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IN MINERAL ACTIVITIES**

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SUSTAINABLE DEVELOPMENT OF VIET NAM'S COAL INDUSTRY

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Abstract: This report summarizes all the theory related to sustainable development and deeply analyzes the current situation of the coal industry on three main aspects: economy, society and environment in order to create the model for sustainable development of the coal industry. This report also gives out some solution for this problem. However, within the framework of this paper, all the solutions still stop as an orientation.

1. Introduction

It is obvious that the mining industry, especially the coal industry is currently considered as one of the most important industries in Viet Nam. This industry provides mineral resource for many other industries like electricity, cement industry, fertilizer, etc. and its product is mined from the non-renewable resource. Nowadays, the mining and processing activities are creating lots of negative impacts on the environment of the rounding area. Therefore, it is very necessary to carefully mention and consider about the sustainable development of this industry.

2. Theoretical basis of sustainable development

2.1. Definition

The very first definition of sustainable tourism was introduced on Brundtland report of the World Commission on Environment and Development – WCED (now it called the Brundtland Commission). After more than 30 years of researching and developing, there are so many definitions of sustainable development given out by many different scientists and organizations. Although the ways of approaching and describing are not the same, those definitions all show that development has to ensure the balance among generations, which means development must meet the needs of the present without compromising the ability of future generations to meet their own needs. As a result, development should make it balance between economic, social development and environmental protection.

In this article, the author refers to the concepts given in the Environmental Protection Law of Vietnam^[1]. Accordingly, sustainable development is defined as follows:

"Sustainable development is development that meets the needs of present generations without compromising the ability to meet the needs of future generations on the basis of incorporating, harmony rose economic growth, ensuring social progress and environmental protection".

2.2. Pattern of sustainable development

The concept mentioned before shows that sustainable development actually is the symmetrically development of 3 factors: economic, society and environment. In fact, there were many patterns for sustainable development built. And this paper will base on the model proposed by Mohan Munasingle, a specialist of the World Bank (WB) developed in 1993. The model is applied by many countries in all over the world^[1].

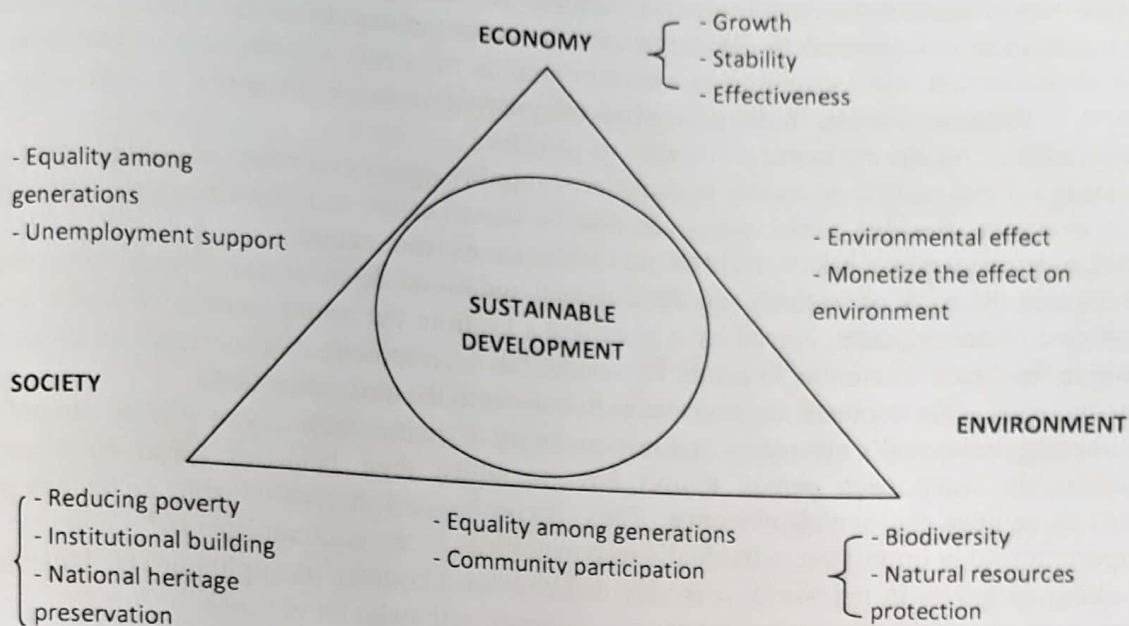


Figure1. Model of approaching to sustainable development of Mohan

It can be seen from many different ways of approaching sustainable development that the main goal of sustainable development of a country is to develop sustainably in economy, society and reduce bad impact on environment. In the above model, it is drawn that:

