



Research Article

Mining Activities and Sustainable Development Issues in Burkina Faso (West Africa)

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Abstract

Burkina Faso is a landlocked country, which struggles to meet the international development standards. The country knows a “mining boom” since 2008 with more than 600 exploitation permits with many environmental, social, cultural issues due to the limit of the actual mining local code that was established since 2015. The majority of mining companies found in the country exploit most of all gold as the main ore. Sustainable Development requires a country to utilize rationally its natural resources while having on mind that next generations should also meet theirs. This study showed that even the Burkina Faso legal context of Sustainable Development suffers of the

lack of applicable texts that could help in preserving the integrity of the population and the territory. Hence, this study requires that the local government should reconsider its mining exploitation code in order to reach a responsible sustainability. IAMGOLD Essakane is an example of an industrial mining company located in Burkina Faso since 2009. The current study showed that, the Essakane mining company proposes many ways to reach sustainability in its exploitation.

Keywords: Industrial Mining; Sustainability; Environment; Culture; Society; Development; Essakane; Burkina Faso

1. Introduction

Burkina Faso has experienced a mining boom in recent years [1]. With the rise in the price of gold, mining companies are attracted by a local mining code favorable to investment [2]. About ten active industrial mines generated approximately 916 billion in direct contributions to the state budget between 2008 and 2015 [3]. Burkina Faso's objective was to achieve a participation in the GDP to the state budget [4].

However, the extent to which the benefits can be achieved strongly depends on how the country manages the institutional and political challenges associated with this wealth. Sustainable Development of the mining sector covers environmental, social and economic dimensions and includes producing and consuming now but also for the next generations [5].

We believe it is important to approach sustainable development in the mining world in Burkina Faso both pragmatically and strategically [6]. Sustainable development is a “development that meets the needs of current generations without compromising the ability of future generations to meet theirs. » (Brundtland 1987).

The principles of sustainable development are based on the following points [7]:

- Environmental protection: Environmental protection must be an integral part of the development process
- Responsible production and consumption: Production and consumption patterns must evolve in order to minimize their unfavorable

social and environmental repercussions

- Responsibility: Responsibility is exercised at the individual and collective levels
- Solidarity: Solidarity is conceived in time and in space. In time, between present and future generations
- Participation and commitment: Sustainable development is based on the commitment and participation of everyone
- Precaution: If there is a risk of serious or irreversible damage, the lack of scientific certainty should not be used as a pretext to postpone the adoption of effective measures to prevent environmental degradation
- Subsidiarity: Decision-making and responsibility must fall to the lowest administrative or political level able to act effectively.

In this study, we will see firstly how to approach the issue of sustainable development in mining sector in Burkina Faso.

Secondly how to respond to the dilemma of sustainable development in a context of the exploitation of a non-renewable resource (mining resource). Finally, we will study the contribution of mining sector to sustainable development regarding of the positive effects of extractive activity.

2. Methodology

2.1 Industrial exploitation

Burkina Faso is full of fairly large and diversified mineral resources differently located and exploited in the country (Table 1).

Mining companies	Field (localization)	Ore	Total expected production (tonnes)	Estimated lifespan (years)	Operating time (years)
Bissa Gold	Bissa (Bam)	Gold	34.3	9	7
BMC Youga	Boulgou	Gold	25	7	12
Bouere-Dohoun Gold Operations Dohoun (Tuy)	Douéré et	Gold	6.3	5	1
Iamgold Essakane Sa	Essakane (Oudalan)	Gold	100	12	10
Hounde Gold Operations	Houndé (Tuy)	Gold	22.8	8	3
Komet Ressources Sa	Guire Bayildiali (Seno)	Gold	3.06	5	8
Nantou (actual Trevalli) Mining	Perkoa (Sanguié)	Zinc	6900000	15	7
Netiana Mining	Nétiana (Nahouri)	Gold	2.7	4 (stopped)	4
Pan Africa Tambao Sa	Tambao (Oudalan)	Manganese	107000000	33 (stopped)	2
Riverstone Karma Sa	NAmisiguima (Yatenga)	Gold	57	8.5	4
Roxgold Sanu Sa	Bagassi (Balé)	Gold	22.74	10	4
Semafo Boungou Sa	(Partiaga (Tapoa)	Gold	35	9	12
Semafo Burkina Sa	Wona-Fobiri-Mana (Balé)	Gold	36.8	7	2
SMB	Inata (Soum)	Gold	22.5	10 (stopped)	8
Somita	Taparko Bouroum (Namentenga)	Gold	35	8	13
Wahgnion Gold Operations	Niankorodougou (Leraba)	Gold	32.66	9	1

Table 1: Mines and their locations in Burkina Faso [8].

