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ECOLOGICAL MANAGEMENT IN THE BAIA MARE – ROMANIA INDUSTRIAL AREA

Case Study

Keywords
Pollution
Damages
Depollution expenditures
Regression analysis

JEL Classification
Q57

Abstract

Today more and more the world is facing different sources of pollution, the most affected areas being the proximity of the biggest industrial centres (e.q: chemistry, mining and metallurgy, machine building etc.).
The industrial area of Baia Mare is a typical one for such a situation. To maintain a clean and healthy environment in Baia Mare and the surrounding areas, important financial costs are necessary. In terms of European Union accession, demands on environmental protection have also increased, aspect that was unfortunately neglected until now in Romania.
Will local community be able to support these costs? Or, finally, all the responsible pollutants will be closed down.

Short description of Baia Mare area

Baia Mare industrial area is in the East part of the town. One can identify in this industrial area an old mining and metallurgical centre. In addition, the last 30-40 years other machine-building factories were developed, so nowadays a heavy industry area is placed there, made of plants, metallurgical plants, machine building factories and others. Some of these plants currently produce heavy metals such as Cu, Pb, Au, Ag, Se.(Pop, 2006).

This industry is a source of specific pollution, from which we can mention: SO_2, Pb, As, Cd, Mn and Cu, Ni, Zn, acid water, organic substances etc. (Pop and Toader, 2010; Pop, 2010).

Pollution Effects

Many different economical and social effects were identified as a consequence of pollution. First of all, the agricultural land in the vicinity of industrial area, more than 7-8 km round is less fertile or completely infertile. A similar situation happened with the vegetables and the fruit trees. Statistically, it can be seen that the forest nearby is the most affected by pollution. Also, statistically, human life and animal life in the area is shortened with 2 to 12 years compared to the rest of the country.

As a consequence, the medical care and the medical treatment is 20-30% higher than the country average. The drinking water is affected too in this area, because of the heavy metals and the organic substances in the water. Houses and buildings have become dirty and rusty.

Finding Solutions

Ideally talking, it would be better to create a friendly environmental industry:

- running without wasting raw materials,
-saving energy,
-using renewable resources,
-recycling industrial wastes,
-using long-life equipments etc.

Unfortunately, we cannot make over night all these things. Realistically, we only make them less dangerous for the environment.

In this respect, to find solutions for less pollution, we can calculate the released volume by-products and associate the eliminating cost using the “input-output” method. (Heinsohn, 2009; Pop, 2011).

Assumed that, depollution costs are “internal” covered. So, production costs increase with some percents.

The key problem is how to find the optimum level for depollution costs. Usually depollution costs express an exponential curve, meanwhile depollution effects express a logarithmical curve with saturate tendency. Using table 1, and diagrammatic representation, figure 1, we find that “Economical optimum” is at 35 % depollution ratio. That point represents the maximum economical advantages.

We can say that the difference between the total saving cost and the total operation costs is maximized.

That means that, the maximum efficiency (1,607 millionEuros) we get at 35% depollution ratio, while the total operation costs were 0,407 million Euro and the total saving costs were 2,014 million Euro.

To get the mentioned results, we used field data, statistically processed and using regression analysis method. Yields the algorithms:

$Y = 0{,}048 \cdot 1{,}063\ x$ (millions Euro) - depollution costs.

$Y = 2{,}26 - 4{,}56 \cdot 0{,}92\ x$ (millions Euro) - saving costs.

The top limit, up to which we can spend financial resources to reduce or eliminate pollution is represented by the cross point of two curves (operation costs and saving costs). We can see, in this paper, the cross point at a level of 2,252 million Euros. In that point, the operation costs and the saving costs are equal, at a 63 % depollution ratio.

Up to this point, any additional financial expenditure goes to losses.

Regarding problems as showing in the figure 2, we try to answer the question:

how long do we need to calculate damages due to pollution and how to evaluate them? Up to what level of depollution the community wants to spend financial resources?

To answer these questions we represent in diagrammatic ways the followings (see table 2, and figure 2): the saving costs, the depollution costs and the value of pollution damages.

Combining the depollution costs and the value of the pollution damages, we find a depollution ratio at 46% - with 1,524 million Euro (see table 3). Are these costs bearable for the community? If not, the alternative is "zero option" where the balance between costs and savings is "zero" (see figure 2 and figure 3)

The "zero option" happened for 61 % depollution ratio and 2,241 million Euros.

For calculations the algorithm was used:

$Y = 12 \cdot 1{,}06\,x - 0{,}096$ (millions Euro)

find by regression analysis.

The evaluation of depollution technologies costs and the benefits, resulted by depollution, is simple. But, in financial terms, the damages evaluation (produced by pollution) is difficult, for example: the comfort diminution and the work ability, the soils degradation, the water and air pollution etc. (Ardelean, 2007).

At the same time, the pollutants effects are accumulated by times. How do we calculate them, how do we prognosticate them?

The environmental damages evaluation is important in the establishment of the priority directions at financial resources allocation for the environment protection and rehabilitation projects.

