

# Circular Economy Vision 2020

May 2020

Ministry of Economy, Trade and Industry

# Contents

Introduction.....	2
I. The 1999 Circular Economy Vision and its Achievements.....	5
1. Background to the formulation of the 1999 Circular Economy Vision.....	5
2. Outline of “the 1999 Circular Economy Vision”.....	7
3. Achievements of the 1999 Circular Economy Vision.....	8
(1) Improvement of the legal system.....	8
(2) Reduction of waste generation and improvement of recycling rate.....	9
(3) Expansion of environment-related businesses.....	10
II. Need for Shifting to a Circular Economy.....	12
III. Direction of Japanese response.....	16
1. Transition towards more circular business models.....	16
(1) Manufacturers and service providers - shift to a circular industry that designs circularity and leads a resource circulation system that incorporates recycling.....	17
(2) Waste management and Recycling Industry.....	19
(3) Encouraging voluntary activities toward a circular economy.....	20
2. Appropriate evaluation from the market and society.....	21
(1) Information disclosure and performance indicators.....	22
(2) Guidance for sustainable enterprises on attracting investment.....	22
(3) Market creation.....	23
3. Early establishment of a resilient resource circulation system.....	24
(1) Securing recycling capacity and quality in Japan.....	25
(3) Areas where the development of resource circulation systems are urgently needed.....	28
Conclusion.....	31

## **Introduction**

Sound and efficient waste disposal and advanced circular use of resources are currently urgent issues around the world. Japan approved the Circular Economy Vision (Hereinafter referred to as "the 1999 Circular Economy Vision") in 1999 and it was among the first countries in the world to make such a commitment, in order to cope with the pressing needs for waste disposal sites and other issues such as natural resource constraints.

In the 1999 Circular Economy Vision, the aim was to transform the economic system from one based on mass production, mass consumption and mass disposal, to a circular economic system where environmental and economic aspects are integrated. In addition to strengthening the conventional recycling measures, the vision proposed the full-scale introduction of the 3Rs (reduce, reuse, recycle), which also included measures to control the generation of waste (Reduce) and to repeatedly use materials from products or parts which are still usable (Reuse).

20 years have passed since the introduction of the 1999 Circular Economy Vision. Although Japan has made progress on the 3Rs, extending the remaining life of final disposal sites, and improved recycling rates, it is still only half way to achieving a circular economy.

The significance of the transformation from a linear economy to a circular economy has already been discussed from various perspectives such as tackling environmental problems like waste problems, reducing dependence on natural resources as well as mitigating the impacts of price fluctuations of natural resources. However, these discussions have tended to focus on how to respond to issues which already existed in Japan.

Looking at the world, the population is projected to reach 9.7 billion in 2050. This is expected to lead to an increase in the demand for materials such as biomass, fossil fuels and metals, while bringing an increase in the amount of waste and making the environmental problems such as global warming worse. While global economic growth including developing countries and emerging markets accelerates, the potential amount of materials that can be produced are limited. In addition, the development speed of these materials has a physical limit.

Japan depends largely on importing material resources from abroad and, needless to say, securing a stable supply of these resources is an urgent issue. Moreover, as economic activities become more level and interdependent, local issues like waste problems could trigger foreign policies such as restricting imports of used products and waste, which could affect the global supply chain. Furthermore, natural resources as public goods including air and water have been damaged by such economic development and growth. Global issues such as climate change and marine plastic litter are also facing a tipping point.

As shown above, it is clear that a linear economic model based on mass production, mass consumption and mass disposal will cease working sooner or later, not only in Japan but also for the entire world. There is a need to depart from a growth model that pursues quantitative expansion of wealth under shareholder-capitalism, which prioritizes short-term interests. In other words, it is important to shift to a model that aims for robust growth from medium and long-term perspectives through circular social and economic activities. In this shift, service-based business models, such as product service system (PSS), will play important roles. They will maximize the value added by effectively using the already extracted material stocks in our society instead of natural resources, and eventually enable us to decouple resource consumption from economic growth. It is necessary for Japan to contribute to global sustainable development by quickly changing to such a growth model and, at the same time, to strengthen the international competitiveness of Japanese industries that will be less dependent on natural resources and more resilient to fluctuations in product demand.

The development of digital technology and the increasing societal and market-driven demand for environmental action play key roles in shifting Japan to a circular economy.

The benefits of digital technology have been widely enjoyed. With the transition to a knowledge-intensive socio-economic structure (Society 5.0) that produces services and solutions thanks to Artificial Intelligence (AI) and the Internet of Things (IoT), industries including manufacturing have already started to change toward service-based models that do not overly rely on production and consumption of goods. Also from the conventional 3Rs perspective, further improvements are expected, such as reduction of production loss through precise

demand projection and on-demand production activities (Reduce), sharing service that match the value of unutilized assets with their demand through visualization (Reuse), and high-quality recycling by utilizing digital technology.

In addition, since the announcement of the Sustainable Development Goals (SDGs) by the United Nations in 2015, there has been a rapid increase in societal and market-driven demand for environmental action, which has strongly encouraged changes in corporate behavior. As environment-related investments such as Environmental, Social and Governance (ESG) investments are expanding, the flow of funds that drive the capital economy is changing drastically. Environmentally friendly efforts, which before might have been seen as a cost for their businesses, are now overlapping with essential activities for their businesses that bring value added. Gaining market reputation or providing benefits to customers are examples of the value added. In response to this trend, businesses have already started making efforts voluntarily to accelerate resource circulation. For example, in the case of marine plastic litter, more and more companies are actively communicating their environmental initiatives and commitments.

In this way, changing to a circular economy can provide us with a new frontier that enables us to achieve “a virtuous cycle of environment and growth.” This is because circular activities that attract public interests, and deliver social benefits, like conservation of the global environment are evaluated as value added in the market and create private profit.

In order to realize a circular economy and generate benefits for all stakeholders, cross-industry partnerships will become even more important. Since the Edo period (1603-1868), the concept of "Sanpo-yoshi (three-way satisfaction)", which is the managerial philosophy of the Omi (Shiga Prefecture at present) merchant meaning "Good for seller, good for buyer, and good for society", has permeated Japan. As a result, companies have developed their business activities while placing importance on the close connection between private and public benefits and taking reliability and good faith seriously. These ethics are vital to promoting partnerships in a circular economy. In order to achieve a circular economy, it is necessary for businesses, consumers and governments to play their respective roles responsibly, and to cooperate not only domestically but also

internationally. Replacing the term "Sanpo-yoshi" to "Good for businesses, consumers, and the environment" and promoting a circular economy in cooperation with stakeholders can be Japan's form of a circular economy. This can then create a new capitalist economy.

