



## **STAKEHOLDERS IN MINING PROJECTS**

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### **Abstract**

Extraction of lignite, hard coal and non-ferrous metal ores, in a market economy environment, involves analyzing stakeholders who can significantly influence the success of the project and this will have an impact on the economic dimension and media image. For effective project management, the environment in which the project is to be implemented needs to be taken into account. Based on the analysis of literature, interviews with the mining industry, and the experience of people employed in research units carrying out mining research, stakeholder analysis will be carried out. The paper will attempt to identify stakeholders in the mining sector, identifying and evaluating the factors influencing the impact of stakeholders on the project. As a result of the research, the impact of stakeholders on the project will be determined. The problem will be solved using an Analytic Hierarchy Process (AHP) and its extension Analytic Network Process (ANP) (Saaty, 2005). The example was based on the experience of persons implementing the international research project in mining industry.

**Key words:** *stakeholders, project management, international project, operational research, mining industry.*

**JEL code:** C65, O22

### **Introduction**

Mining industry involves many types of activity. The most aggravating socio-economic environment are extraction of lignite, hard coal and non-ferrous metal ores.

In a market economy environment, it should involve analyzing stakeholders, who can significantly influence the success of the project and this will have an impact on the economic dimension and media image. Project evaluation by stakeholders, is one of the key elements of the project's success. The establishing new knowledge areas in the ISO 21500 standard (ISO 21500: 2012) and also in fifth edition of PMBoK (Project Management Institute, 2013), dedicated only to the stakeholders, is the realization of this view.

In practical projects we have many stakeholders with different influences. Moreover, they have influence on each other. This paper proposes to use Analytic Network Process to describe stakeholders structure in mining projects. We analyse different stakeholders in such projects. The objective of this paper is to adopt method proposed in (Targiel, 2017) to projects in mining industry. We use experiences people involved in international research project titled "Real-Time Reconciliation and Optimization in Large Open Pit Coal Miners", acronym RTRO-Coal, is grant funded by the European Research Fund for Coal and Steel (RFCS), partnered by Technische Universität Bergakademie Freiberg (Germany), AGH University of Science and Technology. Stanisław Staszic in Cracow (Poland), Mitteldeutsche Braunkohlengesellschaft MBH (Germany), RWE POWER AG (Germany) (Benndorf et al. 2015).

The AHP method, which is the predecessor of the ANP method, was used to requirements prioritisation, for quite a long time (Berander and Andrews, 2005). Used mainly for software projects. The first works using ANP for prioritization appeared recently (Akinli Kocak et al., 2013; Ali Khan et al., 2016). However, they did not make structure of stakeholders, how it was proposed in (Targiel, 2017)



First part it is considerations on place of stakeholders in mining industry. Second part of paper presents short introduction to Analytic Network Process. Next part explains considered case. Then we try to calculate stakeholders influence based on hypothetical evaluation. The work ends with conclusions and proposals for further research.

## **Research results and discussion**

### **Stakeholders of the mining project**

A relatively new concept of stakeholder appeared in the management sciences. In the literature and business practice there are still such phrases as: "interested groups", "interest groups", "actors", "partners", "interested parties", "participants". The term "stakeholder" was first used in 1963 in the Stanford Research Institute document to identify groups of entities before which business owners should be responsible and without which the organization would cease to exist (Freeman, 2010). Many later publications on corporate planning (Ansoff, 1965), system theory (Churchman, 1979), organization theory (Rhenman, 1973) and corporate social responsibility (Preston and Post, 1975; Votaw and Sethi, 1973) referred to the concept of stakeholders (Freeman, 2010)

Freeman defines stakeholders as any individual or group that can interact with or be affected by the organization in pursuit of its goals (Freeman, 2010). In this definition, the relationship between stakeholders and the organization may be of a diverse nature, where both stakeholders and particular organization may influence each other.

In the literature, one can meet the concept according to Donaldson and Preston that the stakeholders are people or groups that have direct or indirect contracts with the organization (Donaldson and Preston, 1995). Thus, a stakeholder can be virtually any element of the closer and more intimate environment, which is linked to the organization of the contract, with a specific situational context of great importance in analyzing the impact of the stakeholder on the organization. At this point, it should be emphasized that the organization is not always the subject of interaction of the stakeholders as a whole, it can often be a project or a project.

