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# **Production and merchandising of building raw materials in Cameroon: the case of Ebebda sand.**

*Producción y comercialización de materias primas para la construcción en Camerún: el caso de la arena Ebebda.*

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## **Abstract**

This paper reports on the study of building raw materials and their merchandising, precisely on the sand from Ebebda area (Lekie Division, Cameroon). During the work on the field, we have a production of approximately 1.000 tons (T) per day in raining season, 4,400 tons (T) per day in dry season. The sale of sand allows stakeholders to take care of their family. We evaluated the shortfall due to the proliferation of clandestine quarries in Ebebda. On a day basis, it is 1,050,000 FCFA in the raining season and 3,900,000 FCFA in the dry season. Thus, we suggest to the government in the short term, to create a mining brigade. This, for staff support and merchandising of sand extracted from the depths of the Sanaga River. At the local town hall, we suggest to use the tax collected from sand transporters to improve live condition of native.

**Key words:** Cameroon, Sand exploitation, Sand merchandising, clandestine quarry, mining brigade.

## **Resumen**

Este artículo presenta el estudio de materias primas para la construcción y su comercialización, precisamente la arena de Ebebda en el departamento de la Lekie, Camerún. En el trabajo en el campo, se estima una producción de aproximadamente 1.000 T por día en la temporada de lluvias, 4,400 T por día en la de sequía. Se evaluó el déficit debido a la proliferación de la clandestinidad en Ebebda por día, a 1,050,000 FCFA en la temporada de lluvias y 3,900,000 FCFA<sup>1</sup> en la de sequía sólo en unas veinte plantas en esa zona. Así, sugerimos al gobierno en el corto plazo la creación de una brigada minera para el apoyo del personal y la comercialización de arena extraída de las profundidades del río Sanaga. En el ayuntamiento local, sugerimos utilizar el impuesto recaudado de los transportadores de arena para el bien de la cantera y sus operadores.

**Palabras Clave:** Camerún, Explotación de Arena, Comercialización de Arena, Cantera Clandestina, Brigada Minera.

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## Introduction

In a country where the population is unceasingly increasing and where there is a higher need in housing; at the moment when Cameroon transforms itself into a vast building country; the problem of the availability of building raw material necessary for the house construction at a local level is raised. This raw material is used either for construction of housing for family's safety, or for structuring great scale project which can boost the country economy.

During 2011, the economic performances of Cameroon were "good" and its economic growth evaluated at "more than 4%" by the Strategic Document for Growth and Employment (DSCE<sup>2</sup>, for its acronym in French, 2009). The positive results of the Cameroonian economy are made possible due to the massive public investments, with the effective starting of the structuring great projects into the infrastructure and energy sector. Regarding the urban development, the question of housing, it arises with acuity that the problems of social housing remains as a priority and a great challenge for households, organizations and State.

Thus, in the same way, the problem arises to all those which undertake to build a house. To do this, it is necessary to be equipped with all necessary means: building raw materials and sand on the first place. After the air and water, sand is the most used resource in the world (Bernit, 1982). It represents an international turnover of USD 70 billion per year. Cameroon contribution is not insignificant, this because of the Ebebdia zone which is this study's subject. It is a zone of junction between the Sanaga River and the Mbam. It abounds remarkable sand deposits which supply to all Cameroonians needs, this with the sand coming from the other rivers (Mungo, Noun, Wouri...).

Thus, the purpose of this work is to index and analyze the operation of the various sand pits, by

analysing the importance of the economic exploitation of sand in Cameroon and Ebebdia in particular.

## Statement of the problem

To become an emergent country by 2035, Cameroon must carry its annual economic growth rate to approximately 5.5% on average during the period 2010 to 2020. It also need to reach an investment rate of 25 % per year (by 2,020) during 25 years (Cameroon's vision for 2,035).

However, since 2001, investment rate is approximately 18% including 2% for the public sector. This is a valid reason for increase the public and private investments substantially, leading to set up a growth strategy, considering the infrastructures development. According to the DSCE, the infrastructures provide the essential foundation where the development and the competitiveness of the economy are built. They reduce the production and transaction costs, simplify activities, increase the level of production and then induce social progress. Among all these project in Cameroon, we can quote these:

Hydroelectric project of Lom Pangar, Memve' Ele, Kribi Port Authority, Yaoundé-Douala highway construction project, 2nd Bridge on Wouri in Douala, and so others.

