



“Gheorghe Asachi” Technical University of Iasi, Romania



THE ROȘIA MONTANĂ - GOLD CORPORATION PROJECT IN THE OPINION OF ENVIRONMENTAL ENGINEERING STUDENTS – CASE STUDY

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Abstract

The present study is an exploratory one representing the first endeavor to test the opinion of a small group of Environmental Engineering students from the “Gheorghe Asachi” Technical University of Iași, Romania in terms of environmental issues. The purpose of the research presented in this paper is to determine the opinion of the students who are likely to become professionals in the field of Environmental Engineering, on the consequences of the Roșia Montană - Gold Corporation project implementation. To this purpose, a brief opinion questionnaire was used. It was required that the respondents say whether they approve or disapprove of the implementation of the above mentioned project; additionally, the respondents have to provide general information about their knowledge on the Roșia Montană area and on the project and they have to share their experience on this topic. The questionnaire was sent out anonymously by teaching staff (not involved in the research) to 40 undergraduate students (Bachelor studies) and 59 postgraduate students (Master studies). The data was processed with the SPSS software. The collected data showed that Environmental Engineering students from the “Gheorghe Asachi” Technical University of Iași do not share the same opinion on the Gold Corporation project as a means of economic development in the Roșia Montană area. The percentage of students who oppose the implementation is higher than the percentage of students who support it, but agreement is not accidental or contextual, because the difference between the two subgroups is statistically significant.

Key words: case study, environmentally-risky project, opinion poll

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1. Introduction

An environment with finite resource requires a paradigm change in the approach of resources management and of environmental protection; otherwise mankind’s future is in jeopardy (Ioan and Carcea, 2010). Chapter 36 of Agenda 21 defines four major directions to be followed by education for sustainable development (Agenda 21, 1992):

1. improve basic education;
2. reorient existing education to address sustainable development;
3. developing public understanding and awareness;

4. training.

The first two directions involve education in the classical sense, whereas the last two are addressed by the present approach, which aims at raising awareness and at creating skills related to sustainable development. In the OECD’s report “Education and Learning for Sustainable Consumption”, the statement “education and learning initiatives can play a positive role” (OECD, 1999) means that “promoting sustainability through lifelong learning will develop the citizens’ environmental competence and will determine them to radically change their consumption patterns in a sustainable

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manner” (Ioan et al., 2005). The paper presents a study which investigates the opinion of Environmental Engineering students from the Faculty of Chemical Engineering and Environmental Protection, about the implementation of Rosia Montana Gold Corporation Project. In this direction, the paper evidences the results of the efforts invested by the teaching staff of the Environmental Engineering Department in developing environmental attitudes and initiatives among students.

One of the main objectives of environmental education is raising awareness of the fact that the natural resource richness of an environment niche should not be left unused, untouched, just in order to comply with environmental protection standards, but it is important to design the approach of an efficient management of natural and human resources, by implementing sustainable development principles, policies, strategies, and projects. Making efforts to find balanced methods to integrate these dimensions in the training of future environmental engineering specialists is challenging to the highest degree, since it requires alternate ways of thinking, valorization and action.

Roșia Montană is a village located on the slopes of the Roșia Valley in the Apuseni Mountains (Western Carpathians). Its name comes from the reddish color of the river, which contains a high level of iron oxides. Gold mining in this area dates from the Roman Empire period (two thousand years ago). The place has become a center of intense national and international scrutiny, as soon as the Gold Corporation Company showed interest in the area. The company was founded in 1997, in Alba County; the shareholders of Roșia Montană Gold Corporation being the state-owned mining company *Minvest Deva* with 19.31% of the shares and Gabriel Resources, with 80.69%. The representatives of Roșia Montană Gold Corporation (RMGC) claim that they want to develop the most modern mine in Romania and that by starting this mining project, Romania will become the largest gold and silver producer in Europe, by extracting approximately 314 tons of gold and 1480 tons of silver. A sustainable development program is aimed at the local community, which also includes the restoration of the historical center of the village.