Based on the above, the international situation surrounding a circular economy and market changes are opportunities for further growth for Japan. The Circular Economy Vision for 2020 indicates a new direction in letting Japanese industries shift to new business models with higher circularity and to improve the resource efficiency of their businesses, while taking advantage of our industrial structure. This will strengthen the international competitiveness of Japanese industries and achieve "a virtuous cycle of environment and growth."

## **I. The 1999 Circular Economy Vision and its Achievements**

Under the 1999 Circular Economy Vision, Japan's waste and recycling policies changed from the 1R (Recycle) to a comprehensive promotion of the 3Rs. Circular use of resources has been promoted through the development of laws relating to resource circulation, large reductions in final disposal (namely, landfilling), and improvements in recycling rates. This section describes Japan's efforts for resource circulation in connection with the 1999 Circular Economy Vision.

### **1. Background to the formulation of the 1999 Circular Economy Vision**

In 1998, the Fundamental Problem Joint Sub-committee (at that time) was established to develop the 1999 Circular Economy Vision under the Earth Environment Committee of the Industrial Structure Council and the Waste and Recycling Committee. The background behind this was the growing recognition that environmental problems, which had traditionally been considered local industrial pollution problems found in limited areas, now reflected a broader global concern with long-term implications. While people's daily lives and economic activities depended on resources that were in danger of being depleted, the amount of waste being generated had continued to increase. The number of remaining life for final disposal sites was only 8.5 years for municipal waste and 3.0 years for industrial waste at that time. This sense of urgency was particularly

pronounced in the Tokyo metropolitan area. On the other hand, the recycling rates of municipal and industrial wastes had stagnated around 10% and 40%, respectively.

In addition, natural resource constraints became apparent. Since the Industrial Revolution, but particularly in the 20th century, human beings have rapidly extracted and consumed finite fossil fuels and metallic minerals. Under such a situation, the Kyoto Protocol was adopted at the 3rd Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP3) held in December 1997. As a result, there was a growing awareness that climate change was indeed one of the most important environmental issues that would affect humanity, and that international efforts should be made to address it.

Behind the appearance of environmental changes and other various urgent issues, there was a widely adopted linear economy that equates to a mass production, mass consumption and mass disposal pattern. The linear economy was accompanied by the increase in individual income during Japan's high economic growth period from the mid-1950s to the early 1970s, changes in lifestyles such as the rapid consumption of home appliances, and changes in sales methods and consumption behavior due to the emergence of supermarkets and convenience stores. Under these circumstances, the enlargement of household appliances and the increase in the types and amounts of containers and packaging had led to a rapid rise of waste that was difficult to dispose of properly. In order to achieve both environmental maintenance and sustainable economic growth, there was an urgent need to transition from a linear economy. This meant changing the social rules and code of conduct that had been accepted in the conventional economy and establishing a "Circular economy system" in which responses to environmental and resource constraints are built into all aspects of industrial and economic activities. After discussion for approximately one year at the Fundamental Problem Joint Sub-committee of the Waste and Recycling Committee and Earth Environment Committee of the Industrial Structure Council, "the 1999 Circular Economy Vision" was formulated in 1999.

## **2. Outline of “the 1999 Circular Economy Vision”**

“The 1999 Circular Economy Vision” consisted of four chapters: (1) The way forward to a circular economy system, (2) Reconstruction of waste management and recycling measures in Japan toward the establishment of a circular economy system, (3) Future challenges and policy responses toward the establishment of a circular economy system, and (4) Current status and issues in individual areas. The roles of business entities, consumers, and national and local governments were specified in the activities in order to maximize the effectiveness and efficiency of the 3R initiatives. Specifically, the following were the roles to be played by (1) business entities that could efficiently construct a circular economy system by taking actions that would lead to the reduction of environmental impact throughout the product life cycle; (2) consumers who would make consumption choices in the market and who themselves would be the emitters; (3) the government that could present the direction to be taken and set conditions; and (4) local governments that would carry out waste collection and management and promote the actions that residents would be taking toward environmental conservation.

For concrete actions, priority was given to the areas which had the characteristics of "Industrial-scale amounts of waste", "High usefulness of the contained resources" and "Difficulty for disposal" in order to promote the reconstruction of waste management and recycling measures in Japan. The measures for the implementation were presented, such as the revised Law for Promotion of Utilization of Recyclable Resources, the improvement of the guidelines for Waste Treatment and Recycling (by product category and by sector) issued by the Industrial Structure Council, and the enactment of individual recycling acts. The actions that were to be taken by the business sector were as follows: disclosure of environmental accounting, active disclosure of information using environmental labeling and life cycle assessment methods, active promotion of inter-industry cooperation, and development of 3R technologies.

The circular economy system presented in “the 1999 Circular Economy Vision” was aimed at overcoming the conflict between the environment and the economy by integrating them through built-in market mechanisms, etc. By doing so, circular economic and social activities could be appropriately evaluated in the

market, and environmental conservation costs could also be internalized by society as a whole. As a result, both economic vitality and a good living environment could be maintained.

### **3. Achievements of the 1999 Circular Economy Vision**

#### **(1) Improvement of the legal system**

After the formulation of “the 1999 Circular Economy Vision”, the Act on Promotion of Effective Utilization of Resources and the other recycling acts were revised or formulated. Until then, waste and recycling measures in Japan had focused on recycling (1R), however, with the aforementioned changes, a transition to comprehensive promotion of the 3Rs and the role of each actor promoting the 3Rs were clearly defined. Also, the roles of consumers were defined as follows; cooperation in extending product life, the use of products made from secondary raw materials or recycled parts, and contribution to source separation.