The housing sector is in shortage. It is estimate that more than 500,000 habitations are necessary to reabsorb the most urgent needs of the populations, in particular in the urban periphery (DSCE, 2009). The demand increases by 10% per year.

The realization of all these great infrastructures projects and habitations require as all building work, an important quantity of building raw materials: cement, gravel, laterite and sand. However, their exploitations remain complex because of the difficulties in accessing to the careers. It is also related to the costs of the equipment and

especially to the disorder which reigns in this sector due to an absence of a legal control. Thus the need appears for directing our research in this field, in order to firstly raise the importance of sand and in a second time, highlight its importance in the economic development of Cameroon.

## Research objectives

The main objective is to index and analyse the processing of the various sand quarries of Ebebda area. It will thus be a matter of evaluating the importance or the size of sand exploitation in Cameroun: Ebebda in particular and its economic aspect.

Specifically, is about to:

Build a cartography of the zone of study quarries ; Quantify levels of produced sand; Evaluate in terms of incomes the proportion of each participant working in the sector; Analyse the impact of the abuses (related to special charges) during the distribution of sand on its final price; Evaluate the State loss due to the proliferation of clandestine careers; Examine the possibility of a mining craftsmen control and the insertion of this activity in the formal economic circuits; Record the constraints met in this activity; Analyse the various impacts of such an exploitation on the environment.

## Background of the study

### About Sand.

Ntep *et al.* (2001) defines (according to granular materials' in geology) sand as a granular material made up of small particles coming from the disintegration of other rocks whose dimension are between 0,063 (silt) and 2 mm. An individual particle is called sand grain. Sands are identified on their "granulometry" (size of the grains). According to the system of classification used, the particle size can also lie between 4,75 mm and 5mm. Here it's used the unified classification system of grounds (A.S.T.M: American Society and

Testing Materials) as it's used in the field of geotechnics and the civil engineering in North America. It shows the higher limits and diameter of the grains and the numbers of corresponding layers A.S.T.M, this for three range of size of grain sand: coarse sand, average sand and fine sand such sands are found in Cameroonian queries.

### Mineralogical composition of sand.

The abundant minerals in the sands are already abundant minerals in the rocks (as well as less abundant), they are very resistant during transportation. Inside continents, quartz is generally the first mineral in abundance in sands. The composition of sand can reveal to 180 different minerals (quartz, micas, and feldspars) as well as remains limestones from shellfish and coral (Ntep *et al.*, 2011). We can also quote Amphiboles, Biotite, Pyroxene, Olivine, Hematite, Rutile, Apatite, Chlorite, Epidote, Tourmaline, Pyrite and "Andalousite".

### Types of sand.

There are three types of sand according to the popular terminology in Cameroon: known as "fin": it is the fine sand which comes from the depths of the marshes; another known as "Sanaga": it is the stream sand resulting from the erosion of the alluvia; and the last called "carrière": it is coarse sand resulting from crushing of basalts, granites and other blocks rock.

Notwithstanding this popular or vulgar point of view, let us note that there are three types of sand, Natural sand: It is directly extracted from the pits and is composed of silica, clay in higher proportion and dust. It is the natural version of silico-argillaceous sand. We can also mention silico-argillaceous and chemical sand.

## Merchandising of mineral substances

Mineral raw materials are very unequally distributed in the world (Bernit, 1982). Those which have a high monetary value are subjected to a very active international trade. By order of importance, energetic mineral substances (oil, coal,

uranium, natural gas...), invaluable and semi invaluable substances, metals and industrial minerals. Let us note that the ornamentation and building materials such as stone, clay, marble, limestone, pozzolana, sand and river gravel are also significant.

Trade of these substances is carried out in one, or in all the following systems: Authoritative fixing of the price by a group of producer which grant a monopoly. Concretely, in this case the group of plungers and the retailers have this authority to fix prices; Barter deal, such as equipment for raw materials; Private treaty price fixing between purchaser and salesman for nonstandard products or in a very competing market (the sand market in Cameroon).

Whatever the system, the mining characteristics are not the same because of their geographical situation and the layer conditions. This give great profits to most-favoured exploitations.

### **Presentation of hosting firm**

Cameroon has a long history in mining craft industry, since 1907 with German colonization. We can note the following cases: the artisanal exploitation of Gold since 1933; the tin exploitation in the small mine within 1934 - 1968; Rutile exploited between 1935 and 1955. Until 2003, the mining activity was reduced in the hydrocarbons and invaluable substances exploitation in clandestine circuits. In 2001, a new gravitational and competitive mining code materializes the will of the government to develop its mining potential.

