Governing the commons through circular economy?: A preliminary, conceptual, and critical investigation

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Abstract

In the current Anthropocene era, significant resource depletion and environmental degradation is observed in every region worldwide; this can be understood by the concept "the tragedy of the commons." This phenomenon is posing serious threats regarding sustaining the economy and business, as well as sustainable development; hence, it should be addressed through an environmental governance system. Based on preliminary, conceptual, and critical perspectives, this paper attempts to explore the viability of circular economy (CE) to overcome this tragedy. In a CE, there is a loop of production, consumption, and disposal—wastes are regenerated into new products; hence, there is no waste generated in a CE. Based on some Japanese CE practices, this paper indicates that while applying the CE concept alone is not sufficient for governing the commons because of the limits and challenges associated with CE in principle and practice, applying the idea of commons can contribute to overcoming limits and challenges associated with CE.

Keywords: circular economy, commons, environmental governance, resource depletion, environmental degradation

1. Introduction

One of the most urgent issues faced by economies worldwide is resource depletion and environmental degradation in the Anthropocene. *Global Risks Report*, an annual publication from World Economic Forum, shows that environmental risks are getting increasingly serious for world economy. Hence, climate change, biodiversity loss, and water security are key crucial challenges for sustaining economy and business, as well as for transforming the current development model to sustainable development.

Consequently, what steps should be undertaken to address this issue? —the answer is partly derived from studies of commons. The concept of "the tragedy of the commons" clarifies the mechanism of resource depletion and environmental degradation in an open access resource management system and vague ownership of land; it implies that there are only two policy options to overcome this tragedy: to privatize land ownership or to regulate land use by the government (Hardin, 1968). Hardin's framework focuses on institutional arrangements in the market that are implemented by the government to internalize external diseconomies as a means of overcoming the tragedy.

However, his framework has been criticized by subsequent researchers. Based on several case studies worldwide concerning commons, researchers have shown that there is a third way to overcome

the tragedy—for example, voluntary management in local community has been proven to be a viable alternative. Consequently, theoretical investigations regarding this third way have been largely advanced by Elinor Ostrom; her work has defined the general condition of sustaining commons (Ostrom, 1990).

It should be recognized that Hardin's and Ostrom's frameworks have one common presumption: governing institutions of commons aim toward maintaining the source function of environment, namely, the function of generating natural resources or provisioning ecosystem services. In general, an environmental governance system should meet the following requirement: the system should ensure the avoidance of the depletion of natural exhaustible resources, or that of the use of renewable resources beyond the natural reproductive capacity. In the absence of such a system of environmental governance, resources or ecosystem services act as a common-pool good, the consumption of which has rivalrous and non-excludable character, thus leading to overconsumption.

In addition to considering the source function of the environment, this paper also focuses on the sink function of the environment, namely, its function of absorbing wastes or pollutants. Moreover, this paper attempts to determine the means of governing the commons through *circular economy* (CE). The CE concept has become popular among practitioners and scholars in recent years, and is used in contrast to linear economy (LE), which is unsustainable as it has a "take-make-consume-dispose" material flow model. Currently, the majority of the modern economic system employs LE. While LE often leads to large extraction of natural resources and massive generation of waste, CE aims toward maintaining both source and sink functions of the environment.

The object of this paper is conducting a preliminary, conceptual, and critical exploration to determine whether CE can be efficiently employed to alleviate the current environmental concerns, in line with research in the Japanese context. A potential advantage of discussing commons governance by means of the CE concept is that the theme of sink function of the environment or waste management is addressed, which is not sufficiently investigated in relevant studies. This exploration exhibits the following: "the tragedy of the commons" cannot be overcome by applying the CE concept alone to commons governance; however, the limits associated with CE can be partially overcome by applying the idea of commons.