- **Economical aspect:** according to the opinion of sustainable development, a country considered as sustainably developed in economic if the surplus value created by it used to exchange and offset all the damage from the economic development alone. For example, the benefit from non-renewable resource exploitation activity like coal, petroleum should be taken out a small part to improve and recover the polluted environment which is impact by these activities. One possible solution that can be suggested such as the work of researching and creating some products which have the ability to be used instead for future generation.

- **Social aspect:** economic development must go along with social development, employ all the product from economic to solve social issues, improve and enhance living standard for all people in the country.

- **Environmental aspect:** environmentally sustainable development need to ensure that the economic – social development does not harm to the environment, support for the work of natural resource preservation and also prevent pollution.

2.3. Effect of sustainable development

- The definition of sustainable development is given out by the limitation of many resources which includes the natural resources (both mineral and renewable resources) and the waste assimilation capacity of the environment. Due to this limitation, people need to consider their behavior to ensure for both current and future development and it is the nature of sustainable development. In general, for every country sustainable development is an important and meaningful task.

- **Rationally and economically using all the available resources:** When a country applies sustainable development, they will have to find out the way to make use of these resources reasonably and sparingly at present to ensure for the exchange of these resources in the future.

- **Promoting economy growth rate:** Particularly, it is the calculated development, it helps allocate the available resources reasonably and this is the basis to build up a stable and durable growth rate for the economy.

- **In term of environment:** Sustainable development has to make sure that the development

will not create bad impact on the environment. It implies that during the production process, every module of the economy is allowed to discharge into the environment (from the natural resources exploitation to production and consumption) a certain amount of waste that can be assimilated and does not harm to the environment. In the case when the amount of waste is too much, there should have solutions to improve the environment as soon as possible.

- Assuring social equity: A society is considered durably developed when its achievement is shared out to everyone. Besides, social equity can also be known as the equality among generations, in other word, every generation has the right to use the resources from nature.

- Promoting the work of research and development and social development: We all know that during the process of development, human have to exploit a lot from the nature include renewable and non – renewable resources. Therefore, to assure for sustainable development, it is necessary to research and create many replaceable resources and knowledge to transfer to the next generations.

- Increasing individual's awareness and responsibility to their community: a society can only develop sustainably when each person knows how to adjust their behavior (production and consumption) to achieve the overall objective. Thus, it can be said that sustainable development plays an important role in improving individual's responsibilities to the community.

- Linking countries in the world: it is very difficult for a country to implement sustainable development alone, therefore the corporation among countries will make lot of sense

3. Current development of Viet Nam's coal industry

3.1. The importance of mining industry

- Compare to other countries, Viet Nam possesses a big advantage for developing both mining and coal industry thanks to a potential resource. However, we still have to face with some limitation and difficulties in other fields of the economic. Moreover, Viet Nam's Party and State opinion is developing mostly base on the internal factors. This is the important premise for the mining industry in general and the coal industry as well to develop. Also with this development, the mining industry, especially the coal and crude oil contribute a significant part in the GDP annually (10-11%) and this contribution was ranked at the 6th in 2000 and 8th in 2008.

- Starting from this importance, in the 21st National Agenda, the mining industry (include coal industry) was listed as one of the most prioritized economic sectors which is sustainably developed (Decision 153/2004/QD – TTg).

3.2. Current situation of the coal industry in Viet Nam

During several decades of development, the coal industry has contributed a lot to the economic growth in general and the local area as well. In this paper, the author just summarizes some of the key issues about the current situation of the industry.

3.2.1. Economic

Due to the high demand of mineral material to satisfy the national economic development, along with the effort of internal employment of the coal industry, Viet Nam's coal industry has achieved a considerable success.