By Noo64 decree of July 25,2003 the Prime Minister, head of the government creates near the minister of mines the CAPAM (Cadre d'Appui et de Promotion de l'Artisanat Minier), it is located in Yaoundé-Cameroon. Its objective is to install a framing mechanism which transforms local populations into contractor-producers and not into employee-consumers, this through the mineral resources valorisation.

### **Presentation of the studying zone**

The Lekie division is located at Cameroon in the Centre region, it is named according to LEKIE River. It covers a surface of 354,864 ha, has as a chief town Monatele and have 9 districts (Batchenga, Ebebda, Elig-Mfomo, Evodoula, Lobo, Monatéle, Obala, Okola, Sa'a). The present study is related to Ebebda district, created by order in Council N92/187 of September 1,1992. Located at approximately 87 km of Yaoundé on the N4 main road and 45 km from Obala, it is extended on a surface of 300 km<sup>2</sup> for a population of 24,543 inhabitants (program ADAM/CAPAM<sup>3</sup> for its acronym in French). It is located between 4 20' 0" and 4 30' 0" of Northern latitude, 11 10' 0" and 11 20' 0" of longitude. It's at 487 m of altitude. It is limited to North by river Sanaga, the South by the district of Monatele, to the West by the junction between river MBAM and Sanaga and to East by the district of SA'A.

The basin of Sanaga is almost occupied entirely by the Precambrian base covered by "formations de couverture" which have a poor extension. The great structural morphological units as well as the limits of the various petrographic formations were pointed out by Owona (1998) in the South of Yaoundé. A polyphase evolution of the facies metamorphism of granulite to the metamorphism of the green schist's facies is noted by Mvondo (2000). We find on both side the formation of volcanic basin of Sanaga. They are concentrated much in the area of the West crossed by Noun which is thrown in Mbam. From the petrographic point of view, we meet the gneissic series of Bafia in North with an amphibolite interstratification; with the Sa'a series, where the gneissic photoliths para-derivatives and ortho-derivatives are highlighted.

The temperatures of the area of Ebebda are rather high all along the year; they vary between 23 °C and 26 °C with the maximum ones in March - April (31.1 °C) and minima in August (19.1 °C).

Relative humidity lies between 71.4 and 82 % (Eyengue, 2012). Average pluviometry varies between 1,400 and 1,500 mm of water. Precipitations are higher in October, about 317 mm and less low in December, about 4 mm. In our zone of study, we can distinguish four great periods: two wet periods, one dry period and a period of sub-drought.

These physical conditions can explain the production and the accumulation of sand on the Sanaga River. It is more precisely of physical deterioration, and chemical weathering which release from many crystals like quartz. These crystals are then moved by the water and wind. They are deposited in troughs of low pressure (valleys and rivers) where they are accumulated to form great extents of silt, sometimes covered with a thick soil also covered by the vegetation.

The quality of the habitat is one of the key indicators of the economic health for a country. The urban centres in particular, constitute a perfect illustration of this assertion. Indeed, the aptitude which is to provide to the populations the adequate living conditions oblige a city to offer the necessary means in order to satisfy household needs. The cities of the developing countries do not escape to this rule. The bad living conditions of the populations correctly show the weakness of their productivity system, this is worsened by the fast demographic growth, the not controlled urbanization and the economic situation. With an urbanization rate of 52%, Cameroon takes into account today 312 towns (results from the 3rd RGPH <sup>4</sup> for its acronym in French, 2005). And when it is known that the Cameroon strategic development document for 2035 focuses on the urban sector as the economic growth's engine, this give a great challenge to the MINDUH <sup>5</sup> to equip these towns with infrastructures to enable them to play efficiently their role.

The main problems encountered in the field of building raw materials come from the production, the distribution and the standardization. This contributes to make the landscape architect-

ture of our towns monotonous. These constraints are related to the weakness of industrial fabric in certain products in Cameroon and to the availability on the market of sand, gravel, cement, concrete-reinforcing steels, sheets and wood.

## Materials and methods

### *Materials used.*

The choice of these sites and the work carried out on the ground required suitable materials: A GPS receiver to note the geographical coordinates of the area and various quarries; A topographic map: BAFIA 1D to 1/200,000, projection WSG84 was used for the orientation; A camera for the photos; Investigations questionnaires for the collection of information was used; A microphone-receiver for the interviews; A report card and a pen.