Since then, based on individual recycling acts, Japan has promoted a system to recycle each product or products categorized into individual groups. For example, regarding vehicles, the respective responsibilities of car owners, End-of-Life Vehicle (ELV) collection operators, fluorocarbons collection operators, automobile-dismantlers, shredders, vehicle manufacturers and importers are stipulated in the ELV Recycling Act. Under this Act, for items which are difficult to recycle economically, namely airbags, fluorocarbons and automobile shredder residue (ASR), vehicle manufacturers and importers are required to properly treat and recycle them based on the principle of extended producer responsibility (EPR, physical responsibility in this case). By establishing a mechanism to properly secure necessary costs for recycling the above-mentioned three items under the Act, ELV recycling in Japan has been facilitated. Before the time of the enforcement of the Act, inverse onerous situation was observed in ELV transactions. However, after the enforcement of the Act, the financial responsibility was imposed on vehicle owners to deposit a recycling fee for the three items, which constitute negative costs, at the time of purchase. As a result, the issue of illegal dumping and improper storing has been greatly improved, and the ELV recycling system has also revitalized the conventional market

mechanism due to increasing trade value of ELVs.

For home appliances, based on the concept of extended producer responsibility, producers cooperate with recyclers to achieve high-quality recycling. Having the company recycle their own products helps to ensure the reliability and quality of secondary raw materials.

Japan has updated legislation systems such as the Act on the Promotion of Effective Utilization of Resources and individual recycling acts to deal with new issues that arise with social changes and technological developments. In 2006, the government amended the Act on the Promotion of Effective Utilization of Resources to oblige manufacturers and importers of electrical and electronic equipment to affix a label indicating the presence of six hazardous chemical substances: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyl, and polybrominated diphenyl ether. This amendment attempts to prevent emissions of hazardous chemicals into the environment, to improve the efficiency of reuse and recycling processes, and to improve the quality of recycled materials by separating and managing products during reuse and recycling processes. The government considered various issues during the discussions for this amendment, including voluntary actions, the potential for affected parties to technically follow the amendment, and international harmonization.

Also, the Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging has been amended to introduce mandatory reporting and disclosure of municipal government plans for the sorted collection of waste containers and packaging within their jurisdictions and additional matters related to such plans for advanced domestic recycling.

## **(2) Reduction of waste generation and improvement of recycling rate**

As a result of these efforts, the amount of waste generated in Japan has significantly decreased. Also, the remaining life of final disposal sites were improved significantly from 8.5 to 21.8 years for municipal waste and from 3 to 17 years for industrial waste, comparing between when “the 1999 Circular

Economy Vision” was formulated in 1999 and 2017. Regarding cyclical use rates at inlet<sup>1</sup>, Japan’s rate raised from 10% in 2000 to 15.4% in 2016.

Compared with other countries, Japan has a low level of waste generation. Although there are some inconsistencies in the definitions of the national statistics, the per-capita municipal solid waste generation amounts for 2017 were 489 kg/person in Europe, 746.6 kg/person in the United States and 335.8 kg/person in Japan, respectively.

Under today’s recycling laws, Japan has achieved high recycling rates. For example, recycling rates<sup>2</sup> of specified home appliances collected within the recycling system developed under the Act on Recycling of Specified Kinds of Home Appliances in fiscal year 2018 were 93% for air conditioners, 71% for cathode-ray tube televisions, 86% for liquid crystal and plasma display televisions, 79% for refrigerators and freezers and 90% for washing machines and dryers. In fiscal year 2018, under the Act on Recycling, etc. of End-of-Life Vehicles, the recycling rate<sup>3</sup> of shredder dust reached 97-99% and that of air bags reached 94%. Under the Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging, high recycling rates were maintained in fiscal year 2018, of 69% for glass bottles<sup>4</sup>, 85% for PET bottles<sup>5</sup>, 92% for steel cans<sup>6</sup> and 94% for aluminum cans<sup>7</sup>.

### **(3) Expansion of environment-related businesses**

“The 1999 Circular Economy Vision” states that "Now is the time to expand frontiers through development of environment-related industries and technologies. In a circular economy system, companies leading this expansion of frontiers are expected to acquire new markets and competitiveness."

---

<sup>1</sup> cyclical use rate at inlet = amount of cyclical use/(input of natural resources + amount of cyclical use)

Cyclical use rate at inlet represents the share of cyclical use (amount reused/recycled) to total input in the economy and society

<sup>2</sup> Recycling rate = Weight of materials recycled/Weight of units treated for recycling

<sup>3</sup> Recycling rate = Weight of materials recycled/Weight of materials collected

<sup>4</sup> Recycling rate = Weight of materials recycled/Weight of domestic shipment

<sup>5</sup> This rate shows collection rate, which is calculated by Volume of total collection/Volume of sold bottles

<sup>6</sup> Recycling rate = Weight of steel cans recycled/Weight of steel cans consumed

<sup>7</sup> Recycling rate = Weight of aluminum cans recycled/Weight of aluminum cans consumed

In fact, voluntary efforts by private companies have progressed. The Japan Business Federation (Keidanren) and other economic organizations have formulated a Voluntary Action Plan for Establishing a Sound Material-Cycle Society. It has set voluntary goals for each industry and the progress and results of their efforts are reported. For example, the cement industry is utilizing existing technology to accept a wide range of waste. More than 20 types of waste from other industries, such as blast furnace slag, waste tires, coal ash and sewage sludge are recycled. This results in approximately 28 million tons of raw material per year, thereby reduces the input of new natural resources. Another example is one model of reconditioned copiers, which utilize reused parts, accounting for 80% of the product average weight, which results in 79% less environmental impact than new copiers in the manufacturing process. This indicates that corporate business models that contributes to circulating resources have been adopted.

New recycling technologies have also been developed. Such technology includes the use of lasers for component analysis of aluminum alloys and advanced sorting methods for resin materials by predicting the composition ratio based on product information. These have contributed to the improvement of recycling rates.

With the above movement, the environmental industry is growing steadily. The market size of the environmental industry in Japan increased from 58 trillion yen in 2000 to 105 trillion yen in 2017. The environmental industry here consists of four sectors: "Prevention of environmental pollution", "Measures against global warming", "Waste treatment and effective use of resources" and "Conservation of the natural environment." The "Waste treatment and effective use of resources" accounts for the largest share, reaching 49 trillion yen in 2017. On the other hand, the market in this sector increased by only about 26% from 39 trillion yen in 2000. This indicates that this sector is not yet a growth industry capable of creating value added, even though it should have more growth potential.