Particularly, compare to the establishing year 1995, in 2011, all the criteria get a rapid growth rate. Especially, the multi – disciplinary and multi – sector business had made the outside coal sales go up very significantly (more than 130 times)

Table 1. Some economical criteria of the coal industry in 1995 and 2011

No	Criteria	Unit	1995	2011	2011/1995
1	Output	Million tons	6	45	7,5 times
2	Total revenue	Billion	2.448	109.333	44,7 times
-	Revenue outside coal	Billion	514	65.257	130 times
3	Submission of budget	Billion	102	16.605	163 times
4	Total asset	Billion	2.354	103.423	44 times
5	Return on equity	Billion	751	31.040	41,3 times

(Source: nangluongvietnam.vn)

In fact, the output of coal produced not one satisfies the demand of many domestic industries like electricity, cement, fertilizer, paper... but also can be exported and create a large amount of foreign currency for the country.

Table 2. Coal production and consumption from 2006 to 2010

No	Criteria	Unit	2006	2007	2008	2009	2010
1	Raw coal	Million tons	40,757	45,494	44,724	45,946	47,470
	Opencast mining coal	Million tons	24,473	26,797	25,333	25,760	26,690
	Proportion of opencast mining coal	%	60,0	58,9	56,6	56,1	56,2
2	Clean coal production	Million tons	37,011	42,183	38,612	43,025	43,000
3	Coal consumption	Million tons	37,669	41,652	35,437	44,489	43,000
	Export	Million tons	21,611	24,158	17,263	24,303	19,000
	Proportion of coal exported	%	57,4	58,0	48,7	54,6	44,2

(Source: Vinacomin)

It can be seen from table 2 that the amount of coal production (both raw coal and clean coal) had a remarkable growth in the period of 2006 – 2010. In term of the raw coal, open pit mining coal accounts for a large percentage but it had a decreasing trend during the time. In addition, the increase in the amount of coal production had resulted in the rise in the consumption of coal, especially for the exported coal. However, the proportion of coal export also tended to reduce (from 57.4% to 44.2%)

3.2.2. Society

The mining industry consists of many businesses whose major activity is exploiting and processing coal, with the main task is to provide the input factors and consume the output. And all these businesses work together to form an industrial zone which is quite centralized inside the coal zone. The development of these industrial areas has made the economical – social life of the local people improve significantly. For instance, in Quang Ninh, before 1993 there were only 3 communes which are Hon Gai, Uong Bi and Cam Pha. But now, in 2013, the province has 4 cities among which Ha Long was ranked as type 2 city and it is also in the planning of Ministry of Construction to be upgraded to type 1 city. It is believed that almost these developments of the city are closely related to the mining industry.

Besides, being a heavy industry, mining industry require a large amount of employment; therefore, it provide job for many people not only in Quang Ninh province but also other province nearby. Actually, the average income of a employee in the coal industry is about 7 to 9 millions, this is much higher than the national average income and also income from many other industries.

Table 3. Statistics of employment from some business of coal industry

No	Company	2011	2012
1	Vàng Danh Coal Company	6.682	6.061
2	Nam Mẫu Coal Company	4.754	4.854
3	Hồng Thái Coal Company	3.255	3.276
4	Núi Béo Coal Company	2.667	2.654
5	Hòn Gai Coal Company	1.502	1.489
6	Đèo Nai Coal Company	3.175	3.190
7	Cọc Sáu Coal Company	3.866	3.767
8	Dương Huy Coal Company	4.369	4.459

No	Company	2011	2012
9	Quang Hanh Coal Company	3.662	3.606
10	Mine Construction Comapy 1	1.330	1.405

(Source: Statistics from companies)

During the operation, the coal industry has lots of remarkable contribution to GDP and the State Budget. For the more detail, a large amount of exploited coal is exported and bring a huge foreign currency for the country every year, which help promote the development of the economy.