### *Sampling.*

The population targeted is divided into three categories (from 19 to 55 years old): owners, conveyors and workmen. Owners: we sought to know the methods of acquisition of the careers, their operations and the role which these owners and the other members of the team play; Conveyors: we sought to know the conditions under which sand is conveyed: the state of the vehicles and the roads; Workmen: (the plungers, the workers which charges the trucks), we sought to apprehend the various social inequalities generated by this activity. Because of our limited financial means, the choice of surveyed was done randomly and we set a rate of 15 % which is applied to various manpower of each quarries. The sample is composed of 63 individuals on the whole.

### *Quarries description.*

SOCAM/Balamba: It is located at approximately 3km from Sanaga Bridge on the side of the Department of the Mbam and Inoubou. Its geographical coordinates are as follows: 11013' 19 " of longitude and 4025' 22 " of Northern latitude. It is the stream sand which is extracted in this quarry and the activity is more significant compared to

other quarries. The activity proceeds on a surface of approximately 2 Hectares; Marabot/Nlongzok: it is located at approximately 2 kilometers of the town centre of EBEBDA. Its geographical coordinates are as follows: 11019' 00 " of longitude and 4022' 10 " of Northern latitude. It is the fine sand which is extracted in this quarry, it extends from a surface from approximately 3 Hectares; Bridge Assi: it is located right under the bridge at less than one kilometre of the downtown area of Ebebeda. Its geographical coordinates are as follows: 11016' 20 " of longitude and 4021' 00 " of Northern latitude. It is the stream sand which is extracted in this quarry. Its surface is approximately one Hectare. Let us note that apart from these quarries, there are more others whose activity is clandestine because the owners do not have an exploitation permit.

### **Variables.**

#### *Independent variables.*

The age will enable us to determine the age which is most interested in this activity; The village, the origin will help to determine the ethnos group which is devoted more to this activity and to appreciate the migratory phenomenon towards the Lekie; The sex will help us to have an idea on the allocation of the functions in the careers; The matrimonial situation will be used to evaluate the incidence of the marital status on the trade; Nationality will help to determine the number of workers from abroad.

#### *Dependent variables.*

The educational level will enable us to evaluate the education level of workers in the sector, to determine their aptitude to include/understand the phenomena and to accept the innovations for the environmental protection for example; The income and the number of people will help to determine the socio-economic impact and to include/understand the passion working on this activity; The working conditions will help to better appreciate Malayan social population; The

estate of the network road, it will help to justify the difficulties of conveying sand.

### **Data and Survey processing.**

In spite of the multitude of the sand pits which exist in Cameroon, this informal sector remains unknown. Up to now no socio-economic study, nor systematic research on sand as building material or sand for glassmaking was never undertaken. This handicap does not enable us to find existing data. Thus, the data used in this study were collected with a series of questionnaires proposed to quarries owners, conveyors and workmen. Three types of questionnaires were elaborate according to the population targeted.

In order to achieve our goals, we carried out an investigation. The above quarry was furrowed with the assistance of a "bike driver" which is at the same time a worker in one of the quarries. During this phase, the questionnaire was managed and the work consisted in having the interviews and deferring a brief reply. For work credibility reasons, three days spaced each by one week were selected for our investigations. Thus the investigation proceeded with SOCAM/Balamba quarry on august 12, 2014; with Bridge Assi quarry one week after i.e. august 19, 2014 and finally with Marabot/Nlongzok quarry on august 26,2014. This stage was preceded by a period of pre-investigation carried out one day during July 2014. It consisted in locating the various quarries and makings contact with the various owners, the mines regulator agents. It also enabled us to suit the questionnaire to the field realities. The tabulation of results was manual and also computerized, this enabled us to have the statistics and the frequency switchboards with a good precision level. The software used for this purpose is Excel (from Microsoft Office package) for the diagrams and Word for the key-boarding and the word processing.

