

WASTE MANAGEMENT INDICATORS – STATISTICAL INDICATORS FOR INDUSTRIAL WASTE MANAGEMENT – CRITERIA FOR ENVIRONMENTAL IMPACT ASSESSMENT

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Abstract

Statistics at the EU and national level, on the generation and management of waste coming from industrial activities are used in the process of monitoring the implementation of industrial waste policies and in assessing how the prevention/reduction principle in generating waste at their source is applied.

The paper presents the methodology of setting up a system of statistical indicators able to illustrate the environmental pressure coming from the economic development, by reporting the production value obtained to the waste quantity generated to get that production.

The indicators developed in the work at the aggregated level for several industrial sectors or for a given NACE-coded industrial activity have been calculated by using the databases of the National Agency for Environmental Protection and of the National Institute for Statistics.

Statistical analyzes of the dynamics of the developed indicators revealed a series of expected trends, absolute (or relative) de-coupling of development from resource use, but also some instances in which the environmental impact increased. As the indicator system assesses the success or failure of environmental policies, they may constitute a decision making support, relevant for Central / Local Authorities, Regulatory Agencies, business operators but also for communities, NGO and the general public.

Keywords: industrial waste management, hazardous (or nonhazardous) waste, the de-coupling indicator, statistic intensity indicator

Introduction

Indicators, e.g., the ratio of hazardous (or nonhazardous) waste to production expressed in monetary units are relevant intensity indicators enabling highlighting the environmental impact by evaluating the economical development variables (expressed as the increase in production value) and the associated environmental pressure (expressed by the amount of waste generated). Such indicators are included in the statistical indicators assessing the de-coupling of the use of natural resources from the economical

development. According to the OECD definition (OECD, 2011), such decoupling arises when the increase in the environmental pressure is less than the increase in the level of the economic activity, in a given period of time.

Industrial waste management indicators may be set up both at the level of a specific industrial activity, along the NACE coding system and at an aggregated, global level (economic sector, national industry).

Calculation Methodology

Indicators are derived using the Romanian Environmental Protection Agency (ANPM) and the Romanian National Institute for Statistics (INS) databases related to quantities of generated waste and value of production realized at national / regional level as well as per industrial economic activity (NACE code).

Formula used: $(IndWaste_{non-hazardous} \text{ or } IndWaste_{hazardous}^)$ generated at the level of industrial economic activity / Val production*

Where:

IndWaste_{non-hazardous} = non-hazardous industrial waste (includes inert waste).

IndWaste_{hazardous}^{}* = hazardous industrial waste

Val production = production value in constant prices for a reference year.

In order to allow comparability of the collected and reported data, the calculation of the indicator for the period 2003 – 2007 takes into account the classification of the economic activities according to NACE Rev.1. After 2008 the elaboration of the indicator complies with the classification NACE Rev.2.

Unit of measure - thousand lei / ton of generated waste.

Level of aggregation: may be the industrial unit, all the units under the same NACE, the national industry or one of its branches.

Data sources

INS database

-IND103A – Industrial production per activities according to the classification CAEN Rev.1 (Series of data 1997 – 2008);

-IND103C – Industrial production per activities according to the classification CAEN Rev.2 (Series of data after 2009).

In order to ensure comparability in time, the gross added value is determined in constant prices of a reference year, thus eliminating influence of the price factor.

ANPM database

The statistical data regarding the quantity of waste generated by the industrial activities (per categories of hazardous and non-hazardous waste) are obtained through the survey AS - GS - PRODDDES “Statistical study regarding waste management, for waste generators” executed at national level by the National Agency for Environmental Protection.