3.2.3. Environmental protection

a) Current impacts of the coal exploitation on the environment

The coal exploitation activity is carried out both on the surface of land (for the opencast mining coal) and underground (with the exploitation in the mines). This kind of activity is evaluated as the one that damage the environment the most. It can be seen in some aspects as following^[5]:

- Impact on the topography and landscape: exploitation activity lead to a significant change for the topography which is caused by the process of mining coal and rock from coal seams (negative change) and the disposal activities (positive change)

- Impact on the forest resource: it is obvious that forest is affected a lot by the coal mining activities. This is the result from the work of expanding exploited zone and the buffer one; expanding the landfill because of the increase in the amount of waste; the forest exploitation to serve for the mining process. Moreover, the urbanization also creates some bad effect on the forest. All these above causes have made the forest area decrease more and more rapidly.

- Impact on the process of sedimentation of rivers and streams: the mining activity, especially the opencast mining has discharged a large amount of waste rock and soil. Consequently, by the support from rain, a huge amount of them will flow down and filled in all the rivers, streams, valley and field under the landfill.

- Impact on the air:

- + Dust: the coal production process, especially the opencast mining activity releases a remarkable amount of dust into the air. Actually, every single stage of this process all produces dust

- + Toxic gas: the coal mining process also raises lots of toxic gas like CH₄, CO, CO₂, NO_x, SO_x, H₂S....those gas raised from the blasting; due to production from coal, the rock around the fireplace

- + Noise and vibration: the noise and vibration are produced from the blasting activity and the noise from the machines during the working time.

- Water resource:

- + Decrease in the amount of water: in term of the surface water, the disposal process has deposited, changed and slow down the flow as well, this leads to the reducing in the amount of surface water a lot. With the groundwater, due to the pumping, regular sucking inside the mining pits, along with the destruction of flora, the amount of groundwater is significantly reduced and the water mode is broken too.

- + Reduction in the quality of water: It is the fact that most of the sewage is directly discharged into the environment, this leads to the decrease in water quality and create water pollution as well.

b) Environmental protection activities

To deal with the pollution caused by the coal production process, many coal businesses have given out some method and solutions in this area, they are^[5]:

- In term of sewage treatment: at present, there is a sewage treatment system available in the industry. At the insistence of sludge, most companies in the industry have had wastewater treatment systems (Deo Nai, Cao Son, Pile 6, Mong Duong, Khe Cham ...). This works by Environment Company Limited – Vinacomin invests, using funds from the treasury of Vinacomin focused environment. However, the operation of this system has not really meet the wastewater treatment, especially for open pit mining enterprises.

- In term of dust treatment: nowadays, many coal – related businesses have employed various methods to handle the dust raised from exploitation and shipment process such as water spray, high pressure mist, compressed water and gas spray, building vehicle washing station, covering canvas on the car during shipping time, using cars to spray water on the road, using pipelines to reduce the pollution. In addition, many companies are implementing many different reverting measures by building dike system, reforestation (mainly glue) on the waste dump.

- Besides, in order to get enough budgets for the work of treatment and recovery the environment, the coal industry has raised an environmental fund. In 2008, this fund obtained 808 million VND and the total expense for environmental protection activities was about 640 billion VND. Not only that, the coal industry even pays in advance for the forestry farms to help them reforest more easily and also provide the wood for coal companies.

To summary, it can be seen from the above preliminary analysis that the coal industry development has contributed significantly to the general development of the country by the continuous growth in volume which satisfies the need of both domestic industries and to export as well. However, there are also some potential risks from the development. First of all, the push for coal mining – a non – renewable resource to export while the reserve become more and more depleted has forced the pit mining down to several negative hundred meter. As a result, the domestic demand for coal will be affected in the near future. Furthermore, most of the current mining activities are based on the opencast mining (more than 50% of the total output) might lead to more and more serious damage to the environment. Thereby, is it necessary to find solutions to help the coal industry develop more durably, ensure the energy security for future use and also create sustainable development for the whole country.

4. Sustainable development of Viet Nam's coal industry

4.1. Perspective of coal industry sustainable development

The perspective of sustainable development of coal industry was mentioned in many undertakings and policies of the Party and State. Particularly, the direction number 36/CT-TW, on 25/6/1998 emphasized: “Environmental protection is a basic content that cannot be separated from the policies and economic-social development plans in every levels and sectors, is an important base for sustainable development, successfully implements the industrialization and modernization of the country”^[7].