The study presented in this paper uses an opinion questionnaire, which identifies the opinion in relation to the respondents' gender, level of study (Bachelor or Master studies) and the type of acquired information (direct, or indirect-from different sources) concerning the Rosia Montana project, as well as the motivation behind their opinions, based on the advantages and the risks brought by the project. Related to this issue is the problem of place identity that must be considered when analyzing the opinions. Place identity represents “conscious or unconscious models of ideas, feelings, preferences, values, scopes, tendencies and behavior attitudes that connect a person's identity to a specific location and

offers dispositions for a future involvement in that type of environment” (Feldman, 1990). In this study, Kurt Lewin's theoretical model has been used to cover the motivational aspect (Miner, 2005; Smith, 2001).

The purpose of the research is to know the opinion of students, future specialists in Environmental Engineering, regarding the Gold Corporation project at Rosia Montana, taking into account its relation with educational factors. The sample is formed of 99 respondents - students of the Environmental Engineering Department, who have general and public information on the Gold Corporation project from Rosia Montana.

2. Material and methods

In order to know the respondents' opinion, a brief opinion questionnaire was developed, which, besides the main question about their agreement or disagreement regarding the implementation of the Gold Corporation project in Rosia Montana, required data such as gender, age, level of studies and their knowledge regarding Rosia Montana area and the Gold Corporation project. In addition this questionnaire required information regarding the reasons on which their opinion is based on, the advantages of the implementation of the project and main economical and environmental risks associated to the implementation of the project. The questionnaire has been applied anonymously by the University's teaching staff which was not involved in research.

The results show that the students' opinions tend to bias, as 40% of them are in favor of the implementation of the project. There are differences between the opinions of females and males, of undergraduate students and of postgraduate students, between those who directly and indirectly know the area and the project. When stating their opinions, the students identified some decisive reasons, which are analyzed. The reasons that are favorable or unfavorable to the implementation have also been analyzed, in relation to the future individual professional interests of the respondents.

The research does not validate the hypothesis according to which the opinion of future specialists in Environmental Engineering on the Gold Corporation project is a quasi-unanimous disapproval, i.e. 90% of the respondents disagree with the implementation of this project. The single dependent variable is the opinion of the respondents on the Roșia Montană Gold Corporation project, which is influenced by two independent variables: education level (Bachelor or Master) and the type of knowledge on the project (directly or indirectly acquired). Analysis of the results highlights the homogeneity degree of opinion within the target group, the relation between the students' opinion and their education level, and their knowledge on the project respectively. The dependent variable has a binomial expression; the instrument of collecting

data requires a choice between agreeing or disagreeing with the implementation of the Gold Corporation project in Rosia Montana.

The requirements of participation in the poll were the respondents' quality as students in the Environmental Engineering study program from the "Gheorghe Asachi" Technical University of Iaşi and their explicit acceptance of filling in the questionnaire. The investigated group was defined on the basis of the filled in questionnaires, as shown in Table 1.

According to age, the studied group is relatively homogeneous, the participants being between 21 and 25, ages that are specific to academic studies, around 96%. According to gender, females represent 69% of the investigated group. The larger share of female students is also explained by the women's greater readiness to participate in surveys. The participants' status is given by their level of study. In the initial group senior Bachelor level students have been identified: 44 in the third year and 7 in the fourth year. In this study, they will be treated in the same category, Bachelor students, unlike the fifth year students, the majority of the project, identified as Master students.

The type of knowledge regarding the project is given by two criteria: indirect knowledge, based on public information about the Gold Corporation-Rosia Montana project, respectively direct knowledge as stated by the respondents, but without having visited the site. Another category of knowledge considered was that acquired by participating in training sessions and/or trips to Rosia Montana organized several times by the Department. The questionnaire was filled in by 99 students who consider that they know the issues of the Rosia Montana Gold Corporation project, out of which 42 students have participated in training sessions and/or trips to Rosia Montana.

3. Results and discussion

The key question of the survey clearly and emphatically regards the opinion concerning the implementation of the Gold Corporation project at Rosia Montana. Expressing agreement or disagreement towards this project shows the tendency of the group to bias, as 59 of the respondents, (representing 59.59%) are against the project whereas 40 of them are in favor of it (Fig. 1).