This paper is structured as follows. First, the concept CE is summarized in terms of research interests of this paper. Second, the limits and challenges of CE are further explored based on existing CE researches and some CE issues confronting Japan. Third, the possibilities to overcome CE limits are addressed in a preliminary and conceptual manner by consulting the concept of commons. Finally, this paper concludes by addressing some issues that can be investigated in future research.

2. The CE concept

2.1. What is CE?

CE and LE can be described by means of Fig. 1. In the LE system, the following situations are prevailing: The amount of waste generated is too high; it is not economically feasible to use waste as a resource; waste that cannot be used as a resource is generated, and so on. Consequently, the situation continues to be one in which the procurement of raw materials depends on the extraction of large quantities of natural resources and the disposal of large quantities of waste.

In contrast to LE, CE aims to protect both source and sink functions of the environment; this is anticipated to enable the "decoupling" of resource use and environmental impact from economic growth (Reike et al., 2018).

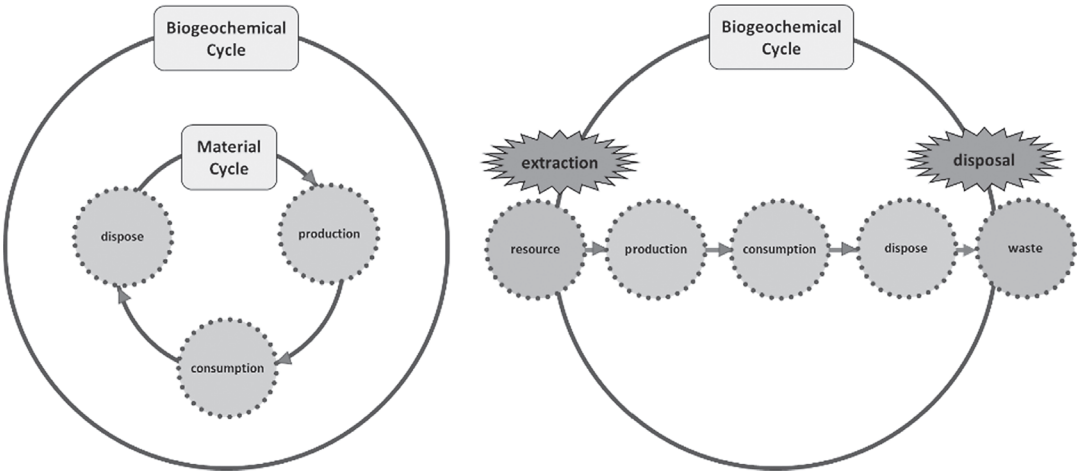

Fig.1. CE (left) and LE (right): A visual comparison
Source: Modified Fig. 3-1 from Miyanaga (2023)

From mid-2010s, the term "CE" has received increasingly broader attention from practitioners or policymakers (e.g., Ellen MacArthur Foundation, 2013, European Commission, 2015, Lacy et al., 2015). They seek a new pattern of economic system, keeping in mind the rapid economic growth in developing countries, increasing world population, planetary boundaries, and so on. This implies that the main aim of CE is considered to be economic prosperity, followed by maintaining the environmental quality (Kirchherr et al., 2017).

Another feature of CE is that it is promoted to mainly to enhance the competitive strategy of each corporation in an era of globalization and drastic industrial structure change, wherein new business models and corporate growth opportunities are consistently sought for (e.g., Henry et al, 2020,

Lewandowski, 2016). The book title of Lacy et al. (2015), "*Waste to Wealth: The Circular Economy Advantage*," is exemplary of such a phenomenon.

In summary, CE advocates have insisted that circularity "pays." For conducting business in the Anthropocene, the cost of accessing the source and sink functions of the environment is anticipated to incur higher expenses, and the potential value of using waste as a resource is forecasted to increase. Thus, CE is anticipated to be a prescription for these projected higher expenses.

