

IMPLICATION OF NEW ADVANCE TECHNOLOGY IN MINING INDUSTRY AND ITS APPLICATION IN IVORY COAST, CHINA

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ABSTRACT: The rapid progress of human society, where technology economics such as the natural sciences and social sciences converge, and a model union is a necessary system of science which guides system theory, control theory, information theory, the theory of dissipative structures, collaborative theory, and catastrophe theory as a link. The contributions of modern day science and technology have brought in numerous changes in a number of industries, such as mining. This research aims to show that through the findings of science and technology, economic, social, ecological and cultural complex large-scale systems, integration will eventually face rare development opportunities and challenges. The conclusion of this paper is that in the future, the application process of technology economics research will show the following trends: the study of complex technology; wide range of research areas, technology integration of economic theory, economic approach to intelligent technology, and low entropy of the system of technical economics.

Keywords: Ivory Coast, Mining Industry, New Advanced Technology, China

1. INTRODUCTION

The modern mineral exploration is largely been driven by the modern day technology. Several minerals discovered have attributed and will continue to increase geophysical and geochemical technologies developed by the governments and also industries since 1950s ([1], [2]).

Artisanal mining extraction activity has existed in Ivory Coast since the country's independence in 1960. This country is located in the western part of Africa, with almost 23 millions populations [3], and is the world leader of cocoa. The agriculture industry plays the main role in the Ivory Coast's economy. The mining sector is seen as sector to boost the country's national GDP, which is still being run by the artisanal way. There is a significant lack of technological means for mining extraction, and also there is no enough new technological strategy to recognize mining or mineral districts for focuses on deeper drilling. The use of old tools makes Mineral extraction in the country very slow and difficult. Additionally, the lack of information in mining sector, and lack of sufficient logistical measures to collect, store and distribute outputs, remains a serious problem.

According to the distribution of the Ivory Coast national GDP, there is not much financial support from government to the mining sector. The government holds the primary role of cocoa development in Ivory Coast. The mining sector

seems neglected due to the fact that the current government tries to control and invest more financial resources in the new mining code, in order to encourage mining investors all over the world. This is the case because Ivory Coast is home to several gold mines, apart from being the world's leading cocoa producer.

Some of the major problems in the Ivory Coast's mining industry, like in most African's countries, include the absence of economical incentives and benefit sharing. There are real problems related to the transfer of funds, such as the non transparency in the sale of operating licenses, economic operators taking limits without having the financial operations capacity or the ability to reach the final phase of their operations. This blocks the perimeter when other investors are asking, and that often leads to lands conflict. As such, hampers the economic growths of Ivory Coast [4].

Comparing to the Chinese Mining System, Science and Technology has developed at a rapid pace with regards to mining technology. The Chinese government through various forms of funding, reforms and societal statuses on science and technology as a fundamental part of the socio-economic development of the country and national prestige, has placed so much emphasis on mining technology. It is evident to see rapid advances in areas such as infrastructure and high technology manufacturing in some areas, which has placed the

economy in some measures, as a world leader. This is one of the many instances that show that through rapid development in science and technology, there are some great development opportunities in this field of mining. China is now increasingly targeting indigenous innovation and aims to reform remaining weaknesses ([5], [6]). Mining technology has thus been one of the vital tools for achieving economic goals as well as national prestige, where lacking indigenous technological property and innovation, are seen as national problems. The Chinese state continues to direct both the public and private economy and research by means such as national plans, regulations, taxes and subsidies. As such, developing prioritized industries and research in mining, for instance, are protected and guided [7].

The Chinese mining system has been shifted from a planned economy to a market economy, and is currently constructing a system that is more adaptive to their socialist society, which is in synch with their whole economic system. Many scholars have studied the west's mature system to learn from it by example. There are three main aspects that are noteworthy of borrowing from: first, are the mining resources ownership and the mining rights, which are the basis of the west government's mining system. Second, there are relatively uniformed management systems supervising the mining sector. Third, the macroeconomic environment serves as the instructor to the mining policy. In alignment with the findings above, it is notable to state that the Chinese government has made the following steps [8].

Firstly, the Chinese government has taken steps in strengthening the government's protection and management over mining rights, and completing the laws and regulations of the mining sector in order to keep mining activities healthy and functional. This also helps to intersect with the international market. Additionally, the Chinese government has pursued unifying the mining management institutions, thus facilitating institutions and fitting changes in the mining sectors readily. Moreover deepening the mining enterprises reformations and inducing these enterprises to exploit resources overseas in order to enhance Chinese competitiveness in global markets and share the resources to their own ([9],[10]).

In addition to the above-mentioned system in the mining sector in China, we can also enumerate some methods as following:

1.1 Technology

Modern technology has been used in mining for many years in China. Companies provide

machinery and facility for mining. Where for instance, Shearers scrape conveyers and supporting equipments can be seen in general mines. For higher efficiency, development machines, emulsion pumps, loading machines and other auxiliary equipments are applied to match each other better, and large-scale machinery will be used.