The opinion about sustainable development was even reaffirmed in the “Economical and Social Development Planning period 2001 – 2010” indicate that: “economical and social development has to close link with environmental protection, ensure the balance between the artificial and natural environment and preserve for the biodiversity”^[7].

Applying this allege, the Government approved the Agenda no 21st of Viet Nam (Decision no 153/2004/QD-TTg), in which mining industry is referred as one the important industries that should be priority to be sustainable developed.

Starting from these perspectives above, sustainable development issue of the coal industry in Viet Nam need to base on the following factors:

- Developing durably the coal industry plays an important role in the general sustainable development of the country. And the mining industry which includes coal industry is one of the spearhead economic sectors of Viet Nam. However, this industry also causes some serious problem to the environment of the mining zone. Thus, the development of mining industry in general and coal industry has affected a lot to the national development.

- The product of this industry is a non – renewable resource, thus, it is impossible to be reserved. The amount of resource will be reduced more and more during the time. Hence, to achieve sustainable development, the amount of coal exploited should be control to be ensured for use in future. They might be the replaceable resources, knowledge or advanced technology.

- The activity of exploitation must be implemented in the same time with environmental protection in the mining zone.

- The sustainable development of the coal industry also needs to be performed synchronously on all three aspects: economy, society and environment and in coordination with other sectors in the process of sustainable development of the country.

On the basis of this opinion, this report proposed to build a sustainable development model for coal industry as well as some solutions for sustainable development of Viet Nam's coal industry.

4.2. Model of sustainable development for coal industry in Viet Nam

a) Objective

Like the goals mentioned before in this paper, sustainable development of the coal industry in Viet Nam also proposed three objectives:

- Sustainable development for economy
- Sustainable development for society
- Sustainable development for environment

b) The model of sustainable development for Viet Nam's coal industry

The model is specified base on the model of Mohan Munasingle but it is applied and changed to be suitable with current situation of Viet Nam's coal industry

