Analysis of trends in ecological and economic development of the Russian Federation Eastern regions and China Northeast regions

I A Zabelina

Currently, the environmental situation in many countries continues to be tense, despite various efforts to move them in the direction of ensuring balanced development. China's dynamic economic growth has contributed to the aggravation of the environmental situation. Russia exceeds the level of many developed countries in terms of the number of pollutant emissions per capita [2].

The objective of this article is to study the character of the relationship between economic growth and negative environmental impacts in the regions of Eastern Russia and Northeastern China. The relationship between environmental and economic indicators is estimated for the period from 2011 to 2020 using the "*The Decoupling Diamond*" model proposed in [5] and developed in the study of P. Tapio [4]. Depending on changes in the environmental load on the environment (ΔE), economic growth (ΔY) and the value of the coefficient of elasticity (KD_t)[1], eight decoupling states are distinguished (Fig. 1).

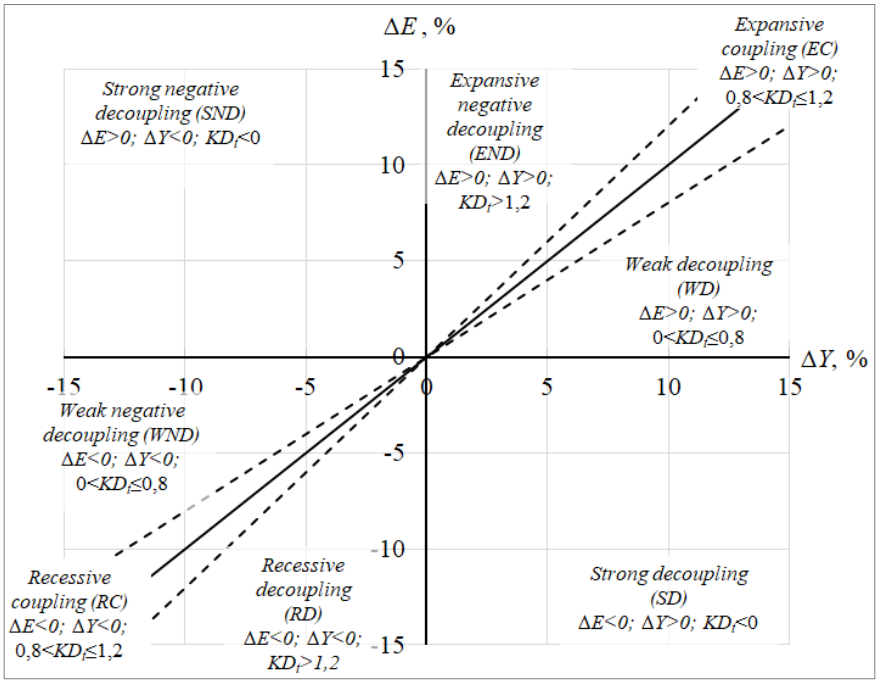
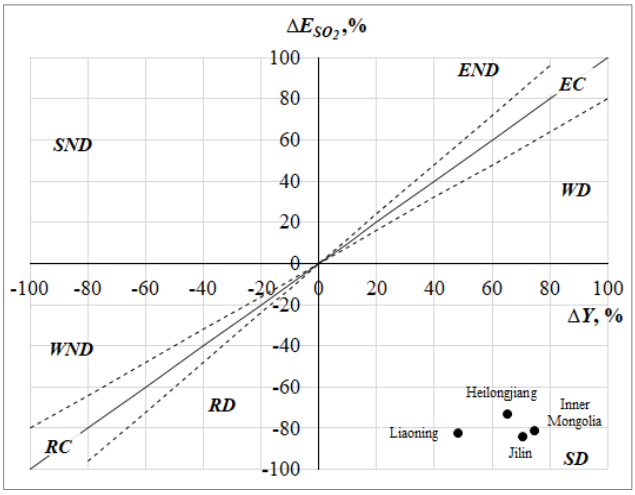


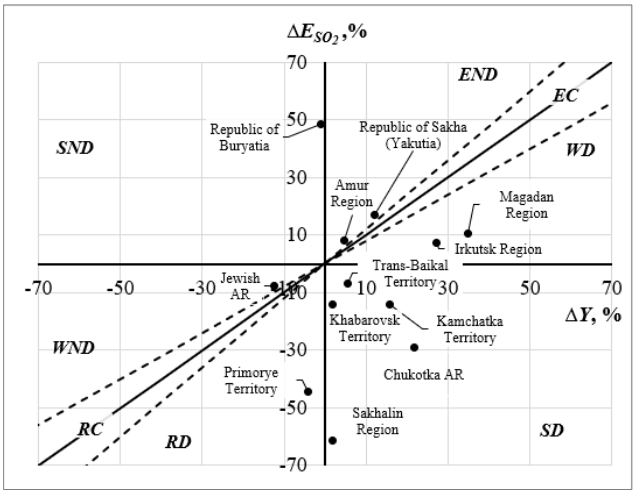
Fig. 1. The decoupling statuses according to P. Tapio model

Source: Compiled by the author using sources [1, 3, 4].