The difficulties encountered were enormous. One of them is to have the exact information on

**Table 1. Summary of manpower surveyed of the sample; source. mestrales, entre el SBC vigente y la propuesta de reforma.**

<i>Quarries</i>	<i>Owners</i>	<i>Drivers</i>	<i>Workmen</i>	<i>Total</i>
<i>SOCAM/BALAMBA</i>	3	10	17	30
<i>ASSI Bridge</i>	2	3	10	15
<i>MARABOT/NLONGZOK</i>	1	1	3	5
<i>Total</i>	6	14	30	50

Source: Own elaboration

the assets of the sector. Because it is an informal sector, the statistics were not available nowhere. It was necessary to refer to the found estimative data owners and other groups met on the place. Indeed, we was confronted to a great hostility coming from some workmen and these zone drivers. It was thus necessary to use tact and patience in order to untie tongs. Considering Because of this hostility, the size of the target population subjected to the questionnaires and that gave answers is 50 individuals out of 63 given a percentage of 79.36%.

## Sand Exploitation method and materials

The exploitation of sand in Ebedda like everywhere in Cameroon remains artisanal up to now, with more than 85% (Ntep *et al.*, 2011). The growing rate of unemployment is one of the multiplicity of the sand pits causes. West region from Mifi, Mbam to Noun, Littoral region with the Wouri River and Mungo, East region with Sangha and Sanaga in the Centre region, shown how intense the sand exploitation activity is in Cameroon.

In the majority of artisanal quarries of stream sand in Cameroon, the mining method is the same. In Sanaga quarries, the exploitation remains very difficult and dangerous. Indeed, the plungers as they are called enter the river using their dugout. They immobilize it at more than 500 meters of the bank using a long stake. After this, with a bucket, they plunge in the river water to more than ten meters sometimes to draw sand to the surface: this is the artisanal dredging

(figure 1). During the intense rain season, it often happens that the waves carry away certain plungers. In the fine sand pits, the exploitation is less dangerous because it occurs in the forests. The workmen proceed initially by grubbing and cutting of the large trees, then they excavate the grounds to a depth varying between 1m50cm and 2m. Only on this moment, the extraction of sand can start. These quarries have the same configuration which is that of an open-cast mine in which the activities (Figure 1) proceed.

**Figure 1. Exploitation of fine sand in Ebedda.**



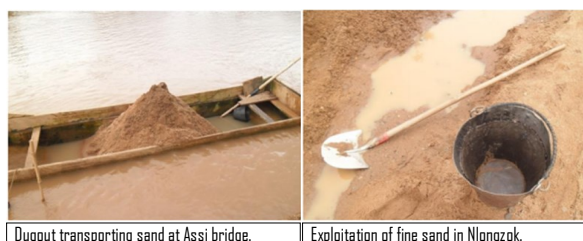
A plunger arising from water at BALAMBA

Exploitation of fine sand in Nlongzok.

Source: Own elaboration

The material usually used in the stream sand quarries of Ebedda is made up with: Dugouts: they transport the sand from the river towards the littoral; Shovels: they are used to discharge the dugouts and to charge the trucks; and some rehabilitated and perforated buckets: these are the buckets which are dropped in the Sanaga

**Figure 2. Exploitation Sand Material in Ebedda**



Dugout transporting sand at Assi bridge.

Exploitation of fine sand in Nlongzok.

Source: Own elaboration



**Table 2. Summary of filing prices and incomes of workmen according to the seasons (case of the stream sand).**

Number of filled trucks	Dry season			Rainy season		
	Per day	Per week	Per month	Per day	Per week	Per month
	20	120	600	10	60	240
Filing price (Fcfa)	500			500		
Income per worker (Fcfa <sup>a</sup> )	Per day	Per week	Per month	Per day	Per week	Per month
	10,000	60,000	300,000	5,000	30,000	120,000

Source: Own elaboration

<sup>a</sup>1 EURO = 655.957 FCFA, dec. 2014.

depths, to draw sand. They use their rehabilitated side with a steel plate.

The holes on the bucket allow to easily flow the water mixed with sand during the extraction (Figure 2). Let us note that the quarry owner is the only owner of the whole material. In the fine sand pits, material is consisted of machetes, slicers, pickaxes and shovels.

Sand Truck filling in the pits: working days and prices.

At Ebebda quarries or in other ones in the Lekie, the prices are the same and they include the shares of workmen. These prices are made according to the cubage (or volume) of the truck. Find more details in the above table.

No contract binds the workmen to the conveyors. The payment is immediate and by cash; the workmen negotiate their bonus from day to day according to whether the demand is pressing or not and if the weather is nice or not.

## Results and discussion

The work carried out on the ground is followed by analysis, leading to results consigned in this chapter. These results are related to the population of the sands sector, the merchandising of

sand and its socio-economic and environmental impacts.