One of the reasons behind this situation was that it was difficult to gain profit from businesses dealing with recycled materials except for highly valuable metals. While well-managed waste management and recycling systems have been developed at local levels in Japan, waste management and recycling

companies are relatively small or mid-sized and tend to operate independently, which results in relatively less efficient recycling and unstable supply of recycled materials. This has led manufacturers not to use recycled materials except when these materials have cost advantages. As a result, the waste management and recycling industry has not developed sufficiently, which has brought a negative spiral in which recycled materials usage is not boosted.

In addition, since Asian countries such as China had previously been active importers of wastes, including plastics, paper products, and lead, the increase in the amount of collected wastes in Japan had not necessarily contributed to the growth of the "Waste treatment and effective use of resources" sector. These Asian countries imported massive amounts of wastes from foreign countries like Japan, the EU, and the US, to meet the demand for resources along with the rapid local economic growth. For example, the amount of the imported plastic wastes in China was 24,000 tons in 1990 and 3,024,000 tons in 2003, respectively. The amount of imported paper products increased from 423,000 tons in 1990 to 938,000 tons in 2013.

At the global level, waste management and recycling companies, so-called recycling majors, have taken the lead in resource circulation. They realize economies of scale by implementing consistent waste management and recycling covering large areas through making use of large-scale sorting centers and diligently investing in R&D, especially using digital technologies. In China, some waste management and recycling companies have actively acquired European companies and expanded their businesses into Europe and other Asian countries. Various new business models have also arisen there, such as businesses that collect mobile phones using digital technologies.

## **II . Need for Shifting to a Circular Economy**

As described in Chapter II, the world's population is continuing to increase, and is set to reach 8.5 billion in 2030 and 9.7 billion in 2050. As a result, the demand for materials is expected to grow. The amount of waste is also expected to increase and environmental problems such as climate change are expected to get more serious.

For example, due to rapid increases in GDP and population, global extraction of resources is projected to more than double from 88 billion tons in 2015 to 190 billion tons in 2060. It is feared that not only will prices of resources increase, but impacts on the environment will be greater, especially in countries with abundant natural resources, due to mining of lower-grade resources along with increased demand.

□ In addition, as economic activities become more globalized, the interdependence among countries deepens. Even issues that were previously treated at the local level, such as waste problems, could trigger foreign policies like restrictions on the import of used products and waste. This can affect the global supply chain. Furthermore, as a result of such development and growth, natural resources as public goods including air and water have been damaged. The tangible effects of global issues like climate change and marine plastic litter have also become apparent.

Under these circumstances, a conventional linear economic model of mass production, mass consumption, and mass disposal can no longer be sustained globally. In the past, the priority was placed on short-term shareholder returns, and countries competed for quantitative expansion of material wealth. However, now is the time to change from a growth model based on short-term views to another model that incorporates both medium and long-term perspectives. In other words, it is important to change to a model that aims for sustainable growth over the medium to long-term through circular economic and social activities that maximize value added through services, etc., while reducing resource inputs and consumption in all economic activities and making effective use of social stock.

### **From the 3Rs as environmental activities to a circular economy as economic activities**

In response to the shortage of final disposal sites, which has become a serious social issue in Japan, Japan has been promoting 3R activities by making use of regulatory measures since the formulation of “the 1999 Circular Economy Vision”, such as the enactment of the Act on the Promotion of Effective Utilization of Resources and the establishment of other recycling acts. As a result of these systems and initiatives, the amount of waste has been significantly reduced while

the amount of circulated resources has been increasing. The separation of waste has also become commonplace and widespread across Japan. Thus, Japan has realized one of the best levels of the 3Rs practice in the world.

However, the number of remaining years for the final disposal sites and the rate of circulated resource use have leveled off in recent years. Meanwhile, Japanese efforts to recycle resources have stagnated. In addition, the "Waste treatment and effective use of resources" environmental industry has expanded by only about 26% since 2000, and it is clear that this industrial sector does not generate much value added. This shows the limitations of implementing the 3Rs as environmental activities. Therefore, it is time to transform our circular efforts into economic activities that incorporate environmental activities, in short, a circular economy.

### **Driver of the transition to a circular economy**

"The 1999 Circular Economy Vision" also pointed out that Japan needed to shift to such a circular economy, but it was difficult to realize the vision due to the social and economic condition at that time. However, the situation has changed, providing us with the two keys to this transition; the development of digital technologies and the growing demand from markets and society for environmental action.

With the advances in digital technology, the transition to a knowledge-intensive socioeconomic structure (Society 5.0) that produces service solutions through AI and IoT is progressing, and the change to a service model that does not depend on the production and consumption of goods is beginning. This enables a variety of approaches beyond the conventional 3Rs to achieve improved resource efficiency and waste reduction.

For example, when a highly responsive build-to-order production system can be constructed by utilizing digital technology, it will be possible to minimize opportunity loss and reduce waste loss by having the markets supply in direct response to demand. In addition, service models like sharing and subscription, which provide value by integrating products and services, are expanding in place of the conventional business that focuses on product sales. Active transition to this service model may lead to more efficient use of resources while creating new

added value like improving the convenience for users. Of course, the use of digital technology will also help increase the efficiency of the 3Rs themselves.

In addition, since the adoption of the SDGs by the United Nations in 2015, there has been a rapid increase in the demand from markets and society for environmental action, and this has strongly encouraged changes in corporate behavior.

Needs from consumers have the greatest impact on production and sales activities. When consumers take the lead in purchasing products with low environmental impact, companies are incentivized to develop environmentally friendly products. As a result, a wider range of environmental consumer choices will lead to even more environmentally friendly products and services. Consumers and businesses are “like two wheels of a cart” in the market as each depends on the other. Increased consumer and business awareness will play a significant role in the transition to a circular economy.

In recent years, investors have increasingly played a role as a driving force for the transition to a circular economy through ESG investments and the like. Index funds that invest in companies leading the way to a circular economy and thematic investment funds that invest in projects that promote a circular economy are emerging. An increasing number of investment companies refer to a circular economy in their investment declarations based on stewardship codes. It is expected that investors will continue to encourage companies to transition to a circular economy through the exercise of their voting rights and other forms of engagement.

In response to this trend, businesses are voluntarily starting to make efforts towards resource circulation, and an increasing number of companies are actively communicating their own environmental initiatives and commitments.

In this way, transitioning to circular economic activity creates private interest, allowing the transition to be evaluated as added value in the market, through activities that are undertaken in the public interest (by providing social benefit) or for the conservation of the global environment. It can be said that this is a new frontier that creates “A virtuous cycle of environment and growth”.