2.2. CE and waste hierarchy

CE should not be confused with "recycling." As is indicated in Fig. 2, recycling is merely one component of configuring CE. The CE system is embedded in waste hierarchy with many Rs, in which the first R viewed to be a priority to the second R and so on (Kirchherr et al., 2017, Reike et al., 2018).

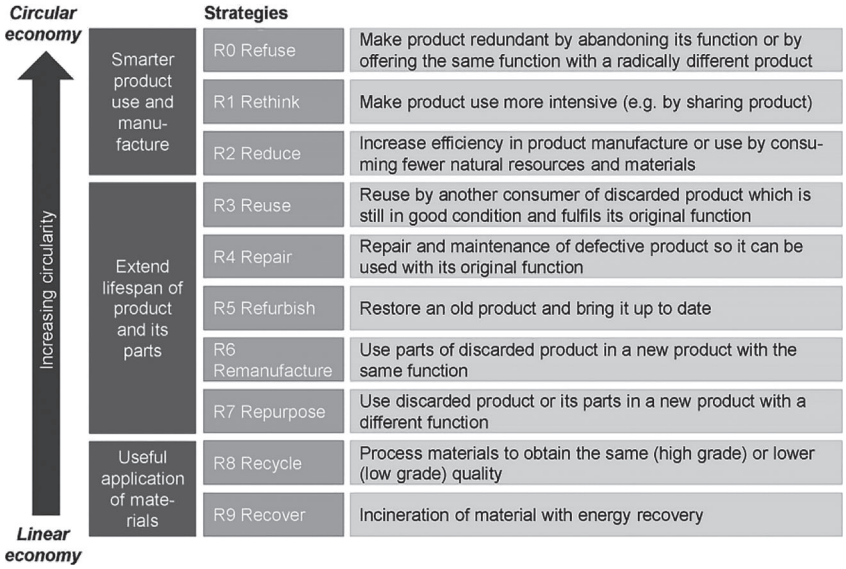

Fig.2. Waste hierarchy as the 9R framework
Source: Kirchherr et al., (2017), Fig. 1.

The idea of waste hierarchy was born and developed in Europe and the US (van Ewijk et al., 2016). In the Netherlands, for example, the idea was introduced in parliament in 1979, guided by the object of addressing the shortage of final disposal sites. As a quarter of the land area of the Netherlands is reclaimed land, this issue was considered to be urgent. Additionally, as the Netherlands does not have an abundance of incineration facilities like Japan, which can reduce the volume of waste going to final disposal sites, this problem gained prominence in the parliament's discussion.

3. Overcoming the tragedy of the commons through CE: is it possible?

3.1. Criticism regarding CE

In academia, the concept of CE is not as novel as frequently claimed (e.g., Pauli, 1997, Pearce et al., 1989, Stahel et al., 1976). Additionally, the CE concept has been receiving increasing attention during recent years, as is evidenced by the numerous relevant review papers (e.g., Centobelli et al., 2020, Geissdoerfer et al., 2017, Ghisellini et al., 2016, Kirchherr et al., 2017, Korhonen et al., 2018, Sarja et al., 2021, Schöggl et al., 2020).

In these papers, some deficits regarding the CE concept have been pointed out and discussed (e.g., Corvellec et al., 2022). There is a lack of common accepted definition; it remains as an unorganized and superficial umbrella concept; there has been a tendency to neglect the social dimension of sustainable development in the CE conceptualization, and so on. In terms of the research object, the following criticism regarding the premises, practicality, and consequences of CE are discussed in this paper:

① "Waste" is not clearly distinguished in some CE cases;
② Cost-benefit advantage is not a driver, but rather a barrier in many CE cases;
③ CE performance depends on institutions in which the CE market system is embedded;
④ CE cannot be beyond biogeochemical cycles and the thermodynamic limit.

3.2. "Waste" is not clearly distinguished in some CE cases

The CE conceptualization is based on the premise that waste is clearly distinguished. Consequently, what determines whether a substance is waste or resource? The answer to this question is not as evident as is normally thought.