### Active workers in Ebebda sand sector.

The studied population has a Cameroonian predominance. Over the 50 of interrogated people, 20 % are Malian or from Chad. These expatriates play the role of plunger in the stream sand quarries (SOCAM/Balamba and Assi Bridge). Young people are numerous than adults. Thus the person whose age is between 19 and 28 years old represent 55 % of the studied population, those from 29 to 45 years old represent 30 % and those 46 years old and more represent 15 %. The minimal age is 19 opposed to 55 years old for the maximum one; the average age is 35 years old.

Etons (44%) and Manguissas (45%) are the dominate tribes in the sector, Toupouris of North region and the others compose the rest. The domination of the sector by Etons and Manguissas is explained by the fact it is their home region. Toupouris have an intense implication in the sand pits of the Lekie.

The study also revealed that over the 50 inquired person, men proportion in the activity is 100%. The presence of the women in these careers is only for commercial purposes.

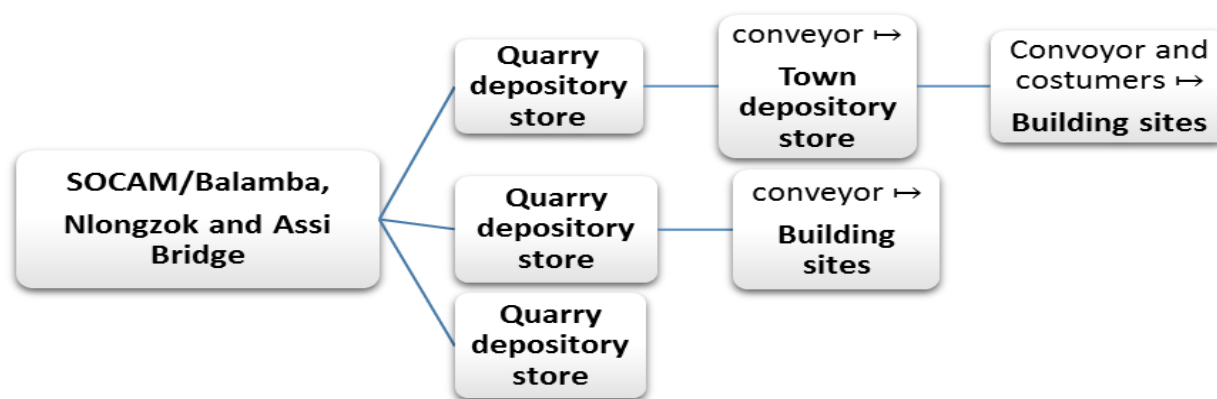
Dissimilar to the situations in the other artisanal mines, where the education level of the workmen is lower or equal to the CEP (Certificat d'Etudes Primaires), the sand pits of Lekie (Ebebda) abound more Cameroonians with an acceptable educational level. WeTThis study finds that 25% of the population have an educational level lower than CEP, 30% of workmen have CEP, 20% of them have BEPC (Brevet d'Etudes du Premier Cycle) or the CAP (Certificat d' Aptitude Professionnelle), 15% hold of "Probatoire", and the rest contain those with a "Baccalaureat" and those which made at least two academic years in a university.

Concerning the matrimonial situation, the married people dominate with 50%, then come the single with 20%, those engaged with 15%, the widowers and divorced with 15%.

**Trading of Ebebda sand.**

The sand trading is primarily ensured by the conveyors. They are then the strong link of the chain. So sand undergoes two types of commercial transaction in the Ebebda's quarries before reaching final consumers. Indeed, in these pits, sand is sold to conveyors whose (most of them) work for private individual in town. The price is a function of the cubage. This sand after been purchased in quarries is sold to customers in the various town store depository in Yaoundé. The price of this final delivery is fixed by the conveyors and consist of the tipper filling price, the distance, the special levies and the accessibility of building sites. Let's noted that the trade is directly done between the customers and the conveyors or the store depository's owners. It can sometimes happen that customer contacts a quarry owner, them

Figure 3. Trade-circuit of sand activity.



Source: Own elaboration

Table 3. Sand prices.

<i>Sand type</i>	<i>Quarry sand prices (FCFA)</i>		<i>Retailer sand prices (FCFA)</i>	
	20 tons	25 tons	20 tons	25 tons
<i>Stream sand</i>	80,000	95,000	185,000	200,000
<i>Fine sand</i>	25,000	30,000	130,000	140,000

Source: Own elaboration  
 \* 1 EUR = 655.957 FCFA

the former will find a conveyor by himself. It can be represented in the bellow figure 3.