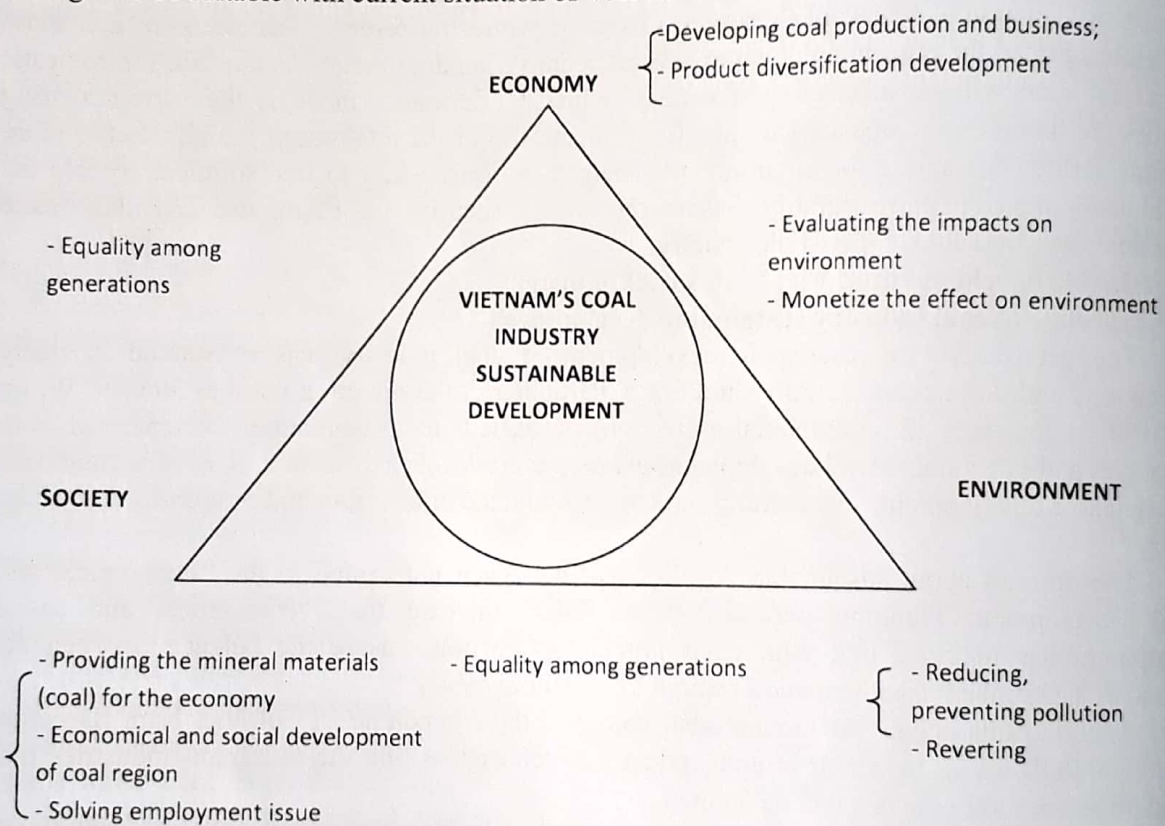


Figure 2. The model of sustainable development for coal industry in Viet Nam

c) The contents of model

1/ Sustainable development for economy

- Coal production development:
 - + Enhancing coal exploitation in order to satisfy national economic demand
 - + Enhancing artisanal mining, exploit again to utilize resource
 - + Doing research to increase resource recovery ratio in exploitation
 - + Diversifying products from coal
 - + Continuing to search, explore in order to increase and recover out more resource reserve
- Developing product diversification:

+ Developing all the sectors and products which relates to the supply of input and output product to establish 1 industrialized zone in the coal region such as engineering, electricity, chemical industry, etc.

+ Developing products which have the same manufacturing technology like metal exploitation and processing.

+ Developing external industries and products so as to make use of some available resources as well as advantages of the coal region like tourism, cement industry, etc.

2/ Sustainable development for society

- Providing and satisfying the demand for coal of other industries in the economy, help to assure the energy security

- Contributing revenue into the State Budget

- Contributing to the economical and social development in the mining zone

- Improving the quality of employees in the industry

- Ensuring safety and security in working environment

3/ Sustainable development for environment

- Reducing and preventing environmental pollution from mining production activity

- Reverting, recovering polluted environment in the past

4.3. Solutions

1. Building up a unique planning in using, exploitation and environmental protection

2. Organize reasonable order for exploitation to avoid the situation that just easy exploited mines are exploited, the difficult ones will be left, because this affects the evaluation and planning process, also damages the existing resources.

3. Strengthening to search to explore more new reserve resources. This can help to offset for the exploited resources, also is the basis to continuously build up development planning of the industry.

4. Reviewing and reorganizing the business structure to ensure that the diversification is still managed so that the value chain can be made.

5. Enhancing to research, apply technology advance into exploitation and production process to make use of the existing resources in environmental protection.

6. Enhancing to review the sewage treatment system (sewage and dust) in every manufacturing stage.

7. Continuing to raise environmental fund, disbursement and use the fund more effectively in the process of protection and improvement the environment.

8. Continuing to appraise the impact on environment and strictly control this content when doing the plan.

9. Enhancing to develop replaceable resources and materials. In order to do so, it is necessary to corporate among different sectors in energy and mining industry like electricity, petroleum. It is also possible to establish, energy development fund, new materials". This fund will be raised from the product price and it is under the control of the State to support for research and development, experimental use new energy and materials

5. Conclusion and recommendation

It is the fact that the demand for coal of the national economy is increasing more and more while the reserve of coal is decreasing a lot, the exploiting condition even becomes more and more difficult. Therefore, sustainable development of coal industry must be seriously taken into consideration. Basing on the general analysis about the current situation of coal industry in Viet Nam, the report has suggested a model of sustainable development for this industry and also some possible solutions for development as well. And here are some suggestions:

1. Continuing to institutionalize related contents to make a legal basis for implementation

2. Sustainable development needs to be synchronously carried out from the central government to energy industry, coal industry and related businesses in the industry.

3. Enhancing the wide the propagation to not only all the staff and employees but also the community to strengthen their knowledge in implementing sustainable development more efficiently.

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