The concepts that companies operate only to satisfy the interests of their owners (shareholders) are now losing their importance. Contemporary trends resulting from globalization, technical progress and the accompanying increase in people's awareness must lead to a change in the way the company is managed. Therefore, in enterprise management processes, it became necessary to take into account the external environment of the enterprise, while implementation of various types of undertaken activities. Why are such trends can be observed? In order to answer such a question, it is necessary to consider what is the undertaking? Definition of an The Polish Language Dictionary defines that the project is: an action taken for some purpose. Starting an undertaking only for the sake of satisfying the interests of its owners (shareholders) - which would seem reasonable, without taking into account the business environment - in this case both the internal and external environments may be the cause for the failure. This is particularly evident in mining projects, because mining has bad press opinion for years. In the environment of an enterprise intending to implement mining projects, there are stakeholders whose position on the planned project may be either positive or negative, and therefore they may exert a positive or negative influence on the undertaking, as well as the undertaking itself may also influence them in different ways.

On the one hand, the economy of modern countries is very much dependent on the fuel and energy base. In Poland there are hard coal and lignite reserves, with a small share of other fuels, which makes coal the basic source of fuel, and so the energy. The importance of coal as the basic raw material for the chemical industry is also growing. On the other hand, mining activity is associated with the degradation of the natural environment, so for the people living in mining areas it is socially difficult to accept. While in the 19th and 20th centuries, the problem of social consent for mining activity was practically non-existent, it is currently one of the most



important conditions for the commencement and, often, continuation of mining operations already in progress.

Open meetings and debates are of key importance to obtain social consent, in planned mining undertaking. Without them the project cannot actually be implemented. Different participants take part in debates on mining undertaking. Among them some characteristic groups can be distinguished. They are as follows: participants representing their own personal interests, public administration, participants representing their own economic interests, representatives of environmental organizations.

In the aforementioned groups in the neighbourhood of the mining undertaking, examples of stakeholders were identified.

Among the participants representing their own personal interests, one can distinguish: local communities, associations, trade unions, media (Internet, press, radio, TV). Those are the people whose personal interest is related to their place of residence in the areas of the future investment or in its neighbourhood. As a result of the project, they may suffer losses or they are not sure about the benefits they are promised. Real estate owners have to take into account the need for resettlement or increased noise, pollution, increased pollination, etc. Lack of approval of these stakeholders for a mining project may encourage the local community to organize themselves within associations opposed to planned investments, trade unions and the media may be involved. The neighbourhood of the mining enterprise on the one hand is associated with the risk of real discomfort directly felt by the residents, on the other hand these are the benefits of a prosperous municipality, whose beneficiaries will be residents, although not directly.



Source: Authors' own work

Fig. 1. Environment of the mining undertaking - groups of stakeholders



Another group of stakeholders is the official administration. These include, among others: local government, councilors, politicians, employees of state offices. They can represent different positions regarding the planned mining project. Their positions may result from election programs or from the law. Stakeholders from the close environment of the mining enterprise may express reluctance, which may be conditioned by the fact that they may also be members of the local community engaged in personal activities in addition to their official functions. They can also express attitudes resulting from resident's expectations. On the other hand, representatives of the administration, observing the problem from a distant perspective, taking into account the benefits resulting from it, are more likely to express a favourable attitude to the planned undertaking.

Among the participants representing their own economic interests, one can distinguish: an investor, local entrepreneurs, producers of alternative energy sources, competitors, coal buyers, suppliers. Among them there may be also people favourably oriented towards the mining enterprise, due to new opportunities in it, as well as potential opportunities to develop their own economic activities. The new mining venture may also arouse objections from those who are fear their current market position, and changes resulting from the new situation.

Representatives of ecological organizations most often postulate against mining enterprises. Their attitude may result from a lack of knowledge; they may also be driven by self-promotion. It is difficult to keep sincere, pro-ecological attitudes, while taking advantage of the benefits of a civilization based on raw materials acquired as a result of mining activities.

#### **Analytic Network Process**

Analytic Network Process (ANP) (Saaty, 1996), is a extension of Analytic Hierarchy Process (AHP). In this method both criteria and variants are called elements. They are grouped into components (clusters). We define source components, sink components and intermediate components. They are connected with paths of influence. We can consider two types of dependence: inner dependence between elements of this same component and outer dependence between elements of different components.