Coal is a typical example of this issue regarding the definition of waste; formerly, coal was not considered a "resource." For example, in England, the mother country of the Industrial Revolution, wood had previously been used as fuel for blast furnaces and as a reductant for iron making. However, the deforestation caused by overextraction of wood and the fortuitous abundance of coal (as opposed to wood) gradually encouraged the use of coal. Thus, it started to be massively used in steam engines and iron manufacturing since the 18th century. Coal is unarguably one of the most important resources in human history, with some researchers even looking back to the beginning of the Anthropocene to indicate this significance. The decisive factor regarding the use of coal was the commercialization of technology for draining groundwater from coal mines using steam engines. Until then, coal had often mined via open-pit mining by human and animal power; however, this commercialized technology led to the widespread use of tunneling in coal mines one after another ("digging coal with coal"), and the

potential for coal utilization increased dramatically. Today, coal is also widely used as the primary fuel for thermal power generation. Compared to other fossil fuels such as petroleum and natural gas, coal has many advantages as a resource: it is inexpensive, its mining and transportation technologies are not that advanced, and its geographic distribution is relatively small.

Another typical example is oil, which was also formerly not considered a resource (Murota, 2001). In the mid-19th century, technology was developed to extract kerosene from crude oil, and it was used as fuel for lighting lamps; however, prior to this, for example, whale oil was used in the US. Gasoline was created as a byproduct of kerosene; however, at the time, it was considered to have no utility value and was thus considered waste. However, with the development of the gasoline internal combustion engine in Germany, the need for gasoline increased dramatically. Subsequently, after World War II, the discovery of large-scale onshore oil fields in the Middle East, which made it possible to use oil at low cost, became a decisive factor in the use of oil taking root worldwide.

On the other hand, there are also cases where an entity formerly considered a "resource" is no longer considered a resource. For example, grasslands were once a valuable resource for Japanese farmers who used the grass they harvested as material for thatched roofs and as feed for cattle and horses used in farming. However, with modernization, such needs regarding grasslands have diminished significantly. This is a case of resource underutilization (Miyanaga et al., 2018).

Thus, as can be observed, whether a substance is useful or useless for human beings depends on a variety of factors, including the degree of scarcity, the extent of scientific and technological development, and trends in social and economic needs. Without this recognition, what kind of "waste" should be made circular in CE would not be well understood.

3.3. Cost-benefit advantage is not a driver, but rather a barrier in many CE cases

In the CE system, it is principally expected that wastes are regenerated into new products, and no waste is generated. Merely the existence of physical value in waste as a resource is not sufficient in CE. Economic value is also indispensable for making an economy circular; however, this does not always hold in reality. Whether they be practical or academic CE debates, waste is sometimes lumped together as "waste," with or without economic availability of "waste to wealth."

Take, for example, livestock waste, which is the second largest source of industrial waste in Japan. One option is to recycle it and use it as compost in agriculture; however, the demand for this is not sufficiently high in Japan, where agriculture continues to stagnate and abandoned farmland continues to grow. Another option is the use of energy through methane fermentation; however, the issues regarding its cost and distribution need to be resolved before it can be implemented on a large scale.

This case shows that while CE advocates often insist that economic advantage is a driver for CE, it

rather stands as a barrier. In other words, CE existence depends on the economic feasibility of the reverse supply chain, composing a part of the close-loop supply chain (e.g., Guide et al., 2003).

Let us now turn to Japan's environmental legal system, where the idea of CE is expressed as "circular society." This term came into use in 1990, when the Environment Agency (the predecessor of the Ministry of the Environment) published the report by "Study Group on a Recycling-Oriented Economy System for Environmental Conservation" (Hashimoto et al., 2006). Subsequently, in 2000, the Basic Law for Establishing the Circular Society was enacted.