But, is necessary the extension of implication interested factors which can contribute at the promotion of new concepts, with better results in the diminution of environmental pollution:

- the education by mass-media, and the teen-agers by school,
- the implication of the non-governmental organizations,
- scientific conferences,
- environmental researches,
- environment publications literature etc.

Conclusions

As a conclusion, we have to mention that the costs to protect the environment are highly increased by an exponential curve.

The public communities sometimes are not able to support such a high level of costs. A result or consequence it is to stop industrial activity as an alternative to protect the environment and health and life of the community.

The paper is a part of the recent concerns of the environmental management, searching for the determination of the damages by pollution, cut costs for depollution and benefits that can appear through the application of the depollution techniques and technologies.

For the conditions of the Baia Mare area, was determined the equation by regression analysis, representing damages, involved costs and benefits in pollution and depollution phenomena (eq: 1, 2 and 3) with determination and graphical representation of the two intervals of economic interest:

- maximal efficiency interval, comprised between 35-46 % depollution degree, and
- "zero option" interval (without financial efforts for depollution by community), the depollution degree comprised between 61-63 %.

Over 63 % the depollution costs increased exponentially as shown in figure 1 - 3. The public communities sometimes are not able to support such a high level of costs.

As a result or consequence it is to stop industrial activity as an alternative to protect the environment and health and life of the community.

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Appendix A

Table 1.
Cut costs and profits by depollution

Depollution efficiency (%)	Cut costs (x 10^6 Euro)	Profits (x 10^6 Euro)	Balance (profits - costs)
10	0,088	0,281	0,193
20	0,163	1,400	1,237
30	0,300	1,886	1,586
35	***0,407***	***2,014***	***1,607*** *max*
40	0,553	2,096	1,543
50	1,018	2,192	1,174
60	1,876	2,229	0,353
63	***2,253***	***2,253***	***0***
70	3,456	2,257	- 1,209
80	6,366	2,265	- 4,111

Table 2.
Damages by pollution and depollution cut costs

Depollution efficiency (%)	Damages (x10^6 Euro)	Depollution cut costs	Global (damages + costs)
10	6,600	0,088	6,688
20	3,648	0,163	3,811
30	1,992	0,300	2,292
40	1,068	0,533	1,621
46	***0,726***	***0,798***	***1,524***
50	0,552	1,018	1,570
60	0,264	1,876	2,140
70	0,108	3,456	3,564
80	0,042	6,366	6,408

Table 3.
Profits and global damages + cut costs

Depollution efficiency (%)	Profits (x 10^6 Euro)	Global (damages + cut costs)
10	0,281	6,688
20	1,400	3,811
30	1,886	2,292
40	2,096	1,621
46	***2,162***	***1,524*** *min*
50	2,192	1,570
60	2,229	2,140
61	***2,241***	***2,241***

70	2,248	3,564
80	2,255	6,408

Figure 1. Cut costs and profits by depollution

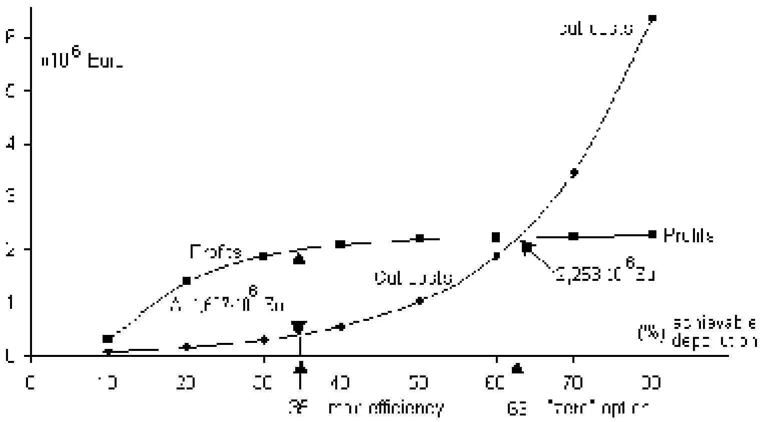

*Figure 2.*Damages by pollution and depollution cut costs

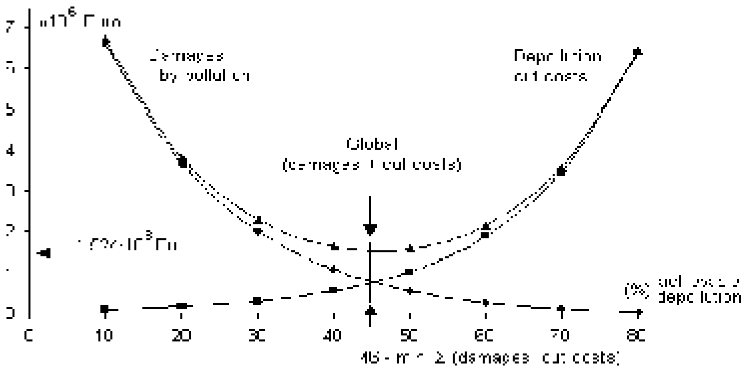

*Figure 3.*Profitsand Global (damages + cut costs)