In addition to gold, zinc and manganese, Burkina Faso has other mineral resources such as copper, phosphate, platinoids, silver, etc. Beside minerals, there are also quarry substances such as granite, Kaolin, laterite, limestone, etc., [9].

2.2 Legal and institutional context

Several laws and regulations oblige private and public

promoters to respect the environment when planning their works and developments that may have impacts on health and environment [10, 11]. These laws and regulations are mainly:

- Law No. 0052/97/ADP of January 30, 1977, establishing the Environmental Code in Burkina Faso which stipulates in its article

17 that "activities likely to have significant effects on the environment are subject to the prior opinion of the Minister of the Environment. The opinion is drawn up on the basis of an impact study or an environmental impact notice".

- Law No. 006/97/ADP of January 31, 1997, relating to the Forest Code in Burkina Faso, which stipulates in its article 50 that "any carrying out of major works leading to clearing is subject to prior authorization from the Minister responsible for forests on the basis of an Environmental Impact Study".
- Law No. 23/94/ADP of May 13, 1994, establishing the Public Health Code in Burkina Faso.
- Law N ° 014/96/ADP of 23 May 1996, relating Agrarian and Land Reorganization in Burkina Faso.
- Law No. 023/AN of May 8, 2003, establishing the Burkina Faso Mining Code.
- Law No. 002-2001/AN of February 8, 2001, relating the orientation law on water management.
- Law No. 034-2002/AN of November 14, 2002, on the orientation law related to pastoralism.
- Law No. 062/95/ADP of December 14, 1995, establishing Burkina Faso Investment and Formalities Code.
- Law No. 05-2004 of December 21, 2004, on the General Code of local authorities.
- Decree No. 2001-342/PRES/PM/MEE of July 17, 2001, related to the scope, content and procedure of the EIA and the NIE.

- Decree No. 98-322/PRES/PM/MEE/MCIA-/MEM/MS/MATS/METSS/MEF of July 28, 1998, laying down the conditions for the opening and operation of dangerous, unhealthy and inconvenient establishments which in its article 7 requests an Environmental Impact that shows how the promotor will eliminate, limit or compensate for the inconveniences along with the estimated costs.
- Decree No. 2001- 185/PRES/PM/MEE of May 7, 2001, establishing standards for the discharge of pollutants into the air, water and soil. It gives in its articles 6, 10, 11 the norms of discharges.

In addition to national regulations, Burkina Faso signed many international conventions and treaties such as the RAMSAR convention, the Stockholm convention, the Bale convention, and the Bamako convention...

The objectives pursued by such regulations are to make sure that a project or a program can be profitable to the country while avoiding or minimizing its negative effects on environment and health and by optimizing the positive effects for the population's well-being [12].

3. Results and Discussion

Agriculture and livestock have long been the pillars of Burkina Faso's economy. However, with the adoption of its new mining code in 2003 (Law No. 031-2003/AN of May 8, 2003), which is more attractive and therefore more favorable to private investment [13]. The country is currently experiencing an

unprecedented mining boom, particularly in the field of gold mining and gold has been Burkina Faso's first export product since 2009 [14]. More than 600 exploration and exploitation permits have been issued to date [15].

In addition to the economic benefits (various taxes, creation of direct and indirect jobs, creation of related businesses, etc.), mining is an activity that generates enormous environmental and socio-economic problems. Among the problems are deforestation, air, soil, surface water and groundwater pollution, loss of agricultural land, displacement and resettlement of affected populations as well as the loss of cultural values.