The results of the assessment have shown that in China and its border regions, the most favorable situation is in terms of emissions of sulfur dioxide and nitrogen oxides. Strong decoupling was detected for these pollutants (Fig. 2 a, 3 a).

[1] The coefficient of elasticity of decoupling KD_t is calculated as the ratio of the percentage change in pollution volumes for the period considered in the study to the percentage change in GRP. The economic values were converted into 2011 constant prices in conjunction with official GRP growth rates.



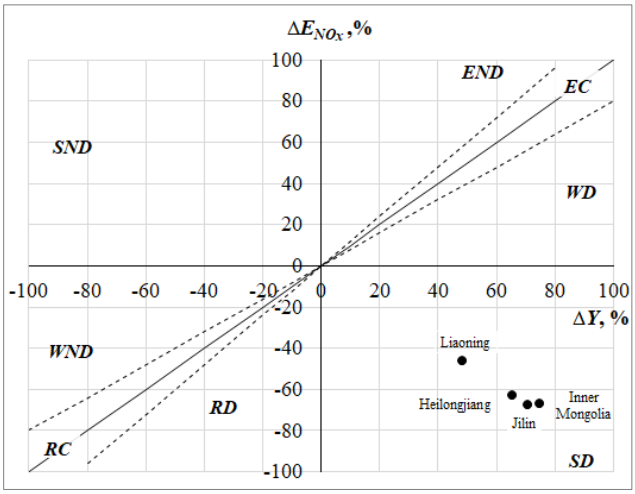


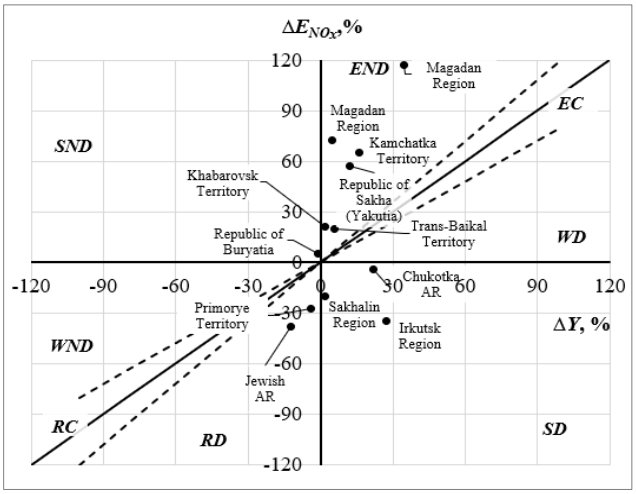
a) China Northeast regions b) Russian Federation Eastern regions

Fig. 2. Decoupling of sulphur dioxide emissions from GRP in analyzed Russian and Chinese regions, 2011–2020

Source fig. 2, 3: the author's calculations are based on data from the Federal State Statistics Service and the National Bureau of Statistics of China.

Alarming trends have been revealed in some eastern regions of the Russian Federation (fig. 2 b, 3 b). For example, in the Amur Region and the Republic of Sakha (Yakutia), expansive negative decoupling took place, i.e., the growth in emissions of these pollutants over the period under review was more significant than the growth in GRP. A similar situation was observed in Magadan region, Kamchatka and Trans-Baikal territories by nitrogen oxides emissions. In the Republic of Buryatia, the worst decoupling state was noted (*SND*), i.e., against the background of a decrease in GRP, the volumes of these pollutants' emissions have increased.





a) China Northeast regions b) Russian Federation Eastern regions

Fig. 3. Decoupling of nitrogen oxides emissions from GRP in analyzed Russian and Chinese regions, 2011–2020

The best decoupling state (*SD*) by polluted wastewater discharge was observed in many Russian Eastern regions (with the exception of Primorye Territory, Republic of Buryatia and Jewish AR). However, with regard to the waste generation, negative trends have been identified in almost all the regions of Russian Far East – their volumes are growing much faster than the economic result (mainly expansive negative decoupling was revealed).

In Inner Mongolia and Heilongjiang Province, the volume of industrial waste generation increased during the period under review, but the growth of GRP was more significant, i.e., there was a weak decoupling (*WD*). A positive trend was observed in the Liaoning and Jilin Provinces. In these regions was observed a strong decoupling (*SD*) in the trends of economic development and the industrial waste generation.

Based on the results obtained, it can be concluded that the border Chinese regions in most cases demonstrate a more positive vector of development. The negative trends identified in some Russian regions require the development and adoption of effective measures that will contribute to reducing the anthropogenic load and improving the quality of life of the population.

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