The transition to circular economic activities is a source of competitiveness which will enable us to break into this new frontier and lead to increased business sustainability in the mid- to long-term. Therefore, companies are expected to consider circularity while drawing up their management and business strategies, voluntarily transforming their businesses into cycles of production and recycling. It is necessary for companies to flexibly optimize their business operations in response to varying circularity requirements based on the conditions of each country or market. Therefore, introducing regulatory measures that are applied to only local business activities could lead to ossified activities, hinder creativity and originality, and reduce international competitiveness.

*Japan should achieve a circular economy through encouraging companies' voluntary activities by making the most of digital technological developments and using "evaluation from the global market" as drivers, with minimal introduction of regulatory measures.*

### **III. Direction of Japanese response**

#### **1. Transition towards more circular business models**

All companies have social responsibilities which include maintaining environmentally friendly standards when engaging in economic activities. Japanese enterprises already conduct business with appropriate prevention of direct environmental pollution through preventative measures. Along with the rapid growth of the world economy, it has turned out that we have limited amount of natural resources. Every industry must recognize that they need to improve their resource efficiency and transform their business models into more sustainable ones.

There are various kinds of business models that improve resource efficiency and circularity beyond the traditional 3Rs. Companies should take the most suitable circular measure at every process of their value chain based on their business model. In other words, companies should design the total circularity of their products or services based on their life cycle.

Japanese enterprises should take these sustainable measures not only for improving waste management and recycling in Japan but also for strengthening their industrial competitiveness. Many countries such as the EU, China, and Asian countries have already started considering policy measures including regulations to achieve a circular economy. As a result, circular business activities get to be appropriately valued in the market and create value added. In other words, businesses which do not take into account environmental aspects are considered as a critical risk factor. Therefore, shifting to a circular business model will increase business sustainability and bring long term competitiveness. Japanese companies should seize business opportunities under this circumstance and create a virtuous cycle of environment and growth, which is driven by breakthrough innovation.

**(1) Manufacturers and service providers - shift to a circular industry that designs circularity and leads a resource circulation system that incorporates recycling**

All types of manufacturers and service providers including the distribution industry and online platformers which take advantage of digital technologies should be responsible for contributing to developing a resource circulation system that incorporates recycling by (a) taking their responsibility as an industrial waste generator seriously, and (b) designing highly circular products and service models.

**Achievement of high circularity by taking advantage of our industries' strengths**

Along with servicization (PaaS/MaaS) which is being brought about through improvements in digital technologies, value added provided by products has switched from hardware to software. Under this situation, moving toward the circular economy can provide Japanese manufacturers with new value added. Our highly sophisticated manufacturing industry can take advantage of the circular economy by seeking higher upgradability and sustainability on the premise that longer-lasting products will be more highly evaluated in the market. Since sophistication and durability are generally required to extend product lifespan, this can enable Japanese companies to cover the disadvantage they face in servicization, which implies manufacturing simpler products.

In addition, our manufacturing industries can apply their business customs that utilize close communications to reach a better understanding of needs across various stakeholders. Our competitive material and parts industry also has advantages in a circular economy since various aspects that circular products require can be incompatible with each other. In other words, durability and functionality can conflict with decomposability and recyclability. For instance, food packaging composed of multiple layers enables better food preservation, but is not suitable for advanced recycling. Therefore, companies should aim to create a new market through innovation, for example by utilizing mono materialization that produces high-quality mono materials with multiple uses or by making the most of eco-design, which is achieved with close communication throughout product chains.

Regarding plastics, the Clean Ocean Material Alliance (CLOMA) was established in January 2019. A wide variety of enterprises in the plastic supply chain have joined the alliance and are cooperating to develop alternative materials and introduce 3Rs measures in order to overcome the marine plastic litter issue. It is essential to encourage innovations that can solve problems by supporting this kind of supply chain cooperation among various stakeholders.

### **Promotion of manufacturer- and service provider-led collection and recycling**

Products in the market are distributed to users and finally disposed of as waste. In order to achieve a circular economy, it is important to develop an effective system to separate and collect used products, which enables them to be reused or recycled efficiently. From this viewpoint, manufacturers that use recycled materials for their products should play an essential role in designing the circularity of products and value chain management including recycling. For example, currently, home appliance manufacturers cooperate with waste and recycling companies in operating a consistent recycling system that has achieved high recycling rates.

It is important to put each used products into as suitable collection system as possible considering their emission source and condition and to reuse and recycle them in the most appropriate way. Enterprises are encouraged to achieve resource circulation throughout product life cycles by

distributing and collecting products while maintaining ownership through leasing, sharing, and subscription-based business models, or developing a recycling route with recycling and waste companies.

Enterprises, especially global consumer goods suppliers, have already started voluntary collection. In other countries, the introduction of a minimum requirement for recycled materials usage is being considered. In Japan, we should encourage and support these voluntary activities by enterprises while examining circulation conditions of each material or product.

## **(2) Waste management and Recycling Industry**

The Waste and Recycling industry have an important role in achieving a circular economy. Waste and recycling companies are expected to become a 'resourcing industry' which provide manufacturers with high quality recycled materials collected from all types of used products, which will support manufacturers in responding to demand from society and markets for environmental action.

For that purpose, relevant companies should adopt business models that incorporate better recycling systems that are cost effective and better in environmental aspects from life cycle perspective. Commodity items such as daily necessities are so widely distributed to users that it is difficult to predict when and where they are discarded. As a result, there is a technical limitation to designing a circular system for such manufacturers. Therefore, it is important for waste and recycling companies to collect enough volume of used products for their operation and secure stable supply of high quality recycled materials. The government should consider making use of a system that enables recyclers to operate in larger geographical regions (outside their own prefecture) like under the Act on Promotion and Recycling of Small Waste Electrical and Electronic Equipment, and foster recycling industries that can compete in global markets.

It is also critical to improve the environment where these recycled materials are actively used. One of the reasons why recycled materials have not been more actively utilized is the presence of information asymmetry in addition to weak cost advantage. In Japan, more than 100 thousand waste and recycling

companies with relatively small areas of operation are located all across Japan, but manufacturers which use recycled materials have not shown interest in actively using recycled materials produced by them. As a result, there have not been any opportunities for them to match demand and supply, including for the quality of these materials. It is therefore essential to develop a transparent and reliable market for recycled materials.