#### **Prices and various factors influencing them.**

The delivery sand prices are fixed by the trade union of the conveyors. These tariffs consist of several factors: the building sites accessibility, the distance, special levies, town hall taxes and cubage of the vehicle. Over these factors, distance is the most significant. It determines dearness or not of sand. The longer it is, the higher the price is. It's important to note that tariffs are higher for the stream sand, especially when it is a matter of delivering it far from the centre region. New tariffs are influenced by the rise in the fuel prices and the Sanaga River high tide.

To transport these quantities to Yaoundé, it is necessary to spend on average 60,000 to 70,000 FCFA for the fuel purchasing, approximately 20 000 FCFA for controls, 3,000 FCFA for the city hall and 45,000 to 50,000 FCFA for the owner receipt and the "pont bascule" penalty (100,000 FCFA per extra ton during weighing).

According to the sand conveyors met on the spot, the principal purchasers are individuals, private or public companies. Most of them are retailers in Yaoundé depository stores. It is from these store depositories that the whole Cameroon sand market is supplied.

#### **Socio-Economic impacts of sand activity.**

The daily incomes of Sanaga and fine sand quarries owners are from 60,000 FCFA and 300,000 FCFA to 30,000 FCFA and 60,000 FCFA according to the seasons. These incomes are used in the major part to provide household fundamental needs, in particular feeding and accommodation. They are also used to pay the school fees of children and to a certain extent, to constitute saving in order to invest in purchasing production material for the quarry. The quarries workmen incomes (plungers and porters) hide enormous injustices. The reasons of this situation must be sought in the organization of the various groups operating in each quarry.

These workmen affirm that in spite of these modest wages they manage to suitably take care of their children and their wife.

**Table 4: Daily workmen income according to seasons.**

	Rainy season		Dry season	
	Sanaga sand	Fine sand	Sanaga sand	Fine sand
<b>Truck fillers; Porters Income per quarry (FCFA)</b>				
<b>Average Truck filled per day</b>	10	5	20	10
<b>Income received per</b>	500			
<b>Daily income</b>	5,000	2,500	10,000	5,000
<b>Plungers Income per quarry (FCFA)</b>				
<b>Number of Dugout filled per day</b>	2		4	
<b>Income per dugout</b>	4,000			
<b>Daily income</b>	8,000		16,000	

Source: Own elaboration

Note: Plungers only work in stream sand quarries (Sanaga quarries).

Most of conveyors work for individuals whose pay to them a remuneration at the end of each month. Some rent trucks at flexible prices, between 45,000 FCFA and 50,000 FCFA per day. They can make a maximum of 3 laps per day. They can then gain an amount of approximately 5,000 FCFA per day, and consequently 150,000 FCFA per month. From the social point of view, these incomes are used to provide for the requirements in drivers' food and their families need. They are also used to pay accommodation and the schooling fees of their children or other members of the family (brothers, sisters).

The town hall levies a sum of 3,000 FCFA<sup>6</sup> on the sand conveyors, those in their turn charge the expenses to the consumers. This money perceived by the town hall must be used to improve the living conditions of the bordering populations such as the rehabilitation of quarry roads, drinkable water points in the village, hangars construction for shelter, toilets in the quarries, equipment for quarries work like seals, the shovels, the life jackets, the gloves, the boots and many other. Unfortunately, nothing of all this is done up to now by the town hall, but it continues to levy its tax.

The quarries site also generated other commercial activities around it: women come to sell food to the workmen. Drink sale points do not miss there.

#### Evaluation of the State opportunity loss.

The proliferation of clandestine sand pits in Ebebdá constitutes an opportunity loss for the State. This loss is evaluated according to the extraction tax on the quarry production (sand, pozzolanas, clay, laterites...) with an amount of 150 FCFA/m<sup>3</sup>. Let us note that we counted more than about twenty of clandestine quarries in the studied zone, including 15 of fine sand and 10 of stream sand.

Thus, State loses in dry season an amount of **93,600,000** FCFA per month and **25,200,000** FCFA in rainy season, rising an annual total opportunity loss of **712,800,000** FCFA only in about twenty clandestine quarries of Ebebdá zone.

