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paper text:

The role of human resources in sustainable development of the energy sector Sorin P. Angheluță, PhD

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Gabriela Arionesi, PhD student The Suceava University „Ștefan cel Mare”, Romania Abstract: Sustainable development highlights the importance of energy sector in any economy by establishing specific targets in the field. Also, for a good human resources management were implemented strategies at national and international level being shown in this way their importance in sustainable development of states and global organizations. The role of human resources in sustainable development of the energy sector can be viewed from two points of view, on the one hand, is presented the influence of the energy sector on the social dimension and, on the other hand, is presented the influence of human resources on know-how, technologies and innovation in the energy field. This paper analysis some indicators for pointing out the role of human resources in energy sector and the results show that Romania has an increase in labor productivity while the active employed population in energy industry and supply is decreasing. We conclude by emphasizing the need for educational reform to recognize both human role in economy and the importance of the energy sector. Key words: energy sector, human resources, indicator analysis, Romania, sustainable development. JEL Classification: J21, O13, O15, Q4. I.INTRODUCTION The energy sector has an important role in any economy because it contributes to reducing

15 **poverty, improving human welfare and raising living standards. [Vera and Langlois, 2007]**

Given the economic, social and environmental problems, that humanity face at international level, as well as the role of energy sector in solving these problems, proposing and implementing sustainable development strategies rely on sustainable management of energy sector, by default on a good human resources management in this sector. The role of human resources in sustainable development of the energy sector can be seen from at least two points of view. On the one hand, are the actions taken by human factors

13 **in order to reduce the production of energy**

obtained from fossil fuels, to increase production from renewable sources, as well as

13 **to reduce the energy consumption regardless the origin of energy**

sources,

7 in order to allow the achievement of sustainable development objectives. In

this regard, there are many research studies, reports and strategies of international organizations and experts, consisting, for example, in analyzing the consumption and energy production and their environmental impact [Omer, 2008], establishing a set of indicators to assess patterns of energy production and of household usage [Vera and Langlois, 2007], presenting the social dimension in the economic, social and environmental development [United Nations Development Programme, 2011]. On the other hand, the second view is that of the importance of intellectual development -the education- of human resources in sustainable development of economy and energy which are presented in the research, a smaller quantity, such as, for example, the importance of the human factor in the change of various ways of water management [Pahl-Wostl, 2002]. In this context, in this article we propose an analysis of human resources from the perspective of the second point of view, the one of the necessity of training, improvement and education in the field. This analysis was conducted by studying the labor structure, the occurred accidents and strikes, costs and labor productivity, the value of industrial production in the field. By researching this set of indicators we established the role of human resources in sustainable development of the energy sector. The objectives of this study are to analyze the human resources involved in various activities in the energy and to establish and present their role in sustainable development of the energy sector. The limits of this paper are the degree of subjectivity on establishing indicators, which are the basis for determining the role of human resources, but, also, the lack of more specific information on energy indicators, such as, lack of employment who works in the energy sector distinguished on the level of graduated education, to demonstrate the practical importance of training human resources in the field. An opportunity of this research is the small number of studies on this subject, which allows us the exposure to new points of view. Would be interesting in the future to be conducted a study based on this research, on the comparison of analyzed indicators at least of all EU countries. The role of human resources in

12 sustainable development of the energy sector is to be

able to use the available resources in such way that reduces over time both the amount of used resource and the consumed energy and existing losses, in the same time with the training of specialists in order to ensure sustainable development of the energy sector. Human resources provides organizational competitive advantages and market differentiation opportunity and we believe that more research should be conducted in this area. II. LITERATURE REVIEW Sustainable development, which involves combining the socio-economic aspects with the environment [United Nations, 1987; Van Cauwenbergh, Biala, et al., 2007], is a topic increasingly discussed internationally, especially in the current crisis, which raises questions not only about the signifier and the functionality of this concept [Lélé, 1991], but also the future of humanity because it depends on natural capital and of the importance that people attach to it. Thus, internationally, have been proposed a number of