Burkina Faso does not have a great experience in mining in general and in industrial mining in particular, the use of highly toxic chemicals such as mercury or cyanide for the extraction of gold can be a source of public health issues [16]. Particularly in the industrial mining sector, the question can be considered differently because the requirement in the application of the standards makes it possible to supervise the exploitation by allowing a significant taking into account of the environmental and health concerns. Thus, the risks of exposure to environmental toxins and the risk of work accidents are reduced compared to the artisanal mining sector. Nonetheless, the principles of precaution and prevention must prevail in the promotion and exploitation strategies of the mineral resources.

3.1 The impacts of mining in Burkina Faso

3.1.1 Impacts related to the mine installation: Prior to mining, a mining project first begins with

prospecting which includes surveys, field studies, test boring and other exploratory excavations. If exploration proves the existence of an important ore deposit with an interesting grade, then the phase of mine development takes place, which consists of building access roads, preparing and clear the site.

If many prospecting techniques, such as airborne geophysics, geological or geochemical surveys, light mining works, do not cause major damage, however, the opening of access routes, prospecting camps, mining works, proper exploration, drilling, trenches, mining works, treatment tests and geophysical work can affect the environment [17]. Thus, the installation of a mine, by the activities mentioned above, can affect classified forests, archaeological sites, can be a source of pollution through the production of waste and wastewater, and can weaken the soil and vegetation coverage [18].

3.1.2 Impacts related to the exploitation: As soon as the mine is installed, the extraction and concentration (or enrichment) of the metal from the ground can begin. Since metal ores are trapped under a layer of soil or ordinary rock, to allow access to the ore deposit, the layer of rock must be moved or excavated. There are several methods used to move or excavate the rock layer in order to reach the ore. In Burkina Faso, most of the current mining projects are surface operations.

The operation of a mine, whether industrial or artisanal, causes disturbances and imbalances that affect the air-water-soil ecosystem and the socio-cultural environment. Indeed, the opening of quarries and the use of heavy machinery unbalance the natural

environment, affect the local vegetation, the natural habitat and the entire biocenosis. Mining activities lead to deforestation, accelerate erosion, disrupt animal and plant biodiversity, and in some cases cause landslides or soil subsidence.

The excavation releases large amounts of waste rock or waste material which, when exposed to air and water, oxidizes in the presence of certain bacteria. The runoff water carries the oxidation products (sulfuric acid and sulphide metals formed), releasing them into the environment in the form of acidic drainage. These acidic waters carrying heavy metals are harmful to the health of humans and animals. Acidic effluents can also reach the groundwater table and thus lead to contamination of deep water.

In addition, the extraction and treatment of minerals regardless of the technique (cyanidation, flotation, leaching, amalgamation, etc.), whether in an artisanal or modern mine, release gaseous, liquid or toxic solid chemicals that will pollute air, water and soil. One of the most important environmental impacts in surface mines is the management of the sludge pond and chemicals [19].

3.1.3 Social impacts linked to the exploitation: The social impacts of large mining projects are controversial and complex. Mining production, as much as it can create wealth, can also cause enormous social disruption. While it is true that mining projects create jobs, build roads, schools and the implementation of well-developed CSR (social and environmental responsibilities) plans for the benefit of the populations, the fact remains that the advantages and the consequences can be unequally shared.

Indeed, the massive influx of people to mining sites can put pressure on land, water and other resources and thus lead to sanitation and waste disposal problems. The sudden increase in the population on the mostly artisanal sites, the promiscuity and inadequate basic social infrastructure in terms of health, safety and education are also leading to a rapid deterioration of morals on many sites. Thus prostitution, drug use, delinquency, swindling, child exploitation, criminality tend to develop there.

In addition, one can note the numerous fatal accidents on the operating sites. These accidents are more frequent in artisanal operations with a high human concentration or non-compliance with safety rules in the digging of wells and galleries, the anarchic accumulation of waste rock, leading to frequent deadly landslides. The risks of accidents are reinforced by certain beliefs or misconceptions which interpret these accidents as a price to pay to find the precious metal. To this must be added the rising cost of living in the mining areas. Traditional gold mining, instead of being a remunerative activity for the gold miner, appears, on the contrary, to be a factor in the pauperization of rural mining areas.