1.2 Theories

A series of theories about mining engineering have also taken shape. They are about geological survey, design and construction of mining, ground stress and support, transport and equipment, labor protection and mining economic.

1.3 Enterprises

Many large-scale industries exist in China. They are supervised and regulated by government and stimulated by the market economy. They have their own management model; and managers also draw up rules to assure their workers to work enough hours every day [11].

1.4 Government and Policy

The Government of China carries out a series of policy and laws to encourage and balance the development of mining industry [12].

Since the founding of People's Republic of China, Chinese government has paid much attention on geological work, even putting it ahead of developing national economy. It also has promoted plans on the exploration of mineral resources in each five-year plan [13].

China has established a mineral resources legal system, based on constitution and consists of relevant laws and regulations. Since the year 1982, Chinese legislature has successively enacted the Rules for the Implementation of the Mineral Resources Law of the People's Republic of China, the Implementation Regulations for PRC Law of Land Administration, the Law of the People's Republic of China on the Coal Industry, the Law of the People's Republic of China on Safety in Mines, and the Environmental Protection Law of the People's Republic of China, etc.

The PRC's constitution explicitly points that mineral resources are owned by the state and Rules for the Implementation of the Mineral Resources Law of the PRC stipulates that it is the state council that has the ownership of mineral resources. In 1994, the Provisions on Administration of Collection of Mineral Resources Compensation Fees came into force

since 1994, calling for the start of the paid use of mining; later in 1998, the Measures for the Administration of Transfer of Mineral Exploration Right and Mining Right was established to define the property of the rights of mineral exploration and mining as well as strengthen the exclusiveness of those rights. China has also listed the prices of mineral exploration and mining in the case of state-funded exploration. In light of those rules and managements, a standardized mineral exploration and mining rights market is cultivated and the supervision of market operation is reinforced.

Chinese government has also issued at least 20 other auxiliary laws and regulations. For example, the Decision of the State Council on Amending the Regulation of the People's Republic of China on the Exploitation of Offshore Petroleum Resources in Cooperation with Foreign Enterprises, the Decision of the State Council on Amending the Regulations of the People's Republic of China on Sino-foreign Cooperation in the Exploitation of Continental Petroleum Resources, the Regulation for Registering to Explore For Mineral Resources Using the Block System, the Procedures for Administration of Registration of Mining of Mineral Resources, the Interim Measures of Hubei Province on Administration of Phosphate Resources, and the Regulations on Administration of Geological Data, etc. Various provinces, autonomous regions and municipality directly under the central government have made correlative local decrees. Those laws and regulations are helpful in providing a standardized and steady environment for mining industry.

As for the jointly contribute to the mining industry by government and private sectors, there is a significant transformation in mining management system since the year 1978, leading to a formal start of mining market construction [14]. The mining economy system has thus turned into the pattern with the public sector remaining dominant and diverse sectors of the economy, such as private sector economy, joint-stock sector economy, etc. developing side by side. This change resulted in a rapid development of China's modern mining system. In 2003, the numbers of non-state-owned mining enterprises rose to 140,000, including 160 are foreign invested enterprises. Since Chinese mining has faced many problems due to history factors, the Chinese government adjusted the policy guidance in real time and some mine enterprises and private sectors improved their technique in the production practice unceasingly. And finally they solved these problems jointly and brought great social, economic and environmental benefits [13].

1.5 Labor Protection

This ensures that workers get financial compensation if they were injured during working; and an employee's company would pay medical expenses for their treatment. Laws and rules are drawn up for worker-protection such as Labor Law, Production Safety Law etc.

Even though there are also problems of environmental protection and circular economy for instance, the mineral production in China has become an industry chain. Due to the positive role of technology in the mining sector, we strongly suggest the government of Ivory Coast aims to understand the mining industry activities in China, and to use its applications in Ivory Coast in order to overcome the problems of artisanal miners, lands issues, and illegal mining activities.

2. EVOLVING TECHNOLOGY RESEARCHES IN THE IVORY COAST'S MINING INDUSTRY FIELD

2.1 A Review of the Technical and Economic Development

Over the years, many scholars have studied technical economics in an attempt to define technical and economic development. According to most scholars, technical and economic development is defined in three areas, four levels, and three aspects.

Technical and economic problems in three areas refers to technology development inherent laws; the laws of economic activities in the technical field; and, technological developments in the field of the law of economy. Additionally, four levels of technical and economic issues relate to the technical and economic issues at the project level; the enterprise level, technical and economic problems; technical and economic problems in the industrial levels; and, technical and economic issues at the national level. Finally, technical and economic problems in three areas in general terms refer to the basic theory of technical and economic disciplines; the basic methods of technical and economic disciplines; technical and economic disciplines basic theory, and basic methods applied in the real technical and economic activities.