In line with the environmental legal system centered on this basic law, local governments play an important role in recycling of waste, such as packaging materials, and the pertinent large amount of costs are shouldered by taxpayers. This is nothing more than an indication that "circular society" in Japan is not self-sustaining as a closed-loop supply chain, and can only be established with massive inputs of money and energy from other sources.

3.4. CE performance depends on institutions in which the CE market system is embedded

While the idea of CE mainly adopts a corporate-led market model, institutions in which the CE market system is embedded are frequently ignored by CE advocates. In other words, in the real world, CE is path dependent (Korhonen et al., 2018). The following examples demonstrate this:

The first example is the incineration-centered waste management system in Japan. Approximately 70% of the world's incineration facilities are located in Japan, and this is often cited as a characteristic of Japan from an international perspective. The reason for this adopting this approach is hidden in the history of waste administration (Hosoda, 2016). Population growth and industrial development in the process of modernization during the Meiji Era (1868–1912) led to quantitative expansion and qualitative changes in waste, making the establishment of a waste management system a national imperative. Additionally, appropriate disposal of human waste and improvement of public health (for example, preventing infectious diseases such as cholera) also emerged as an important national issue. Against this backdrop, the Meiji government enacted the Waste Cleaning Act in 1900 to encourage the incineration of waste.

The incineration-centered system has been helping Japan to address the shortage of final disposal sites, such as that by Netherlands regarding the waste hierarchy approach. The lock-in effects of this type of waste management system would lead to following two consequences for CE: Even wastes with potential value as resources are easily treated to be burned and filled up in disposal sites; It enhances a tendency to rely on "Recover" in waste hierarchy, which has merely the least priority of many Rs in CE.

The second example is debris waste in Japan. It ranks third in terms of industrial waste emissions in Japan, and while progress has certainly been made in recycling, there continue to be many issues to

be addressed in terms of controlling the generation of debris. The life span of a Japanese house (38.2 years) is considerably shorter than that of the US (55.9 years) and the UK (73.2 years), according to Ministry of Land, Infrastructure, Transport and Tourism[1]. While natural conditions of high temperature and humidity and susceptibility to corrosion play a role in shortening the life span of houses in Japan, the more significant reasons are economic conditions (Sunahara, 2018). The Japanese housing market is based on new housing, and is characterized by the infancy of used and rental housing market. This is due to the fact that new construction is purchased for the use of one generation only, with no resale in mind; technology and materials are standardized based on the assumption of a short life span; home ownership is encouraged through various tax and other incentives; and, simple rental housing for inheritance tax purposes is rapidly increasing. These institutional factors are one of the reasons why a significant amount of debris waste is generated in Japan.

3.5. CE cannot be beyond biogeochemical cycles and the thermodynamic limit

Making materials circular is only a necessary condition for establishing CE. There is also a need to set CE within the extent of source and sink functions of the environment, where at least two more conditions must be fulfilled. First, CE should be set within biogeochemical cycles, as is shown in Fig.1, while the socio-ecological system to which the CE system belongs has sometimes been ignored. Second, when large amounts of energy are invested to make material flow circular, the thermodynamic limit should be taken care of (Korhonen et al., 2018). Without these conditions, there is a risk of accelerating harmful consequences due to the rebound effects in CE (Castro et al., 2022, Zink et al., 2017), which is also known as the Jevons paradox.

The idea of "spaceship earth" and "cowboy economy" enables us to understand this problem (Boulding, 1966). The earth is like a small spaceship navigating through the grandeur of space, and if we use the things in the spaceship as we please, they will soon run out—and if we throw away the things we use as we please, the ship will quickly fill up with waste. This type of economic system was expressed by Boulding as a cowboy economy, in which the source and sink functions are thought to be infinite.