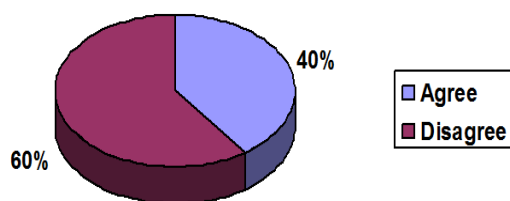


Fig. 1. Frequency of opinion

The statistical processing of the data was performed with a nonparametric binomial test, which allows "comparing the results obtained from a group,

from a variable which has only two levels of measurement with a certain proportion expected to exist in the population" (Lungu, 2001). The hypothesis has been used according to which 90% of the respondents disagreed to the project, presuming that 10% of the answers are random and/or influenced by contextual factors, others than the educational ones.

The 90% disagreement can be explained by the supposition that the target group of the study is represented by environmental engineering students who are supposed to be fully aware of the high environmental risks involved by such a project. Should the target group be the normal (heterogeneous) population, then the hypothesis would be 50% agreement versus 50% disagreement.

The results in SPSS Table 2 show the observed proportions of 0.6 disagreement and 0.4 agreement comparing to the expected proportions of 0.9 and 0.1 and a value of the test with a significance less than 0.5. These data show a significant difference between the values of the expected proportions, based on the fact that the students belong to the same program. The questionnaire used to collect data facilitated a thorough analysis based on other educational variables, namely the level of study and the contents of the courses, in relation to the specific issues of the Gold Corporation project from Rosia Montana.

The proportion agreement/disagreement is analyzed for the sub-groups of undergraduate students (Bachelor studies) and postgraduate students (Master studies) respectively. The non-parametric binominal test – SPSS Table 3 - applied in the case of undergraduate students, shows an observed proportion of 0.7 disagreement, comparing to the expected proportion of 0.9, which statistically indicates a significant difference of opinion at this level of education. The expected proportion of disagreement, based on Z approximation is 0.3 compared to 0.2, in the case of undergraduate students. From Fig. 2 and Tables 2 and 3, one can notice that, in terms of level of study, the expressed opinions show a higher percentage of postgraduate students agreeing on the implementation of the project.

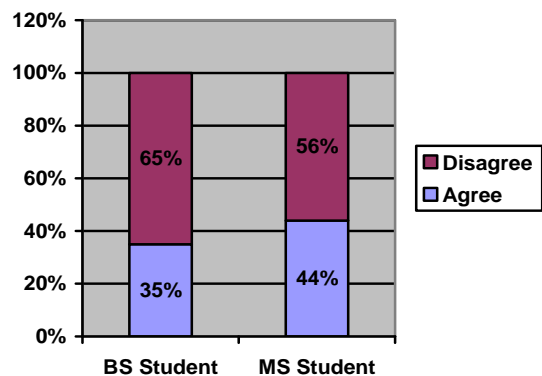


Fig. 2. Distribution of answers with respect to the level of education

Table 1. Characteristics of the investigated group

Criteria	Variable	Values			
		Initial group		Studied group	
		Number	Percentage (%)	Number	Percentage (%)
Age	21 – 25 years old	109	93	95	96
	26 – 37 years old	8	7	4	4
Gender	Female	79	67	70	70
	Male	39	33	29	29
Year of study	3 rd year - BS	44	38	40	40
	4 th year- BS	7	6		
	5 th year - MS	66	56	59	60
Type of knowledge	Visited RM	42	36	39	39
	Didn't visit RM	76	64	60	61
Indirect knowledge	Yes	99	87	99	100
	No	19	13	0	
TOTAL respondents			118		99

Table 2. Agreement / disagreement investigated group

Binomial Test						
		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (1-tailed)
Agreement	Group 1	Disagree	59	0.6	0.9	0.000 ^{a,b}
	Group 2	Agree	40	0.4		
	Total			99	1.0	
a. Alternative hypothesis states that the proportion of cases in the first group < 0.9.						
b. Based on Z Approximation.						

Table 3. Agreement / disagreement undergraduate students

Binomial Test						
		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (1-tailed)
Agreement	Group 1	Disagree	26	0.7	0.9	0.000 ^{a,b}
	Group 2	Agree	14	0.3		
	Total			40	1.0	
a. Alternative hypothesis states that the proportion of cases in the first group < 0.9.						
b. Based on Z Approximation.						

