model, such as awareness of people, businesses, and others operating in the economy, technological capacity, finance, etc., to implement. In order to truly transform into a CE, it requires the joint efforts and responsibility of the stakeholders, in which the business is the central driving force, the State plays the role of creating, leading, and the community participates in implementing change to both awareness and behavior of the whole society. Accordingly, it is necessary to pay attention to the following synchronous solutions:

- *Firstly*, the State needs to perform the tectonic role well so that businesses and people can play a central role in the construction and development of the circular economy in Vietnam. The government should periodically provide guidance on the top priorities for key economic sectors and continue to study and perfect the legal corridor related to CE in line with the Communist Party's policy. Specific guidance on the implementation of the Law on Environmental Protection (just amended, 2020) will help to improve the overall picture of Vietnam's CE as soon as possible. Accordingly, there should be specific regulations on the responsibilities of manufacturers and distributors in the recovery and recycling or payment of costs for waste treatment, the amount of waste that needs to be recycled in each industry at a specific time, and establishing a roadmap for the development and application of environmental standards and regulations equivalent to that of advanced countries in the region and the world.
- *Secondly*, the state should build an in-depth economic growth model, and principles need to be established by industry and field to deploy the model and criteria of the circular economy model with a roadmap for implementation by priority sectors in the following fields:
  - Pioneering ability,
  - Effectively using input resources,
  - Promoting research and application of science and technology,
  - Taking digital transformation,
  - Applying achievements of the Industrial Revolution 4.0 as the driving force for CE development,
  - Paying attention to building a database on CE associated with digital economic transformation and Industry Revolution 4.0,
  - Strengthening policies to encourage foreign investment attraction in manufacturing industries using high technology and clean technology. Accordingly, technological innovation is the core, an essential factor determining success while applying the CE model. Clean and hi-technology help to implement the CE model with high efficiency, significantly reducing pollution, conserving nature and biodiversity, and avoiding over-exploitation of resources, especially waste treatment, to regenerate new replacement materials and, at the same time, create new jobs. Regulating a roadmap to replace fuels, products using hazardous fuels, single-use products with environmentally friendly fuels, reusable products, prolonging the useful life of the product. Promote cooperation and linkage between economic sectors and social organizations in the development of CE in Vietnam, in which the Government plays a leading and creating role.
- *Thirdly*, pay attention to adjusting energy planning, gradually reducing dependence on forms of energy from fossil fuels and hydroelectricity, and controlling and selectively attracting investment projects on the basis of considering factors of production scale, production technology, environmental engineering, and project implementation location, building a technology transformation roadmap based on energy saving and efficiency criteria, and waste reduction.
- *Fourthly*, manufacturers need to clearly identify the top priority of their businesses in line with the country's general economic development orientation and globalization trends to take advantage of comparative advantages. Instead of making products as quickly and as cheaply as possible, product durability and sustainable manufacturing are key. Products need to be designed so that they can be easily recycled if they are to not end up in landfills polluting the environment.
- *Fifthly*, strengthen communication about CE in the mass media to raise awareness of manufacturers, organizations, and the general public about responsibility for products throughout the life cycle of products. It is necessary to propagate and educate to raise people's awareness about the classification of waste at source, creating favorable conditions for collection, transportation, reuse, and recycling. Moreover, knowledge about CE should be integrated into education and training programs at all levels so that people are fully aware of their responsibilities themselves to be self-aware from the stage of choosing eco-friendly products for use intelligently, as well as the need to separate waste from a convenient source for disposal.
- *Sixthly*, it is necessary to attract recycling craft villages to participate in implementing extended producer responsibility (EPR). Producer responsibility is extended to the post-consumer stage according to the product life cycle to reduce the load harmful to the environment and develop in a more sustainable direction. EPR holds manufacturers responsible for the collection, sorting, recycling, and disposal of used packaging products they place on the market. The application of EPR in Vietnam will have a strong impact on the livelihoods of people living in craft villages. If they don't want to be phased out, craft villages must choose to either set up businesses or switch to just collecting, sorting, and re-selling to recycling businesses or invest in a methodical investment in pollution treatment systems, machinery, equipment, and standard output. The State needs to take measures to

encourage and sponsor people in craft villages to apply wastewater treatment and recycling technology up to quality standards, in addition to actively propagandizing and raising people's awareness about the effect of clean recycling, which benefits not only themselves but also the community. Manufacturing enterprises need to work closely with recycling craft villages in submitting recycled inputs. For standard input, businesses can help people with technology and finance in the initial stage to bring practical benefits to the whole society.

- *Seventhly*, it is necessary to strengthen international cooperation in the development of the CE. Accordingly, Vietnam can learn from the experiences of circular economy development in countries with successful models and, at the same time, receive international support in formulating policies and laws related to CE as well as support technology transfer, human resource training for the application of CE models, and communication about CE widely. This will help Vietnam to shorten the time and save costs for economic sectors and fields to transfer and develop CE.

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