2.2 Information, Knowledge Economy and The Technical And Economic Intersection

The information and the emergence of the knowledge of new technology has brought new economic issues, and created a new department of economics. In the application of the new technical tools in the mining sector in some specific areas of study, technical problems can create a new

department of technical economics, such as logistics technology, environmental technology, and information technology and so on. In particular, information industries and other high-tech industries have sprung up everywhere, on the development of Ivory Coast economics can play an important role in promoting mining activities.

2.3 Lack of Adequate Infrastructures

Due to lack of adequate infrastructures, it is thus necessary, to study the original technology of inherent law and the need for technology law in Ivory Coast. Secondly, the lack of scientific basis of technological innovation was one of the important issues facing various enterprises and many industries of Ivory Coast, especially the mining industry. In the case of Ivory Coast, it is therefore necessary to find out if the evolution of technology in science track exists. Once we find out these problems, we can further understand the growth of science and technology into economic, innovation implant growth and inherent laws, and propose a more effective policy advice to the current government of Ivory Coast and to the MDA in charge of the mining sector

3. THE EFFECT OF MINING TECHNOLOGY ON THE ENVIRONMENT

3.1 Theory of Technology and Trade and Environment

With the development of the modern-day technology, the contradiction between mining development and environment becomes a severity. Pollution and destruction are the price we pay for an overpopulated and over industrialized planet, and they are considered as a form of negative externality in economic growth. Ivory Coast has an abundant supply of gold, diamond, Manganese and iron ore reserves, which gives it an absolute advantage over other countries in terms of being pollution haven to some extent. During the process of development, countries such as Ivory Coast face the tradeoff between environmental and economic goals. The following figure (see Fig.1) can help to explain the strong correlation between mineral technology and trade and environmental effects:

It states that as the size of the economy gets large due to technology, trade, production and consumption increases pollution, and at a certain point higher income leads to increased regulations that help to reduce pollution. The idea behind the Environmental Kuznets Curve is that, although growth has bad effects on the environment at initial stages of industrialization, later on it reduces pollution as higher income leads governments to enact tougher environmental policies due to more

new modern-day technologies being used in the mining sector.

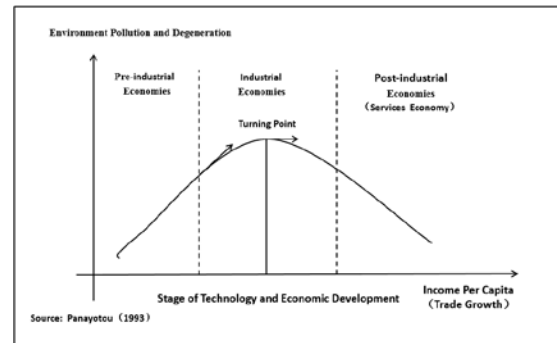


Fig.1 The Environmental Kuznets Curve by Simon Kuznets

The theory works well for developed countries but not so well for developing countries and underprivileged countries, because although the economies of countries like Ivory Coast and China have remained on the industrial economies, they still rely on the production and export of a primary product over the last few decades.

3.2 The Correlation between Technology and Environment

As the Chinese leader Mr. Deng Xiaoping precisely pointed out, science and technology constitutes a primary productive force. Innovative-based technologies will enable global mining trade, open markets, and free mining enterprise, and push the development and spread of new mining technologies. On the one hand, with more innovative-based technologies, it is helpful for enhancing technology upgrading and business integration and lowers the cost for mining industry, thus improves its key competitiveness in the global mining market. On the other hand, modern-day technology can assist and participate in productivity improvement and help mining companies knock out backward productivity such as obsolete equipment, high-cost production processes and high-polluting procedures. While the progress of ecological environment and improving the development of technology cannot be separated, and the development of mining science and technology is the display of these innovative and important stage of modern civilization. Rather, the improvement of mine environment would provide a platform and infrastructure to accelerate new technology development.

3.3 The Application of Modern-day Technology in the Treatment of Mine Environments

With the development of mining industry, it

becomes more and more serious that the problem of geological disasters, ecological environment destructions and environmental pollution are prevalent. While modern-day technology especially the modern information technology develops, the problems would get improved. All kinds of hi-tech mining equipment and manufacturing techniques are put into use to strengthen the investigation and monitoring of the mine environment, and prevent calamities. “3S” technology is a typical case for modern-day information technology in the mining environment treatment. “3S” technology refers to GPS, RS and GIS, which form the geological disaster comprehensive monitor information system. As shown in the next figure (Fig.2), with the “3” technology, mining geological disaster and environment problems can be tracked and controlled in real time. Currently “3S” technology has been applied and popularized in mining environment treatment, and thus effectively promotes the sustainable development of the mining industry in the most advanced mining countries like USA, Canada, Australia, South Africa and Chile. China is also active in this area in the same way to upgrade its mining information technology level.