The practice of a loop of production, consumption, and disposal within biogeochemical cycles and the thermodynamic law has existed in Japan during the Edo period (1603–1868). This is often called the "Edo model" (e.g., Murota, 1989), where almost all waste, even scrap paper, was used as resources. The most typical and famous activity in this model is the recycling of urban manure that is returned to suburban agricultural land. However, in a discourse by Edo model advocates, quantitative expansion

1) https://www.mlit.go.jp/common/001447788.xls

and qualitative change of waste in the Anthropocene tends to be not considered sufficiently.

4. Overcoming CE limits by the idea of commons: how it is possible

The investigations thus far imply that CE cannot always evolve solutions with respect to resource depletion and environmental degradation because CE is riddled with challenges both in principle and practice. In this section, the direction of using the commons concept that may partly overcome the challenges of CE is discussed.

First, recycling waste to be used as resource would be encouraged if substances flowing in a closed-loop supply chain are shared as a kind of commons. Urban mining in Japan is an example of this phenomenon, which is an initiative to recover precious and rare metals from used household appliances and electronic devices (e.g., Portugaise et al., 2023). The composition of metals in home appliances and electronic equipment is higher than that obtained from the ore grade and requires less energy than refining and kneading from ore, thus making it a promising approach with growing expectations.

For the effective use of urban mining contributing to CE, some more devices are necessary. One such condition is the reduction of costs for resource extraction. In order to make it easier to extract metals from waste products, it is critical for manufacturing companies to reduce the number of screws and foundations and to design products in a way that they can be easily dismantled. Another necessary condition is reducing costs of resource recovery. This is because waste products are widely dispersed in a city or region, and their utilization depends on how efficiently and inexpensively they can be collected.

Second, CE practices should go further beyond recycling, and implementing the upper level of waste hierarchy should be encouraged. A kind of common property scheme, intensely explored in commons studies, could enable this implementation. The typical example is the idea of sharing economy or “Product as a Service,” which is based on separation of ownership and use.

In Japan, the problem of unoccupied houses is getting increasingly serious; the reason for this is a strong tendency of the new housing market to remain mainstreaming, in spite of rapidly decreasing and aging population. It also seems to reflect a persisting inertia of Japanese to have house on one’s own.

This theme of separation of ownership and use reminds us of the way of thought by the famous marketing scholar, Theodore Levitt, who stated: “People don't want to buy a quarter-inch drill. They want a quarter-inch hole!” (Levitt, 1960). His intention was to revolutionize the marketing theory of the time by asserting that it is important to distinguish between customers’ wants and needs, and that asking customers what they want does not mean finding out what their needs are. This seems to contain several lessons for studies of CE and commons as well.

Third, the source and sink functions of the environment themselves should also be treated as a

kind of commons, as well as resources and wastes. If values of source function are undervalued with the notion that resources are free to be extracted as belonging to one's own, the function which belongs to everyone would be harmed. The same is true for the sink function of the environment. If people think that since they are free to do what they want with what is theirs, they are naturally free to throw it away as waste; consequently, all kinds of things will be thrown away as waste in large quantities, and the environment, which belongs to everyone, will deteriorate.

5. Conclusions and future research directions

How can the risks and harms from resource depletion and environmental degradation, that is, "the tragedy of the commons," be reduced? Can the idea of CE contribute to avoid this tragedy, by attempting to maintain both the source and sink functions of the environment through a new pattern of economic growth? This paper has attempted to answer these questions based on preliminary, conceptual, and critical perspectives, and concluded that challenges of CE in principle and practice might be well addressed by the idea of commons.

It is beyond the scope of this paper to explore this theme through full-scale theoretical or empirical research. Studies concerning this theme remain largely unexplored, and many questions remain unanswered. However, at this stage, this paper should emphasize that the idea of commons has a powerful potential to bring about paradigm shifts in conventional economic or business thinking. Is what is "yours" truly yours? How is it possible to make something "yours"?—future commons studies and environmental governance studies should focus on these questions, which are becoming increasingly important in the world of economy and business, as well as in the Anthropocene.

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