We can define paths of dependencies using tabular method as presented in Table 1.

Table 1

<b>Tabular method</b>		
<b>Influencing components</b>	<b>List of components</b>	<b>Influenced components</b>
$C_2$	$C_1$	
$C_2, C_1$	$C_2$	$C_2, C_j$
...	...	...
$C_2, C_j$	$C_N$	$C_1$

Source: author's calculations based on (Saaty, 1996)

The impact of a given component on another component is derived from paired comparisons as in AHP method.

The derived weights ( $\square_{ij}$ ) are used to weight the elements of the corresponding column blocks of structure called initial supermatrix ( $W$ ). It is assigned zero when there is no influence. Initial supermatrix is obtained by paired comparisons on the elements within the clusters. This supermatrix is a two-dimensional matrix. The priority vectors from the paired comparisons appear in the appropriate column of this structure. We obtain weighted supermatrix ( $\bar{W}$ ) using equation (1) :

$$\bar{W} = [W_{ij} * v_{ij}] \tag{1}$$



Then we compute limited supermatrix ( $G$ ) raising the weighted supermatrix to  $k$  power, using equation (2):

$$\lim_{n \rightarrow \infty} \overline{W}^k = G \quad (2)$$

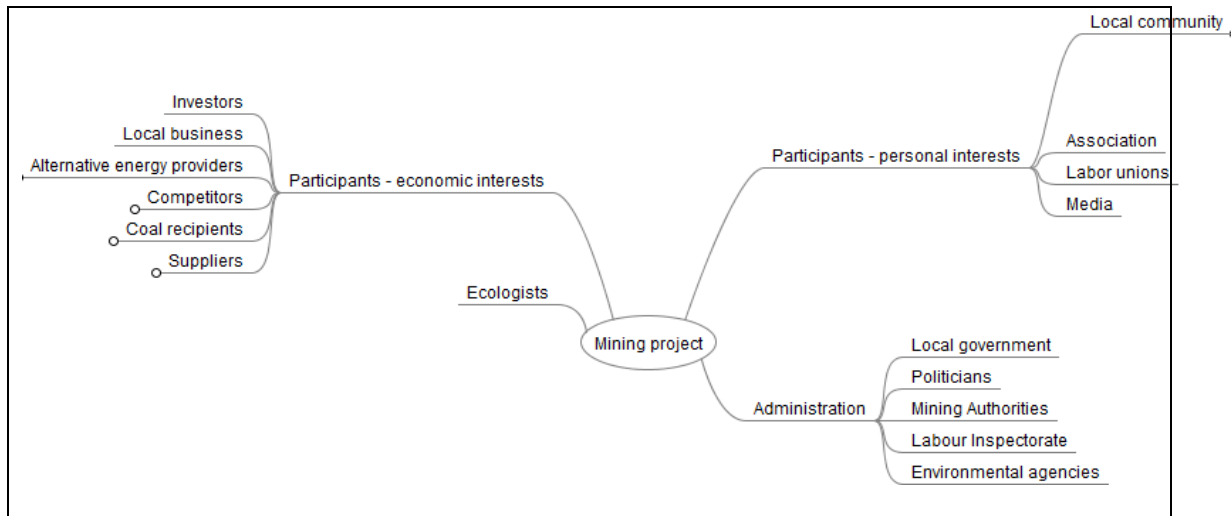
Columns of limited supermatrix gives as priorities of components and elements.

### 5. Considered case

As it was proposed in (Targiel, 2017), we perform first six steps of method:

1. Identification of stakeholders
2. Grouping stakeholders in the cluster
3. Identification the relationships between stakeholders
4. Definition of dependency network
5. Perform paired comparisons of clusters.
6. Perform paired comparisons on the stakeholders within the cluster.

First, based on interviews with specialists, a list of stakeholders appearing in mining projects was developed. It was presented in the form of Mind Map in Figure 2. Not all identified stakeholder lists were expanded. For the sake of brevity of further analysis they were considered as homogeneous groups. They are visible as empty points ending MindMap branches in Figure 2. List of all considered stakeholders is also used in Table 2.



Source: Author's own work

Fig. 2. Stakeholders in mining projects

In second step we are grouping stakeholders on clusters.