20 strategies for sustainable development, that depends on the area of action

and **the**

specificity of each country. Energy is put into focus since 1987 when was dedicated a chapter in the Brundtland Report. After 2001, were implemented strategies for

17 sustainable development in the European Union [Ministry of Environment and Sustainable Development,

2008] and ever since is trying to improve the standing of these strategies. Sustainable development in the energy sector in the United Nations involves

5 access to energy services, doubling the rate of improvement in energy efficiency and doubling the share of renewable energy in global energy mix

[Scott, 2012] and at EU level involves increased energy efficiency, increased use

12 of energy from renewable sources in the total energy by

20%,

16 reducing greenhouse gas emissions by 20% by 2020 compared to 1990

[European Commission, 2010]. Of course, these strategies underpin debates and agreements between different countries of the world, leaving it to each state to implement these strategies. It is noted, therefore, that human resources plays a crucial role in sustainable energy because it is the engine of all strategies and measures that must be taken for sustainable development, human resources training is therefore imperative. This can be evidenced by the relationship of interdependence shown in Figure 1, which demonstrates the two views presented above, namely, that human resource creates, provides and distributes information for sustainable development in energy sector and the latter generates human resources necessary food, territorial accessibility jobs. [Guțu, Antonescu et al., 2013] resources, equity, green jobs Human Resources Interdependence Energy Sector Interdependence inovatlinotne,rkdneopwe-nhdowen,tcechnology Figure 1: Humlannterersdoeuprceensdaenndceenergy sector relationship Source: aldnaprteterddferopmenGduețun,cAntonescu et al., 2013 Another important aspect of the analyzed issue is human resources development so as to ensure an efficient and applicable expertise in our days, beneficial initiatives worldwide, and use of new information and technologies made by them [Torraco and Swanson, 1995]. We believe that the critical point for Romania is the possibility of using new information and technology made by researchers and practitioners in the field of energy, as there is no preparation needed to quickly and accurately handle them. It must be invested in educational programs, promotional campaigns, continuous professional training, educational reforms in the energy sector in Romania, which permit to emphasize importance of the sector at national and global level. Human Resources must be given much greater importance than in the past [Pahl-Wostl, 2002]. They must demonstrate creativity and

innovation, the power to enforce change, adaptability and flexibility in any situation, the rapid uptake of information and most important knowledge about how to use that information because currently is not sufficient to own a piece of information but is important to know how to use it. Their role is both to develop and implement strategies in the field and in their permanent modification to fit the context of time and space required. III.METHODOLOGY This work was performed under a well predetermined methodological framework. As a research method was used the secondary data analysis, which involves interpretation in an objective manner of the quantitative data, meaning that is made the interpretation of the following analyzed indicators: the structure of employment, accidents and strikes occurred, costs and labor productivity, industrial output value of the field. We studied the evolution of these indicators over a period of five years, between 2008 and 2012. Thus, we resorted to identifying indicators capable of analyzing the human resources involved in various activities in the energy sector, to the analysis of human resources working in this field based on predefined indicators and, later, to establish the role of human resources in the sustainable development of the energy sector . The study is based on the use of national statistics taken from the Romanian National Institute of Statistics and by exploring other international studies relevant to the subject under discussion. IV.RESULTS The information era has contributed to the fast development of know-how and new technologies, thus creating a problem in terms of the responsiveness of human resources to these technologies [Torraco and Swanson, 1995], ie, energy employees hardly use new technologies if not previously held a training or adequate preparation. Thus, first step of our analysis was to study a set of indicators which shall prove the role of the human resources in sustainable development of the energy sector. With regard to the structure of employment, we analyzed the evolution of the occupied active population, the average number of employees and the job vacancy rate. In Figure 2 we have illustrated the share of the occupied active population in the total national economic activities. We considered both the mining and quarrying industry and the