In addition, major mining projects lead to the displacement and resettlement of populations. The populations installed or who carry out an activity (agricultural or pastoral) on the site and its surroundings are forced to move and in the best case, resettled on other developed sites. These movements of populations cause a cultural uprooting and an upheaval of their habits and customs [20]. In this regard, the International Institute for Environment and Development (IIED) reports, “the displacement of

established communities is a major cause of resentment and conflict associated with major mining developments. Entire communities can be uprooted and forced to settle elsewhere, often in purpose-built settlements and not necessarily of their own choosing. In addition to losing their homes, communities can also lose their land and therefore their livelihoods. Community institutions and power relations can also be disrupted. (...) Forced resettlement can be particularly disastrous for Indigenous communities who have forged close cultural and spiritual ties with the lands of their ancestors and who may have difficulty surviving when these ties are severed [21].

3.1.4 Impacts related to the mine closure: Since mining sites generally constitute the main economic resource in the areas where they are located, to minimize the significant socio-economic repercussions linked to the closure, post-mine management must therefore be programmed, in close collaboration between the mining company, the populations concerned, the government and local authorities. Post-mine rehabilitation and management engage the social and societal responsibility of the extractive industries [22].

3.2 Main Sustainable Development Goals Applied by Most Mining Companies in Burkina Faso

3.2.1 Goal 1: No poverty

- Creation of local job
- Funding for community development
- Initiatives in microfinance, entrepreneurship for neighboring populations

3.2.2 Goal 2: Zero hunger

- Supports the development of food and training projects for better agricultural production
- Support and job creation in the fields of fish farming, animal husbandry, rice farming, soybean production
- Donation of food products, etc

3.2.3 Goal 3: Good health and well-being

- All mines have a target objective of zero workplace accidents
- Fight against malaria, STIs
- Construction of health centers for the benefit of the population in several municipalities
- Sports support

3.2.4 Goal 4: Quality education

- Construction of schools
- Training on management programs
- Granting of scholarships
- Recruitment of interns
- Support for training schools
- Distribution of school materials, etc

3.2.5 Goal 5: Gender equality

- Encouraging the promotion of equal opportunities and the implementation of actions to empower women through employment, mentoring, training programs, and income-generating activities
- At all levels of the mining operation, employees are of all gender even if the number of women varies between 8% and 18% depending on the strategic work positions

- Support provided to women's cooperatives whose activities generate income
- Implementation of an Anti-Harassment Policy

3.2.6 Goal 6: Clean water and sanitation

- Rehabilitation of wells and boreholes
- Provision of boreholes
- Consultation meeting with riparian communities for the collective and rational management of water resources
- Provision of latrines to local authorities

3.2.7 Goal 7: Affordable clean and energy

- The provision of solar kits to students in schools and training schools
- Device donation

3.2.8 Goal 8: Decent work and economic growth

Mining contributes to sustainable economic growth of local communities and host countries through jobs creation, support to national and local supply chains and income-generating projects, and payments to governments.

3.2.9 Goal 13: climate action

Managing energy consumption and greenhouse gas emissions is essential. However, the mining industries decide to meet their current energy needs while maximizing on energy efficiency, as well as use of developing clean and renewable resources wherever possible.

3.2.10 Goal 15: life on land

Mining industries monitor closely and try to improve performance in biodiversity, reforestation and mine site rehabilitation through diversified activities such as reforestation.

3.2.11 Goal 16: peace, justice and strong institutions

Mining industries are committed to promoting the emergence of peaceful and inclusive societies ensuring access for all to justice and the establishment of effective and accountable institutions. They report all payments to governments in a transparent manner by aligning with the Extractive Industries Transparency Initiative [23]. They recognize the duty to respect Human Rights and the Human Rights Policy and Procedure.

3.3 Weaknesses of mining industries in terms of sustainable development in Burkina Faso

According to the National Assembly [24], they are:

- the exclusive competence granted to the ministry in charge of mines for the management and issuance of authorizations and mining titles which do not take into account the existence of the populations and their concerns, the realities on the ground as well as the priorities of other actors
- the inadequacy of the texts governing artisanal gold mining activities
- the lack of a legal basis that allows the involvement of local authorities, regional authorities, and affected populations in the management of mining authorizations and titles

- failure to take into account customary authorities, cultural and religious values as well as intangible values
- the absence of a harmonized regulatory framework that allows the impacts of mining activity to be taken into account, in particular the relocation of populations, the proper management of the compensation received
- Lack of comprehensive and clear arrangements to manage post-mining and recolonization of abandoned land.