Analysis of the Indicators of Hazardous and Non – Hazardous Industrial Waste Management

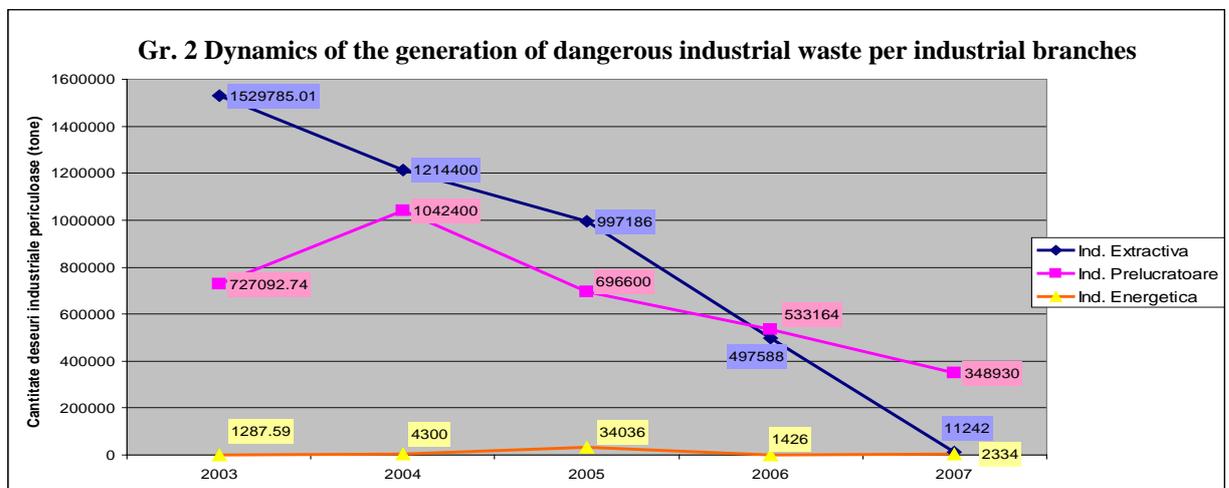
The analysis included the calculation of hazardous and non-hazardous industrial waste at global level (total industry, industrial branches) as well as at the level of industrial economic activity according to CAEN rev. 1 for a series of activities with increased potential in the generation of non-hazardous industrial waste (Reference year = 2000).

Waste management indicators

The dynamics of the industrial waste management indicators (production value and waste quantities, hazardous / non-hazardous) generated by the mining, processing and energy industry for the period 2003 -2007 is presented in Fig. 1-3.



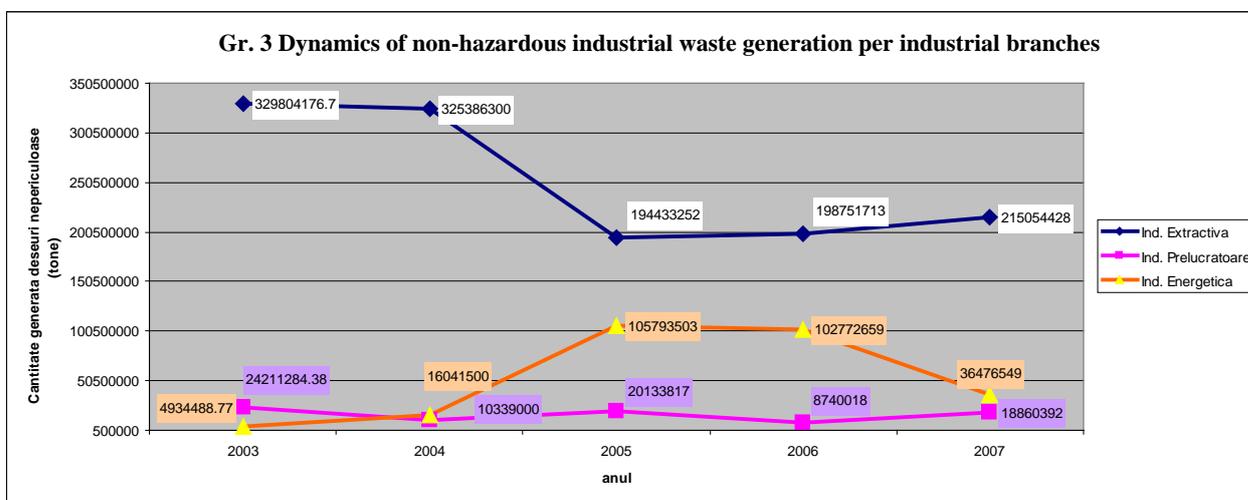
An increase in the production of the processing industry (having the main weight in the value of industrial production) can be detected.