1 **production and supply of electricity, gas, hot water** and **air conditioning**,

because the two indicators are part of the energy sector. We noticed a decrease in the two indicators in the period 2008-2012. The second indicator is higher because it takes into account air conditioning, hot water, and green energy. The production of renewable energy involves allocating a certain number of people for the green jobs, but there are currently no statistics in this regard, because the green energy sector gained a fast development after 2011 when was stabilized the relevant legislation. With regard to the average number of employees for the mining and quarrying and the

1 **production and supply of electricity, gas, hot water** and **air conditioning**,

were all in a declining trend in the period 2008-2012, which can be seen clearly without a numerical analysis because the number of employees is calculated as the ratio between employees and the average length of employment and the active employed population covers also the employees. The job vacancy rate concerning the two indicators (0.06% and 0.1%) was lower in 2012 than vacancy rates on all national economic activities (0.59%) and the trend for 2008-2012 was descending. Therefore, there are a number of different reasons for the evolution of labor indicators including plants restructuring and activities in the mining and quarrying, industry as well as labor migration. In the energy sector, in the period 2008-2012 there were a number of accidents, especially in the mining industry and a series of strikes, including the ones from 2008 highlighted numerically. In Figure 3 we presented the indices of labor productivity in industry and we highlighted the fact that these indicators have had an upward trend

21 in the period 2008-2012 and the value of indices of

labor productivity in the mining industry and in the

1 production and supply of electricity, gas, hot water and air conditioning

were above the productivity index of all activities in the industry. These indicators are very important because show us the labor productivity per employee. Thus, we can say that in the energy sector the employees efficiency is high and human resources can increase the labor productivity through continuous training and obtaining benefits in this regard, money order or not. Regarding the monthly average cost of labor per employee, we conducted an analysis on December months in each year from 2008-2012, noticing that it has a weak upward trend in the

1 production and supply of electricity, gas, hot water and air conditioning,

but there is a fluctuating trend for the mining industry, which recorded a maximum in 2009 and a minimum in 2010 when returned to the tendency of growth. The monthly net average earnings, for which we considered all December months of each year, have an increasing trend over the period 2008-2012 for both indicators. The value of industrial output in the

1 production and supply of electricity, gas, hot water and air conditioning

increased in the analyzed period due to more efficient technologies and their greening trend. A stimulating factor in this case was the promotion of renewable energies. Industrial output value for extractive industry decreased slightly compared to 2008, existing a few cases such as lower demand for materials on the market and decrease processing capacity due to the restructuring that took place. So these are just some of the indicators that must be considered when it is desired to establish

19 the role of human resources in the sustainable development of

the energy sector. However, the energy sector has some special features that influence all these indicators. V. CONCLUSIONS The role of human resources in sustainable development of the energy sector is very important by the fact that they are the engine, primarily, in developing and implementing energy policies and, secondly, in creating innovations, technologies and know-how. From this point of view, continuous training and implementation of viable and sustainable educational reforms are the key steps to be taken towards achieving sustainable development. Indicators analyzed in this paper points out that labor productivity in mining and quarrying and the

1 production and supply of electricity, gas, hot water and air conditioning

increased, especially since the active working population decreased, and the average monthly cost of labor increased slightly and average monthly salary earning regarding the two national economic activities also increased. We observe such a correlation between the two indicators. It is important to mention that for a better emphasis of the role of human resources in the energy field, in addition to these indicators, still need to be analyzed the statistical data regarding the number of training courses on which have attended by the employees from the energy sector, the last cycle of study completed, the field in which they graduated and are employees in the sector, their age number of faculties on energy and energy management. Also, after 2020, it would be appropriate to conduct a study on renewable energy sector and its impact on human resources. We propose in the future to adopt a number of strategies and educational reforms that emphasize the role and importance of human resources in the sustainable development of the energy sector. VI

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