Comparative analysis between GHGs reduction and energy efficiency: focused on industrial sector in South Korea

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Overview

South Korea has carried out energy efficiency improvement programs on industrial secor, and pushed forward CO_2 reduction target starting with voluntary agreement since 2000s. In 2005, South Korea launched incentive program which was about GHGs reduction and modified the program as target management system targeting certain size of workplace in 2011. Also, CO_2 reduction target by 17 million ton compared to BAU was set as a GHGs MBO(Management by Objectives) on industrial and power sector in 2013. Industrial sector participants of MBO accounted for 40% of national total energy consumption and 58% of CO_2 emissions based on 2008 status.

<Target of GHGs emissions>

[Unit: Tton CO_2]

	Number of Participants	GHGs Emission Allowance(2013)	Estimated GHGs Emission (2013)	Reduction
Manufacture and Power	377	553,429	570,586	17,157
Total	480	571,947	589,778	17,831

On the grounds that, GHGs emissions from Korean industrial sector was based on the use of fuel energy so that the climate policy regarding industrial sector has focused on energy efficiency. Therefore, climate policy set as a target improving energy efficiency and reducing GHGs emissions at the same time.

To find out that effect of energy efficiency improvement policy and GHGs reduction performance on industrial sector , this research was designed to compare energy efficiency index and GHGs intensity of South Korea. In addition to that, GHGs reduction program and energy efficiency policy were analyzed respectively how those of two policies were affected by each other regarding climate policies on industrial sector, laws, incentive program and regulations.

Methods

In order to find out the trends of the performance of GHGs reduction program and energy efficiency policy of Korean industrial sector, we checked the time series data of energy intensity(TOE/$1,000), CO_2 intensity (tCO_2/$1,000). As a second step, decomposition method which was introduced by Ang in 1994, was adopted to analyze the performance of detailed industrial sector and to proceed to calculate CO_2 intensity with GDP and CO_2 emissions. Finally, the effect of energy efficiency and performance of GHGs reduction about each manufacturing industrie sector were examined. Total amount of GHGs emissions were decomposed of the productive effect, energy intensity and carbon intensity of fuel as below.

$$G = Y_t \times \frac{\sum Y_t}{Y_t} \times \frac{\sum E_i}{\sum Y_i} \times \frac{\sum Gi}{\sum Ei}$$

Conclusions

Energy intensity and CO_2 intensity has decreased in Korean domestic manufacturing sector over time since 1990s. As time goes by, energy intensity and CO_2 intensity has been expected to show a decline because GDP increased and CO_2 emissions decreased by the growth of enegy efficiency in those sector. In 2010, energy intensity of manufacturing sector accounted for 0.395 down 0.001 points from the year before. However, CO_2 intensity of increased from 2.001 to 2.06 the same year. This decrease is attributed to the increase of electricity intensity compared to fossil power intensity. Also, CO_2 intensity of electricity intensity affected to the increase of overall CO_2 intensity.

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