Creating and maintaining detailed standards related to recycled materials, including those related to their quality and criteria for use is effective in enabling manufacturers and waste management recyclers to communicate with each other smoothly. Through the use of such standards and criteria, manufacturers could expand the usage of recycled materials, which would also bring cost advantages.

### **(3) Encouraging voluntary activities toward a circular economy**

Many countries have already started introducing measures to shift to a circular economy. The government should seek harmonization of standards for products and industrial activities to ensure that Japanese enterprises can keep pace with their competitors in the global market. On the other hand, each country faces a unique situation based on their culture, geographical location, industrial structure and present infrastructure. Therefore, each country should independently determine the most appropriate measure to shift to a circular economy, following the global basic principles such as waste hierarchy and extended producer responsibility (EPR).

Now, member countries at the International Organization for Standardization (ISO) are discussing management standards for a circular economy. Japan should actively contribute to the discussion so that various measures are appropriately evaluated based on each country's situation and vision for a circular economy. In this way, various measures can be adopted depending on the specific circumstances in each country.

Japan has promoted the voluntary activities of enterprises through soft laws such as the Act on the Promotion of Effective Utilization of Resources and voluntary action plans after introducing regulatory recycling systems for large-

volume waste including packaging and containers, automobiles, home appliances, food, and construction waste, responding to the limited capacity of disposal sites in the 1990s. As a result, Japan succeeded in solving the landfill site capacity problem and taking the global lead in effective resource utilization.

Transitioning to a circular economy is a source of competitiveness for acquiring this new frontier, which also leads to enhanced sustainability of business activities in the medium- and long-term. Companies are expected to actively put circular business activities in their business and management strategies. It should be noted that ideal methods of achieving a circular economy should differ based on culture, geographical location, industrial structure and present infrastructure for each country or market. Companies should maintain flexibility in order to optimize their global business operations and deal with the demand from each market. Therefore, introducing regulatory measures that are only applied to local business activities could cause activities to stagnate, hinder their creativity and originality, and reduce their international competitiveness. One of Japan's strengths is that voluntary industrial activities work effectively, so Japan should achieve a circular economy through accelerating companies' voluntary activities by making use of soft laws like guidelines and showing milestones, with minimal introduction of regulatory measures.

## **2. Appropriate evaluation from the market and society**

Since the SDGs were adopted in 2015, demand from society and markets for environmental action has rapidly increased, which has made behavioral changes in investment and consumption, such as the expansion of ESG investment and ethical consumption, thanks to the increased speed of information transfer with today's information-rich society. Environmentally friendly activities that have only been recognized as costs until recently are turning to a source of value added by allowing the creation new businesses, and are an important factor in drawing funds, which affects the capital economy.

A circular economy is a theme that directly connects to some SDG goals and draws attention as an investment destination for ESG investment by major financial institutions. Companies should shift their business models to circular ones that are beyond the traditional 3Rs, enabling them to acquire trust and

positive evaluations from society and the market and opening up business opportunities.

### **(1) Information disclosure and performance indicators**

To receive appropriate evaluations from the market and society at large, it is important for enterprises to present their circular activities through active disclosures and providing explanations of their social responsibility.

Japanese enterprises have actively made efforts to achieve the 3Rs. However, it is sometimes pointed out that these activities are not recognized and evaluated appropriately in the global market. Regarding the plastics industry, the number of enterprises which actively provide information about their activities and commitment has been increasing since the marine plastic issue became a global focus. Other companies should also provide such information and show their stance to commit themselves to contributing to a circular economy through their corporate vision.

It is also necessary to develop a system to appropriately evaluate each company's activities individually. In some countries, recycling is emphasized to achieve a circular economy and the mandatory utilization of recycled content is under discussion. However, there are various activities that contribute to a circular economy including reducing, sharing, and usage of alternative materials, and therefore it is important to develop indicators that indicate these various activities.

*We need to properly evaluate how value added and social value are produced by these activities, while minimizing resource input.*

### **(2) Guidance for sustainable enterprises on attracting investment**

The amount of ESG investment is expected to increase both in Japan and around the world, and enterprises should actively attract these investments by promoting their voluntary circular-economy activities. It is important for them to build “co-creation” relationships with investors to transit to a circular economy

together by actively disclosing their circular economy activities and attract investment.

New financial products have been created recently such as an index fund targeting companies promoting circular activities and a thematic fund targeting circular projects. Unfortunately, it has been suggested that Japanese companies are outside of the scope of these funds due to their lack of effective disclosure of activities.

Therefore, the Japanese government is going to establish a “Guidance for investment in a circular economy” to help enterprises and investors build a common understanding and establish smooth communications through information disclosure regarding circular activities. These strategies generally bring long-term rather than short term profits. This guidance is expected to support enterprises in placing the circular economy in their management philosophies and business models and to show how they will realize comprehensive action based on them. This will result in attracting responsible investments from medium- and long-term perspectives.

### **(3) Market creation**

Towards a circular economy, it is also important to maintain an environment where circular products and business models are appropriately evaluated, get a fair price in the market.

“Circularity,” unlike energy efficiency, doesn’t necessarily give consumers direct benefits, so it does not always lead to consumers’ willingness to pay today. Taking a plastic litter issue as an example, according to the results of the poll about environmental issues by the Cabinet Office in August 2019, only 13.7% of the respondents said they would purchase alternative products without considering price or quality, in order to address a plastic litter issue. This reflects the reality that most consumers prioritize advantages in cost and/or quality.

In order to improve the situation, first we should establish a market for sustainable products by public procurement or visualization showing their

circularity. Japan has introduced several policies such as the Eco Mark and the Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities. It is important to expand and deepen these policies in a harmonized way with the global demands of the market. Business-led initiatives to develop industrial standards and labeling system will be necessary. Along with them, the government should consider incentivizing enterprises to use recycled materials for their products and encouraging consumers to purchase these products.

Of course, the most important element for promoting a circular economy is to enhance the environmental awareness of consumers. Consumers need to understand that they have a responsibility to actively purchase environmentally friendly products and to change their consumption patterns and lifestyles to incorporate higher circularity, through such behaviors as minimizing waste, with a perception that they are members of a circular economy system.

