

Development of methods for assessing the environmental performance of chemical and petrochemical enterprises participating in the Responsible Care program

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Annotation

Relevance

Currently, the need to quantify environmental performance and minimize anthropogenic impact of industry on the environment is reflected in the Sustainable Development Goals approved by the UN in 2015. The voluntary international program Responsible Care is a practical tool for reducing the anthropogenic impact of chemical and petrochemical industry on the environment. Every year, the enterprises participating in the program provide reports on key performance indicators (KPIs) in the field of environmental protection and climate change combating. However, due to the fact that reporting is a voluntary initiative, the collected data sets are characterized by data gaps and are often heterogeneous. So it is quite difficult to draw reliable conclusions about the effectiveness of the program based on actual data. Also, when identifying trends in KPIs changes over time, it is important to take into account that enterprises are undergoing modernization, increase / reduce the volume of production, open or transfer some types of production activities, which directly affects the reliability and volume of the actual data presented in the reports. Meanwhile, there are no comprehensive indicators to assess changes of KPIs in the field of environmental protection and climate change combating before and after the launch of the program.

Given work is assigned to solving the scientific problem of development and practical application of methods for assessing the environmental performance of chemical and petrochemical enterprises, which will allow drawing conclusions about the environmental and economic achievements of the participants of the Responsible Care program. It is important for assessing how the program contributes to the Sustainable Development Goals.

The goal of the dissertation work is the development of methods for assessing the environmental performance of chemical and petrochemical enterprises participating in the Responsible Care program designed to analyze a large set of reporting data of the enterprises in the field of environmental protection and climate change combating.

To achieve this goal, **the following tasks** are set and solved in the dissertation work:

1. Analysis of actual international and national approaches to the assessment of activity of chemical and petrochemical enterprises in the field of environmental protection and climate change combating.

2. Scientific justification of the principles and development of a method for assessing the environmental performance of chemical and petrochemical enterprises participating in the Responsible Care program, for 14 years.

3. Assessment of the carbon footprint of chemical and petrochemical production facilities participating in the Responsible Care program, and forecasting of changes in the amount of greenhouse gas emissions by 2050.

4. Ecological and economic analysis of activity of chemical and petrochemical enterprises participating in the Responsible Care program.

5. Development of a methodology for assessing the degree of visualization of the environmental impact of chemical and petrochemical enterprises in addition to environmental monitoring and industrial environmental control.

Scientific novelty

1. A method for assessing the environmental performance of chemical and petrochemical production facilities participating in the Responsible Care program has been developed and scientifically justified. The method provides for several different approaches to assessing a large set of reporting data characterized by heterogeneity and gaps.

2. For the first time, an ecological and economic analysis of activity of chemical and petrochemical enterprises participating in the Responsible Care program was conducted.

3. A methodology for assessing the degree of visualization of the environmental impact of chemical and petrochemical enterprises has been developed. The methodology is a low-cost addition to environmental monitoring and industrial environmental control.

Theoretical and practical value

1. Using the developed method of assessing the environmental performance of chemical and petrochemical enterprises participating in the Responsible Care program, KPIs in the field of environmental protection that have positive dynamics during the period of implementation of the voluntary initiative and reporting, as well as environmental aspects requiring improvement, were identified.

2. The carbon footprint of the chemical enterprises participating in the Responsible Care program was estimated. Based on the results obtained, the forecasting of changes in the amount of greenhouse gas emissions of the enterprises participating in the program by 2050 was carried out.

3. The economic efficiency of the Responsible Care program implementation has been assessed by calculating the specific environmental and economic damage caused by environmental pollution and payment for the negative impact on the environment.

4. The developed methodology for assessing the degree of visualization of the environmental impact was tested at several production sites. The criteria that should be included in the environmental policy and target planning for further development of set of corrective measures were identified.

5. The main results of the dissertation work have received practical application at the chemical enterprises, which is confirmed by certificates of implementation.

Provisions to be defended

1. The method for assessing the environmental performance of chemical and petrochemical enterprises participating in the Responsible Care program.

2. The results of the assessment and analysis of the KPI dynamics for chemical and petrochemical enterprises participating in the Responsible Care program, for 14

years, conducted using the developed method for assessing the environmental performance of the enterprises.

3. Results of the assessment of the carbon footprint of the chemical enterprises participating in the Responsible Care program.

4. The results of the ecological and economic analysis of the activity of chemical and petrochemical enterprises participating in the Responsible Care program.

5. The methodology for assessing the degree of visualization of the environmental impact of chemical and petrochemical enterprises, developed in addition to environmental monitoring and industrial environmental control.