A strong decrease of the quantities of hazardous industrial waste generated by mining industry is observed (probably due mainly to closing of major mines).

In the branch of power industry, the quantity of generated hazardous waste increases until 2005 (due to organizational changes of major companies in the field, leading to the transfer of waste categories from the mining industry to the power industry).

A decreasing trend is noticeable for the processing industry for the quantities of generated hazardous waste although they increase for the total industrial activities from 32.2% in 2003 to 96.25% in 2007.



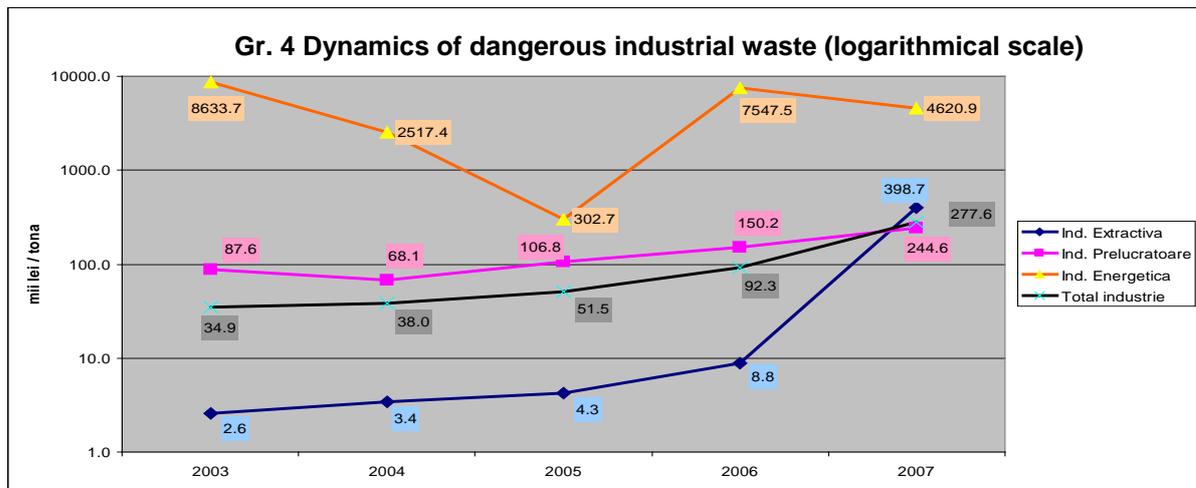
The weight in the generation of non-hazardous industrial waste goes to the mining sector industry (mostly due to the large quantities of sterile generated at the extraction of coal and metallic ores).

The dynamics of the quantities of non-hazardous industrial waste generated by extractive and energy industry for the period 2004 – 2005 follows the same evolution as the hazardous industrial waste.

In the period 2006 – 2007, the quantity of non-hazardous industrial waste generated by the power sector drops due to the restriction of the activities of some larger commercial companies in this field (Rovinari, Turceni, Paroseni).

Dynamics of the Indicator of Hazardous Industrial Waste Management for Industrial Sectors

Considering the various high values obtained for hazardous industrial waste at the level of industrial branches, the dynamics of the indicator for the analyzed period is presented in a logarithmic graph.



The indicator exhibits maximal values in the case of the energy industry, followed by the processing industry and the mining sector (that presents a strong increasing trend for the period 2006-2007).

As for mining and processing industry, the dynamics of the indicator (*hazardous industrial waste / monetary unit of production*) has an increasing trend due to the following factors:

- increase of the production value
- drop in the quantities of generated hazardous waste.