The Japanese are known to have the most meticulous system for the separate collection of waste. Individuals' awareness of environmental issues has steadily continued to increase, so it is necessary to keep conducting educational activities and making use of nudge theory, which is a useful behavioral economics measure, to make them adopt circular lifestyles.

### **3. Early establishment of a resilient resource circulation system**

The situations of waste management and resource circulation both inside and outside of Japan have changed dramatically. Due to the waste import bans by Asian countries like China, waste paper and plastic waste have accumulated in Japan, causing issues like falling prices of recyclable materials and increased processing costs. Also, the increase in logistics expenses due to the recent labor shortage has impacted waste management and recycling companies. Furthermore, enterprises that accept waste and by-products from other companies such as the steel and cement industries are on the decline in Japan. As a result, it has been getting more difficult to maintain the current resource circulation system from both medium and long-term perspectives.

It is necessary to rebuild Japan's resource circulation system from the viewpoint of the medium and long-term, taking into account the future depopulation and aging of society.

*We need to consider both the maximum resource circulation in the nation and a well-balanced international resource circulation that is compatible with it.*

### **(1) Securing recycling capacity and quality in Japan**

To achieve the maximum resource circulation in the nation, it is essential to optimize resource inputs and to expand circular utilization of resources. Also, these two activities should be maximally balanced. In addition, considering that all products are eventually discarded as waste, it is critical to ensure that recycling technologies are advanced and diversified and that the recycling capacity is secured.

When discussing advanced and diversified recycling technology, it is important to examine the forecasted demand and supply of base metals, including ferrous metals, aluminum, and copper, cement, paper, glass, plastics and so on, and the possibility of usage of recycled materials.

For example, the demand for aluminum forged products for automobile engines, which are the main use of recycled aluminum, is expected to decrease due to the wide spread of electric vehicles in the world, but the demand for recycled aluminum for wrought aluminum alloy is increasing since this type of alloy can contribute to lighter-weight automobiles. Regarding plastics, Japan is planning to expand the usage of recycled plastics following the "Resource Circulation Strategy for Plastics," and it has started developing new recycling technologies like chemical recycling.

In terms of minor critical metals, such as rare earth elements, the development of alternative materials and the development of recycling technology have been in progress since 2010 in response to the Rare Earths Crisis. On the other hand, challenges on the demand side for using these materials are becoming apparent. There are other materials such as phosphorus for which the necessity of a stable, secure supply has been

increasing. Therefore, Japan needs to analyze the forecasted recycled materials usage for individual materials and to work on research and development activities aiming to advance and diversify the usage of recycled materials. Based on the findings, it should also figure out the best mix of recycling technologies considering environmental impacts and conditions of used products and waste. The current social infrastructure, which includes waste management and recycling infrastructure, previous introduction of technologies, and technological feasibilities, should be taken into account when determining the necessary technologies.

While weighing what kind of products can use recycled materials, it is essential for manufacturers that use them to develop and communicate criteria for usage of these materials. It is recognized that recycled materials have lower quality than virgin materials under traditional recycling technologies focusing on cascade recycling, but it is gradually becoming possible to produce recycled materials with identical quality to primary materials, thanks to advanced recycling technologies. Therefore, it is important to review the current product standards, Japanese Industrial Standard (JIS), and regulatory standards based on the latest technologies to expand usage of recycled materials. Also, it is necessary to prepare a certification scheme that enables usage of recycled materials to be evaluated as environmental value.

Moreover, it is quite important to secure recycling capacity in the nation, especially with the amount of plastic wastes that have accumulated due to import restrictions by Asian countries. Japan should consider introducing support for capital investments by companies.

Improving collection, dismantling, and separating technologies is also indispensable for efficient recycling. In the waste management and recycling industry, labor intensive methods still dominate. In order to deal with the declining population in the future, this industry should adopt further automation. AI technologies can efficiently and effectively improve optical sorting, magnetic separation, and sink-float separation. Continuous human resources training is also required.

## **(2) International resource circulation and global expansion**

It is significant to expand Japan's advanced circular technologies and systems overseas, as many countries have been shifting to a circular economy.

Japan has advantages in the waste management and recycling field, such as environmentally friendly materials like marine biodegradable plastics, eco-design under Act on the Promotion of Effective Utilization of Resources, manufacturer-led recycling systems under individual recycling laws, and highly efficient waste management techniques. It is essential to incorporate these technologies and systems into Asian countries where many Japanese companies have manufacturing bases and to contribute to international resource circulation and earn value added. In some Asian countries, including China, Thailand and Indonesia, model projects conducted in cooperation with Japanese enterprises' local branches and local governments are in progress. The government should keep supporting these activities through intergovernmental dialogues.

In addition, it is necessary to rebuild an international resource circulation system from the middle and long-term viewpoint. While Asian countries have introduced import regulations on wastes and the EU Commission has stated that the EU does not export its waste challenges to third countries, Japan also needs to rapidly develop a domestic resource circulation system. However, it should also consider a sound international resource circulation system since Japanese manufacturers making use of recycled materials are not necessarily located in Japan, due to the advance of the division of labor undertaken by manufacturers around the world.

In order to smooth the international trade of recycled materials and used products, it is important to ensure appropriate management in third countries. To establish a certification system might be one solution. Adding such a certification system to the Basel Convention, which regulates transboundary movements of hazardous wastes and their disposal, or addressing it in the discussion of international standardization of circular economy management might both be considered. Supporting the establishment of an international

resource circulation system might play an important role in improving both awareness and trust in Japanese enterprises.

### **(3) Areas where the development of resource circulation systems are urgently needed**

Japan has promoted the 3Rs through Act on the Promotion of Effective Utilization of Resources, individual recycling acts, and industry's voluntary activities etc. On the other hand, there are some areas without enough circular activities such as sectors that are outside the scope of the current legislations and products which have since rapidly risen to prominence.

It is crucial to secure Japan's sound waste management and resource circulation system and to enhance the competitiveness of Japanese companies by rapidly moving toward a circular economy in these areas. Key areas where the development of resource circulation systems are urgently needed are below.

#### **✓ Plastics**

Plastics are useful materials that are useful in our daily lives by reducing food loss and improving energy efficiency of transportation, since they are light, easy to mold, and highly functional. The international demand for resource circulation for plastics has been increasing since the marine plastic litter issue started drawing attention, and Japan is also going to increasingly promote the 3Rs and expand the use of alternative materials, following the "Resource Circulation Strategy for Plastics."