Table 4. Agreement / disagreement master students

Binomial Test						
		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (1-tailed)
Agreement	Group 1	Disagree	33	0.6	0.9	0.000 ^{a,b}
	Group 2	Agree	26	0.4		
	Total			59	1.0	
a. Alternative hypothesis states that the proportion of cases in the first group < 0.9.						
b. Based on Z Approximation.						

The abbreviations in Tables 2 through 5 are features of the results screens generated by SPSS and mean: Prop. – property; Asymp.sig. (1-tailed) – the degree of agreement between the distribution of the two independent groups: the value 0.000 means that the two groups are homogeneous and have the same distribution; Z - normal approximation of the standardized sampling distribution.

Comparing the proportion agreement/disagreement of the two sub-groups of

undergraduate and postgraduate students respectively and comparing the proportions of each sub-group with the results of the whole group indicates obvious similarities; in each case the proportion of respondents who disagree is higher, but the proportion of disagreement is significantly lower than the expected one, according to the research hypothesis.

Direct knowledge of Rosia Montana and Gold Corporation project is noticed on 39 respondents,

about 40% of the questioned group (Tables 1 and 5). The number of unfavorable answers in this study subgroup is 25, representing 64% of those who did their practice at Rosia Montana, compared to the 90% expected.

One can notice that the balance agreement/disagreement is similar in both cases – Fig 3, the 4 percentage points difference for approximations to one decimal is not significant for the nonparametric binomial test.

Table 6 confirms the analyzed primary data on the two opinion groups, as they were recorded in the questionnaire of the studied group.

The data do not suggest new hypotheses. The very small values of agreement and disagreement based on direct knowledge in the BS students category (Table 6, lines L1 and L5) are given by the fact that only one student of the studied subgroup has visited Rosia Montana, probably in a different context than of a practice course, since these courses are scheduled in the third year of study, at the end of semester, and the questionnaire was made during the semester. The categories of reasons mentioned in the questionnaire were:

- historical reasons –the interest for preserving tradition and heritage in the area, protecting the archaeological sites etc.;
- medical reasons - health issues related to the gold extraction technology, based on the use of cyanides;
- social reasons – creation of new jobs, possible improvements of the life standard of inhabitants, schools, hospitals, etc;
- cultural reasons – preservation of the cultural heritage;
- touristic reasons – increasing the interest for the area due to its historic significance;
- economic reasons – represent the largest share among both supporters and opponents of environmental risky projects and generally represent the economic development of the area versus the environmental impact of the project in terms of environmental costs;

Fig. 4 shows the distribution of answers with respect to the criteria above. The agreement/disagreement refers to every specific reason why the Rosia Montana project should/should not be implemented.

Table 5. Proportion of agreement / disagreement of the subgroups with respect to their type of knowledge on the place

<i>Binomial Test</i>						
		<i>Category</i>	<i>N</i>	<i>Observed Prop.</i>	<i>Test Prop.</i>	<i>Asymp. Sig. (1-tailed)</i>
Knows the place	Group 1	Yes	24	0.7	0.9	0.004 ^{a,b}
	Group 2	No	9	0.3		
	Total		39	1.0		
a. Alternative hypothesis states that the proportion of cases in the first group < 0.9.						
b. Based on Z Approximation.						

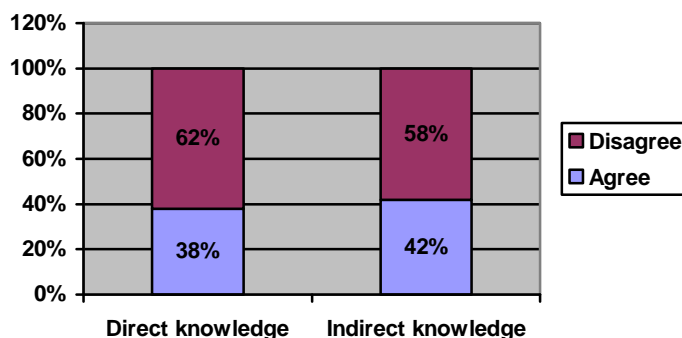


Fig. 3. Relation knowledge / opinion

Table 6. Primary data synthesis

<i>Opinion</i>		<i>Study level</i>		<i>Knowledge experience</i>		
Disagree	59	Bachelor	26	Direct knowledge	0	L1
				Indirect knowledge	26	L2
		Master	33	Direct knowledge	24	L3
				Indirect knowledge	9	L4
Agree	40	Bachelor	14	Direct knowledge	1	L5
				Indirect knowledge	13	L6
		Master	26	Direct knowledge	14	L7
				Indirect knowledge	12	L8