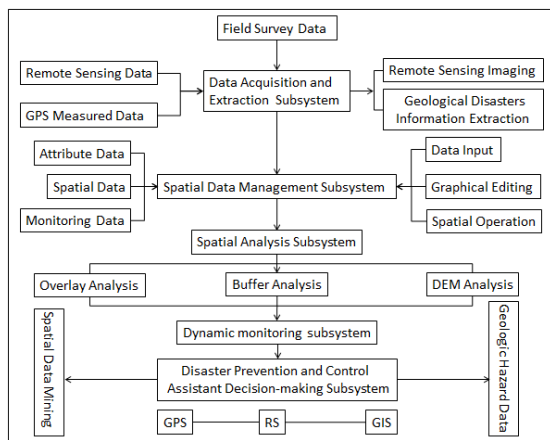


Fig.2 Geological Disaster Comprehensive Monitor Information System Structure Chart

4. THE BENEFITS

4.1 Investment Potential in Ivory Coast

Ivory Coast is currently in the stage of one of the biggest future investments in the mining sector. The need for more fitness of investment projects evaluation to develop the mining industry by the new advanced technology should be imperative in order to attract more foreign mining companies, which often eases valid judgment. That will bring more benefits, such as the precipitation of foreign

investors, creation of jobs, national GDP growth, and reduction of the insecurity in the illegal artisanal mining sites and so on. The introduction of technology investment in Ivory Coast will as such boost economic growth and facilitate sustainable development. Ivory Coast will rely on technological innovation, energy conservation and emissions reduction to promote industrial restructuring and upgrading. While to accelerate technology innovation and industrialize hi-tech needs the support of risk investment from foreign investors to modernize Ivory Coast in order to avoid sell mining products for raw materials.

4.2 Well corporations in Ivory Coast

This paper proposes that a well corporation between the government of Ivory Coast and its miners should be more focused on transparency and technology issues. The enterprise must show the importance of efficient configuration of technology innovation property, which effectively motivates staff. The key is that employees and local people will be innovated and integrated into the new advanced technologies.

Additionally, Artisanal mining will be turned into modern mining, which will assist the speed of business growth, and will therefore determine the survival and development of the industry. The Ivory Coast's enterprises (such as SODEMI), are very necessary to study technology Integration from innovation to mass manufacturing, even after revealing product innovations and mass production technology integration mining law.

4.3 Industrialization issue in Ivory Coast

Due to the multiple efforts of the current government in facilitating industrialization, Ivory Coast in future may become a new manufacturing center in the world. At least one mining is processing industry in the country will help the mining sector in international competition. For this reason, we urgently need to find some issues such as an effective industrial technology upgrading approach to make decision, and the industrial technology of the technology track. The innovation of the industrial technology can become an important phenomenon in the country's mining sector, because industrial development is an important method for every nation. Our in-depth research can become an important guarantee for Ivory Coast to participate in international competition, because even though at present Ivory Coast had joined the WTO, it still impossible to participate effectively in the international

competition. As such, some in-depth studies of industrial technology standards in the mining sector, aiming at boosting the economy are necessary.

4.4 National Economic Securities

With regards to national economic security, the government of Ivory Coast should essentially promote the mining policy on development and technological innovation, because the policy still has many elements missing, which renders it ineffective. It will be important to reform the mining sector by the evaluation of the government policies through appropriate policies, and also the suggestion of an appropriate policy recommendation for improvement. This can lead to the economic globalization, the internationalization of science and technology, information security for the foundation of a country's economic stability, steady growth, and sustainable development.

4.5 Subject Methodology

As a result of lack of an adequate material to mining, it is worthy to note that there are obstacles as to why the artisanal mines are increased. We need to learn from more mature foreign countries (such as China, Canada, Australia...) in the related subject's approach that requires cooperation with an international counterpart's research, improved international cooperation and learning, in order to enhance the modernization of the Ivory Coast mining industry. It is highly recommended that the current government of Ivory Coast should maintain a good relationship with above-mentioned countries.

5. CONCLUSION

Based on knowledge research problems and issues at the forefront of technical and economic development, it can be concluded that it will help the country's authorities to correctly grasp the development direction of technology economics in order to improve the artisanal mining, and transform it into a modern mining industry. It should be a priority to improve the innovation ability of technology, the development of technical and economic industry with Ivory Coast characteristics. Therefore, the study of the technical and economic sustainable development is an urgent task. Modern science and technology, economy and society of these three have been inextricably linked, to find the law of their

coordinated development. As such, it is the most important of technical economics research tasks.

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