In the industry, companies have accelerated their voluntary 3Rs commitments, use more alternative materials, and develop chemical recycling. Setting up an environment where companies can smoothly work on these activities is urgently required.

#### **✓ Textiles**

Textiles are essential to our lives. On the other hand, it is pointed out the 73% of discarded cloths are burned or landfilled around the world. People are very focused on the circularity of textiles and this has been designated as one of the key value chains in the EU's "Circular Economy Action Plan."

It is necessary for the textiles and apparel industry to review their business models that tend to constantly over-supply. This means they need to respond to consumer demand and improve circularity of distribution and sales through mass-customization, promotion of e-commerce, and active deployment of sharing models, ensuring higher value added of the industry by making the most of digital technology.

In addition, it is important to promote textile recycling. Some companies have already started collecting their products in stores and send them to developing countries, but increasing recycling levels is still critical. Recycled textiles made of PET bottle wastes has been implemented. Development of functional mono material textiles that are easy to recycle and technological development which enables recycling from textiles to textiles are still required.

✓ **Carbon Fiber Reinforced Polymer (CFRP)**

CFRP is a light, durable and heat-resistant material. The demand for CFRP is expected to increase, especially in the automotive and aircraft industries, due to its GHG reduction effect resulting from their lighter weight. Japanese companies have a large global share of the CFRP market. These companies have actively developed advanced technologies. However, there are challenges in recycling of CFRP in the current processes, and efficient recycling technologies, including the use of recycled CFRP, are required.

Producers and users of CFRP have been working on developing recycling technologies, evaluation methods for recycled CFRP and other improvement for CFRP. For example, the Innovation Structure Material Association (ISMA) was the first entity in the world that succeeded in producing a chassis made of thermoplastic CFRP. These activities should be accelerated, and a global circulation system should also be established in cooperation with the EU.

✓ **Batteries**

Rechargeable batteries such as the ones used in small home appliances are appropriately treated in the recycling system. This system lets manufacturers collect their products based on the Act on the Promotion of Effective Utilization of Resources and certified operators to collect them based

on the Act on Promotion of Recycling of Small Waste Electrical and Electronic Equipment. However, small products with lithium-ion batteries are sometimes unintentionally included in collected materials or wastes, which cause fire and other accidents during recycling and prevents smooth recycling operations. Small, high-capacity lithium ion batteries are widely used in a large variety of products that are not targeted by the current legislations. Ideal recycling and collecting systems should be developed considering characteristics of these products and distribution routes.

Regarding automobile batteries, the amount of discarded batteries is expected to increase along with the increase in the number of electric vehicles. Car manufacturers have already started to recycle them utilizing the national permit system of the Waste Management and Public Cleansing Act. In addition, they have considered refurbishment for secondary use for automobiles and reuse as stationary fuel cells in households. It is important to steadily promote these activities.

#### ✓ **PV Panels**

Installation of PV panels dramatically increased after 2012, when Feed-in Tariff Scheme introduced in Japan. It is expected that the volume of discarded PV panels will hit a peak between around 2035 and 2037. This means about 170-280 thousand tons of PV panels will be disposed of per year, which equal to 1.7-2.7% of Japan's total final disposals if industrial waste. Concerns about neglected PV panels and illegal disposal have been rising because there tends to be a large amount of turnover among main operators during an operation period, due to low entry barriers to the solar power business.

A bill to establish a new system of disposal reserves that calls on solar power business operators to accumulate external funds to cover disposal costs, has been submitted to the Diet in order to ensure the proper disposal of PV panels. In addition to this, it is necessary to consider appropriate reuse and recycling, because the volume of discarded PV panels is expected to be high enough to deal with the issue only by crushing and reclaiming them. The R&D such as a delamination technique have been advanced by NEDO. Also, diversification of the use of recycled glass from the PV panels that account for the biggest portion of a PV panel have been considered, mainly by recyclers and users of recycled

glass, in addition to developing methods for collecting the valuable metals like silver contained in the PV panels. Looking at the future when the volume of discarded panels will increase dramatically, it is necessary to discuss a method of appropriate reuse and recycling that takes into account the activities above, while recommending long-term use to reduce the number of discarded PV panels.

## **Conclusion**

Japan is one of the first countries that started shifting to a circular economy and society. Since the “1999 Circular Economy Vision” was drawn up in 1999, the amount of waste in Japan has been dropping and the recycling rate has been improving dramatically under individual recycling laws. On the other hand, the domestic and international situations have drastically changed since then. In Japan, the labor shortage has become serious due to declining population and aging, which requires us to review and rebuild the current social and economic system. Internationally, the demand for resources has keep growing along with population increase, resulting in higher uncertainty of securing a necessary supply of resources in the middle- and long-term. In addition, demand for environmental action from consumers and investors has been increasing due to the recent focus on the marine plastic litter issue and the increase in extreme weather events around the world, which have been linked to climate change.

The current situation requires that Japan shift from a traditional linear economy to a circular economy. We should recognize this requirement not as a cost but as an opportunity for industries to grow, which will lead to a new capital economy. Japan, among other countries, has taken the lead in promoting the 3Rs and developed many advanced environmental technologies. Also, Japanese companies have been voluntarily moving to a circular economy in line with the development of digital technologies and the increasing demand for environmental action from consumers and investors. It is essential to harmonize with the international community that is aiming for a sustainable society and to realize a virtuous cycle of environment and growth by introducing these activities to the world and enhancing them.

This vision shows the direction for Japan to quickly shift to a circular economy, to strengthen competitiveness through global markets and to realize

sustainable growth. The government has started discussing how to realize the “Resource Circulation Strategy for Plastics”. For other areas, it is important to understand the current situation and introduce necessary policies. Shifting toward a circular economy represents a major chance for Japan. The government will steadily follow this vision and lead the international community towards a circular economy.

Finally, we would like to express our deep appreciation for committee members and others who have supported the formulation of this vision.

“Economy without circularity is vice, and circularity without economy is a castle in the sky.”

This comment was uttered by one of the committee members, based on the famous proverb by Sontoku Ninomiya, “Economy without moral is vice, and moral without economy is a castle in the sky.” We hope that a circular economy becomes fundamental standards that must be taken into account when we undertake industrial, economic and social activities.