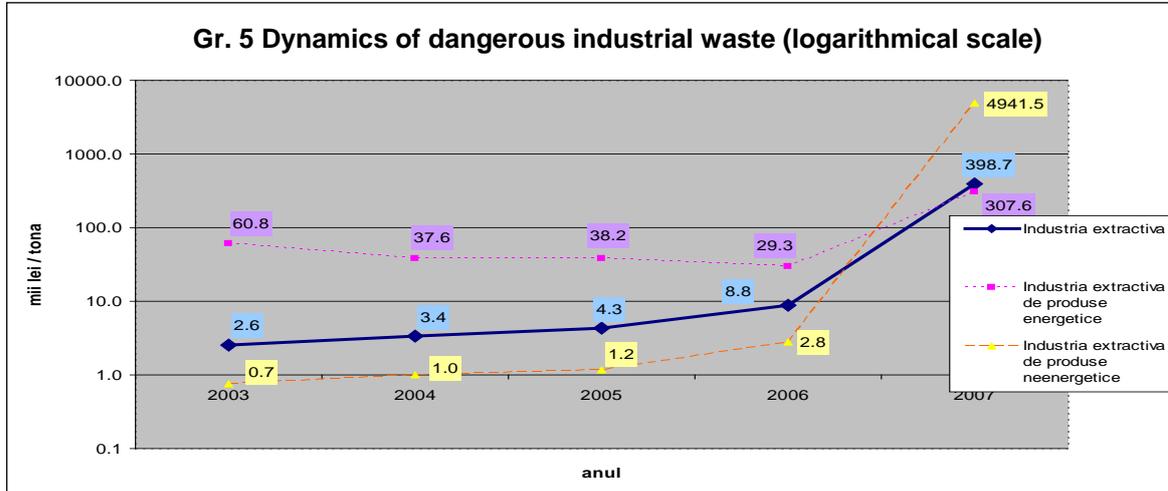
The increasing evolution of the hazardous waste indicator in the mining and processing industries shows a drop of the environmental impact (production values increase, hazardous industrial waste generated decreases). In this case, the decoupling of the value of the industrial production from the quantity of generated hazardous industrial waste is absolute.

As for the power industry one can note a decreasing trend in the period 2003 – 2005, due both to the quantitative contribution of hazardous waste reported in this branch and to the restructuring of the activities of production of electric and thermal lignite-based power as well as to a limited activity of lignite operating units. For the period 2005 – 2006 the increasing trend is due to the drop of the quantities of hazardous industrial waste generated by this industrial branch (1426 tons / 2006 compared to 34036 tons / 2005). The period 2006 – 2007 marks a drop of the indicator due to the increase of the quantity of generated waste with approx. 63% (2334 tone / 2007) on the background of the valorical increase of the production with only 0.2%.

The 2003-2007 evolution of the hazardous industrial waste, at the level of the national industry presents a positive ascending evolution that indicates a drop of the environmental impact showed by the increase of the value of the industrial production reported to the quantity of generated hazardous industrial waste.

The increasing tendency of the economic variable simultaneous to the tendency of drop of the environmental variable indicates, for the whole industry, an absolute decoupling of development and resources.

Dynamics of the indicator of generated hazardous waste management in relation white the value of the production for the mining sector



The evolution of the hazardous waste management indicator in the mining sector shows an increase (1.3 in 2004, 1.65 in 2005 and 3.4 in 2006), in 2007 the increase is higher, the index of increase being 153.3 compared to the reference year 2003.

The high value of the indicator in the interval 2006- 2007 is due mainly to the drop in the quantities of generated hazardous waste (11242 tons in 2007 compared to 497588 tons in 2006), following the reduction of the activities in the mining sector (closing of mines).

The main contribution is that of the mining of power generating products, for which in the period 2003 – 2006 the indicator registers a descending evolution compared to the reference year 2003, which indicates an increase of the environmental impact for this period..

Conclusions

The dynamics of the devised indicators revealed various tendencies which can be explained for each NACE or industrial sector activity (absolute or relative decoupling, increase in the environmental impact for certain activities, etc.).

The dynamics of hazardous and non-hazardous industrial waste, at the level of the national industry, shows an increasing trend indicating a drop of the environmental impact. An increase in the production value associated to a reduction of the waste generating rate indicates a decoupling of development from the resource use

As such indicators reflect the success or failure of the national policies of economic development and environmental protection in the strategic horizon for waste management, it becomes a relevant decisional instrument for central and local authorities, regulating agencies, economic operators, but also for communities, NGOs and for the general public.

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