Resource efficiency evaluation based on MFA in Korea

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INTRODUCTION

Currently, resource depletion and energy crisis due to mass consumption and mass disposal of linear economy and climate change crisis are emerging problems. Thus, the establishment of circular economy along with sustainable development around the world has become an important agenda. The key to building a circular economy structure is the constant circulation of resources and minimization of the environmental load upon waste disposal.

In Korea, most of resources depend on imports with high population density. Thus, resources must be conserved and circulated to increase resource productivity and resource efficiency. The objective of this study was to develop indicators for resource productivity and resource circulation between 2000 and 2018 by using available statistics. Based on such indicators, we analyze resource efficiency and draw implications, create a resource flow chart based on material flow analysis.

MATERIALS AND METHODS

Data acquisition and statistical data collection

In this study, national basic statistics related to resource productivity and resource circulation, industry statistics, and various literature data were used to evaluate resource efficiency related indicators by using material flow analysis.

Resource efficiency and resource circulation indicators

As an indicator of resource productivity, it is often expressed as gross domestic production (GDP/DMC, million won/ton) compared to the amount of resource consumption widely used. In addition, detailed indicators such as DMC per capita and fossil fuel productivity (GDP/ECf), energy consumption of fossil fuels) were used. As an indicator of resource circulation, it represents the recycled resources (R/TMI, Total Material Input) compared to the total input resources, and is often referred to as the resource circulation rate. The recycling rate (R/W) compared to the amount of waste generated and the landfill rate (L/W) compared to the amount of waste generated were used as detailed indicators.

RESULTS AND DISCUSSION

Results of evaluation of domestic resource productivity and decoupling

Trends of GDP growth, DMC, and resource productivity for the past 2000-2018 (year 2000 is set as 100). Resource productivity increased by about 60% in 2018 compared to 2000. In general, the phenomenon that the consumption of resources increases as the economy grows is called coupling, and the phenomenon that goes backward is called decoupling. In Korea, the GDP growth rate is about twice and the DMC increase rate is about 1.23 times, which is a higher rate of GDP growth compared to the DMC growth rate, so Korea has a relative decoupling.

Resource productivity and fossil fuel productivity comparative analysis

The trends of DMC/person (ton/capita) and GDP/ECF (million$/ton) from 2000 to 2018. DMC/person and GDP/ECf increased by about 1.6 and 1.0 respectively in 2018 compared to 2000.

Results of recycling rate and landfill rate compared to domestic resource input

Recycling rate (Recycling/TMI, %), the landfill rate to resource input (L/DMC) and the landfill rate to the amount of waste generation (L/W, %) for the past 2000-2018 when 2000 is set as 100. The domestic resource circulation rate increased by more than 70% in 2018 compared to 2000. Meanwhile, the landfill rate compared to resource input (L/DMC) and the landfill rate compared to waste generation (L/W) decreased by about 50% and 67% in 2018 compared to 2000.

CONCLUSION

1. From 2000 to 2018, domestic resource productivity has steadily increased (from 1.6 million $ / 1,000ton in 2000 to 2.7 million $ / 1,000 ton in 2018), and there is a relative decoupling phenomenon in which economic growth and resource consumption are separated. In addition, domestic fossil fuel productivity (from 4.5 million $ / 1,000ton in 2000 to 5.4 million $ / 1,000 ton in 2018) and domestic material consumption per person (from 11.6 ton / capita in 2000 to 13.1 ton / capita in 2018) are also steadily increasing slightly every year.

2. In Korea, the ratio of recycling to total resource input has increased by about 1.7 times from about 7.9% in 2000 to about 13.5% in 2018. Compared to DMC the amount of landfill decreased by about 2 times from about 3.4% in 2000 to about 1.7% in 2018, and the amount of landfill compared to the amount of waste generated was also reduced by about 3.1 times from 22.4% in 2000 to about 16.8% in 2018.

REFERENCES

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