Table 2

List of stakeholders		
Group of stakeholders (cluster)	Stakeholder	Used abbreviation
Administration		ADM
Administration	Local Government	lg
Administration	Politicians	p
Administration	Mining Authorities	ma



Administration	Labour Inspectorate	li
Administration	Environmental agencies	ea
Participants - personal interests		PPI
Participants - personal interests	Local community	lc
Participants - personal interests	Association	as
Participants - personal interests	Labor unions	lu
Participants - personal interests	Media	md
Participants - economic interests		PEI
Participants - economic interests	Investors	in
Participants - economic interests	Local business	lb
Participants - economic interests	Alternative energy providers	aep
Participants - economic interests	Competitors	com
Participants - economic interests	Coal recipients	cr
Participants - economic interests	Suppliers	sup
Ecologists		ECO
Ecologists	Ecologists	eco

*Source: Authors' own work*

Then as third step, we will also define the structure of the relationship between stakeholders. The structure was obtained by a tabular method as shown in Table 3.

Table 3

**Tabular method**

Influencing stakeholder	List of stakeholders	Influenced stakeholder
eco, p,	lg	
eco, md	p	lb, lg,
	ma	com, sup
	li	
	ea	
md	lc	
	as	
	lu	
eco	md	p, lc



	in	
p	lb	
	aep	
ma	com	
	cr	
ma	sup	
	eco	p, md, lg

Source: Authors' calculations based on (Saaty, 1996)

Based on these findings, it is possible to define a dependence network, which is not presented here due to its size.

In the fifth step, we make comparisons with pairs of stakeholder groups. The results are shown in Table 4.

Table 4

**Comparisons with respect to “Project” groups of Stakeholders**

Cluster	ADM	PPI	PEI	ECO
<b>ADM</b>	1	3	3	5
<b>PPI</b>		1	1	3
<b>PEI</b>			1	3
<b>ECO</b>				1

Source: Authors' own calculations in Super Decision

Administration stakeholders group is three times more important to project than Participants - personal interest group of stakeholders (PPI). The same relation is between Administration stakeholders group and Participants - economic interest group of stakeholders (PEI). But Administration stakeholders group is five times more important than Ecologists stakeholders group (ECO). PEI and PPI stakeholder's groups are the same important for project, but they are three times more important than Ecologists. This small relative importance of Ecologists will be amplified by they influence on politicians, media and local government. Inconsistency ratio is equal here to 0.016.

Then as sixth step, we perform paired comparisons on the stakeholders within each cluster. As an example we present in table 5, comparisons with respect to eco element (Ecologists) two elements in Administration stakeholders group (ADM), namely Politicians (p) and Local government (lg). They have the same importance for Ecologists, so inconsistency ratio is equal to 0.00.

Table 5

**Comparisons with respect to *eco* element in “ADM” cluster**

Elements	p	lg
<b>p</b>	1	1
<b>lg</b>		1

Source: Authors' own calculations in Super Decision





Comparisons similar to presented in Table 5, were used to construct the initial supermatrix. Weights are from groups comparison. Then, using method presented in equation (2), limited supermatrix was computed in Super Decision software. Columns represents priorities of stakeholders. They are presented in Table 6.

Table 6

<b>Priorities</b>	
<b>Stakeholders</b>	<b>Priorities</b>
lg	0.088604
p	0.062416
ma	0.045655
li	0.045655
ea	0.045655
lc	0.032908
as	0.021837
lu	0.021837
md	0.033215
in	0.030863
lb	0.035363
aep	0.014558
com	0.017819
cr	0.014558
sup	0.017819
eco	0.034134

*Source: Authors' own calculations in Super Decision*

As we expect, relative small importance of ecologists has been amplified by they influence on other stakeholders.

### **Conclusions, proposals, recommendations**

The paper presents the use of the ANP method for modeling the structure of stakeholders and determining their impact on the project. The real environment of mining projects was considered, identifying the main stakeholders in it. The numerical example presented later was used to show the ownership of stakeholder structures. Through internal connections, a seemingly irrelevant stakeholder can have a significant impact on the project. The ANP method is appropriate to capture such dependencies. Unfortunately, with the numbers of stakeholders considered in contemporary projects, the use of the ANP method becomes cumbersome, due to the large amounts necessary to perform pairwise comparisons.

We see the possibility and necessity to simplify the ANP method for use in projects, to determine the strength of stakeholder influence.





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