#### Environmental impacts of the quarries exploitation.

According to law N° 001 of April 16,2001 bearing mining code modified and supplemented by law N° 2010/011 of July 29,2010 in its Article 118, Any activity of mining and quarry must conform

**Table 5. State daily opportunity loss.**

	Rainy season		Dry season	
	Sanaga sand	Fine sand	Sanaga sand	Fine sand
<b>Average number of truck extracted per day (20 m<sup>3</sup>)</b>	200	150	1,000	300
<b>Quantity (m<sup>3</sup>)</b>	4,000	3,000	20,000	6,000
<b>Extraction tax (FCFA/m<sup>3</sup>)</b>	150			
<b>Opportunity loss by State</b>	600,000	450,000	3,000,000	900,000
<b>Total loss (FCFA)</b>	<b>1,050,000</b>		<b>3,900,000</b>	

Source: Own elaboration

to the regulation in force relating to protection and management of the environment.

But contrary to laws and decrees, the exploitation of Ebebda sand leaves many marks in the landscape. It leaves a chaotic landscape with insulated hillocks. The vegetation is sometime completely destroyed. The ground becomes more vulnerable to the phenomenon of streaming; coming from the coming destruction of layers. These quarries, in the majority are clandestine, they remain clandestine after their exhaustion. No process of filling after exploitation.

It results from it, great extents which are used as streaming ponding point. They constitute then in rain season places for incubation of larvae and mosquitos, constituting a threat for the native residents. Seen how desolating the place is, it is important to check if when granting authorization document to those whose have some, the proper authority poses the condition or the clause to respect condition of the environmental protection. However, we note that this condition is not especially observed, that of the fill after exploitation is allocated normally to the quarry owners. It is thus a weakness of the MINMIDT (Ministère des Mines, de l'Industrie et du Développement Technologique) and by rebound that of its decentralized authorities which do not manage to index all the operational quarries and consequently do not completely have the hand put on the exploitation in this studied zone. The main consequence is that no proceedings for infringement of environment is carried out against these quarries owners. The fill task returns in an indirect way (in long run) to the State (ministry for the mines).

## Conclusion and recommendations

The activity of sand exploitation nowadays represents a significant sector for the Cameroonian economy. This study produces a document which describes and analyses the production and commercialisation process in the Ebebda main quarries. This study found that the sand trade is mostly influenced by

factors like: distance, accessibility of the building sites and special levies which effect the selling price fixing. The defective condition of the road network (especially in the fine sand pits) constitutes an obstacle for this activity. Controlling Regulating the exploitation, the MINMIDT with its decentralized services and the town hall have the authority on all the quarries. However, the organization of activities and their operation depend on the quarries and store depository owners.

We noted that, because of the proliferation of clandestine quarries (approximately more than twenty in the Lekie place) the State can have an opportunity loss which is not to be neglected. The exploitation of fine sand is however not free of consequences on the environment. Many marks of after exploitation carelessness in Nlongzok place pose enormous concern to the native.

To mitigate these problems, the solution lies in a political good-will, to implement suitable and specific policies. Thus, we recommend:

- At the State level, to urgently create a true mining brigade in Ebebda for the control and the commercialisation of the sand extracted in the depths from Sanaga River; We also propose to them to promote the use of modern mining instruments such as mechanical dredgers, mechanical shovels...;
- Concerning the environment protection, MINEPDED (Ministère de l'Environnement, de la Protection de la Nature et du Développement Durable) and MINMIDT (Ministère des Mines, de l'Industrie et du Développement Technologique) must carry out jointly operations in order to track illegal quarry owners;
- The town hall through the tax levied on sand conveyors, must install appropriate structure such as: bituminized road in the Ebebda quarries zone, construct hangars for shelter and toilets in these quarries, drinking water fountain... etc.

## Notas

<sup>1</sup>FCFA : Franc de la Communauté Française d'Afrique ; Money used in Cameroon, EURO=655,957FCFA

<sup>2</sup>Document Stratégique pour la Croissance et l'Emploi

<sup>3</sup>Appui au Développement des Activités Minières/ Cadre d'Appui et de Promotion de l'Artisanat Minier

<sup>4</sup>Recensement Général de la Population et de l'Habitat;

<sup>5</sup>Ministère des Mines, de l'Industrie et du Développement Technologique.

<sup>6</sup>Approximately 150,000 FCFA (during rainy season) and 660,000 FCFA (during dry season) of tax are collected per day on the 3 quarries by the town all. 1 EURO= 655.957 FCFA.

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