3.4 Shortcomings in mining limiting sustainable development

- Poor management of mine tailings
- Air, wind and noise pollutions
- Contamination of water and soil
- Acid mine drainage
- Overexploitation of female employees
- Lack of transparency in mine data
- Corruption
- Insecurity
- Failure to respect conventions such as corporate social responsibility
- Etc.

3.5 Case study of Essakane industrial mining company

- The Essakane mine is located in the northeastern part of Burkina Faso, in West Africa. It straddles the border between the provinces of Oudalan and Séno, in the Sahel region of Burkina Faso, and lies about 330 km northeast of the capital, Ouagadougou. It is located 42 km east of the nearest large

town and the provincial capital of Oudalan, Gorom-Gorom

- The Essakane deposit is located within an exploration permit covering 100.2 km² bordered by six exploration permits covering a total area of 1,266 km²
- IAMGOLD began managing the Essakane project after acquiring Orezone Resources in February 2009. Essakane went into commercial production in July 2010 [25]

3.6 Essakane Sustainable development policy

These fundamental principles are implemented through their commitment to [26]

- Establish lasting partnerships with the communities associated with operations based on human rights, respect for human dignity, as well as mutual trust in order to achieve common goals and shared commitment
- Incite and encourage all employees and contractors to show leadership and commitment to continuous improvement for the protection of the environment, pollution prevention, community development and economic performance
- Integrate risk management into all facets of business, including maintaining contingency plans to minimize or avoid the impact of unforeseen events
- Constantly improve the environmental performance to reduce the impact of disturbances, containments and spills.

- Create opportunities for communities to share the benefits arising from the activities by developing productive projects
- Integrate biodiversity conservation into all stages of IAMGOLD's activities and minimize impacts on biodiversity while ensuring the restoration of the functions of disturbed ecosystems
- Develop gradual rehabilitation strategies and closure plans with sufficient funding
- Implement good corporate governance, transparency and fairness practices and annually disclose the performance

3.7 Suggestions and recommendations for more sustainability of mining activities in Burkina Faso

- Encourage state services (customs, taxes, environment, mines, communities) to accentuate the control and monitoring missions of mining activity
- Create consultation frameworks specific to mining activities in the impacted municipalities where mining sites are located
- Integrate actions on health, education, the environment in all mining and CSR activities in order to minimize negative impacts on populations
- Accelerate the preparation of texts for the implementation of the local development fund within a reasonable time
- Allow direct payment of area taxes to local authorities and ensure their allocation to investment expenditure
- Create specific consultation frameworks with the populations of the affected municipalities

to deal with all issues related to mining activity

- Create a one-stop shop to facilitate administrative, fiscal and customs formalities for exporting gold and to buy back gold collected by private gold buying, selling and exporting counters in order to limit fraud gold
- Carry out a feasibility study for a national gold refinery
- Prepare an annual national report on fraud in the mining sector
- Suspend and open judicial and administrative information on counters not up to date with their tax obligations in Burkina Faso
- Standardize the number of authorized titles according to the regulations
- Reform the National Commission of Mines so that it is made up of personalities with professional experience and proven integrity
- Make compliance with local development plans compulsory in mine specifications with regard to CSR;
- Urgently apply the regulatory provisions and those of the environmental code prohibiting the use of chemicals in artisanal gold mining
- Provide better supervision and raise awareness of the artisanal miners

4. Conclusion

Mining production plays an important role in the socio-economic development of Burkina Faso. Whether artisanal or industrial, it helps boost economic growth, create wealth, jobs, etc. However, notwithstanding the advantages and the certain

economic stakes for the country, we should not lose sight of the constraints linked to the exploitation, the various environmental impacts and the risks of real imbalance of the ecosystem in the exploitation zones. Profitable mining production for the nation should primarily take into account the interests of the people and of the nation as a whole. Mining production should not constitute simple financial and economic speculations because the interest is also in the preservation of social, human and environmental interests, which must remain inalienable for sustainable development. This study provides information to consider for a potential sustainability in the mining sector in order to minimize the environmental, cultural, social risks that the activity may create.

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