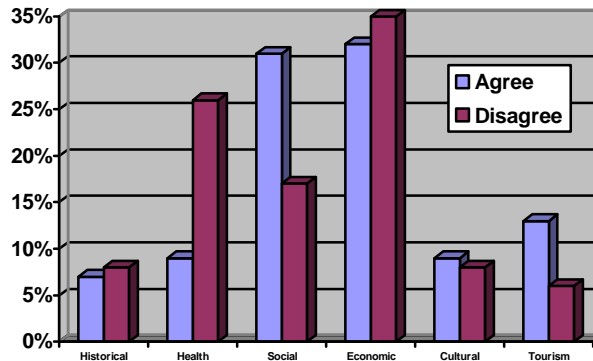


Fig. 4. Distribution of answers with respect to the reasons

4. Conclusions

The study has an exploratory character, testing the opportunity of strategic research approaches of the education process that shapes opinions regarding social, economic, civic, or humanitarian issues related to environmental science. The authors are aware that the preliminary conclusions of this study must be validated by a more thorough approach using verified tools applied to large samples, more significant statistically.

The conclusions of the study are:

1. Obtained data did not validate the main hypothesis, i.e. that a very large percentage of the students (about 90%) disagree with the implementation of the project. The weight of disagreement is larger than that of agreement, but the latter does not appear randomly or contextually, the difference between the two groups being statistically strongly significant.

2. That difference is almost the same in the two categories defined from the standpoint of education level: BS, respectively MS: around 0.6 versus 0.7, much different from the expected 90% disapproval. The almost similar numbers in both categories show that the education level of the students has little or no influence on the distribution of their options, maybe because of the fact that only senior BS students have participated in the poll. Regarding the type of knowledge (direct vs. indirect), relevant answers have been obtained from master students who, in their great majority have participated in training sessions and/or trips to Rosia Montana organized by the Department.

3. The statistical significance of the difference between the expected and the expressed opinions leads to the conclusion that the opinion regarding the implementation of the Rosia Montana Gold Corporation project has another determination than the one deriving from the specificity of the academic program Environmental Engineering.

4. Close values of motivational variables, of advantages and risks indicate that taking into account the knowledge based on public, media and

professional information, the opinion is definitely not determined by rational arguments. On this basis, the authors intend to explore in future research the relationship between given opinions and personality traits. Another further aim is to extend the study including students of other faculties, specialists, adult citizens, and environmental activists at least at inter-regional level.

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References

- Agenda 21, (1992), *Chapter 36: Promoting Education, Public Awareness and Training*, On line at: <http://www.un.org/esa/sustdev/agenda21chapter36.htm>.
- Feldman R.M., (1990), Settlement identity. Psychological bonds with home places in a mobile society, *Environment and Behavior*, **22**, 183-229.
- Ioan C.C., Carcea M.I., (2010), The environmental dimension – an interdisciplinary research area, *Environmental Engineering and Management Journal*, **9**, 735-741.
- Ioan C.C., Horbaniuc B., Dumitraşcu Gh., (2005), Education for sustainable development guidelines, *Environmental Engineering and Management Journal*, **4**, 405-419.
- Lungu O., (2001), *Introductory Guide in SPSS 10.0* (in Romanian), Ereta Tipo Press, Iaşi, Romania.
- Miner J.B., (2005), *Organizational Behavior: Behavior 1: Essential Theories of Motivation and Leadership*, M.E. Sharpe, Inc. Armonk, New York.
- OECD, (1999), *Education and Learning for Sustainable Consumption, Organization for Economic Co-operation and Development*, On line at: <http://www.oecd.org>.
- Smith M.K., (2001), *Kurt Lewin, groups, experiential learning and action research*, In: *The Encyclopedia of Informal Education*, On line at www.infed.org/thinkers/et-lewin.htm.