The socio-economy of artisanal mining in Territoire de Kamonia, Democratic Republic of Congo (DRC)

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CONTENTS

SUMMARY
Social and economic conditions, artisanal mining and the environmental consequences of land uses in part of the Territoire de Kamonia are described. The study area encompasses much of the drainage of the Longatshimo, Tshiumbu and Lubembe rivers, and extends from the Angola border to the Kasai River. Many of Gem Diamond's concessions are within this area, which covers about 3,600 square kilometres.

It is estimated that approximately 306,000 people live in some 34,000 households in 184 settlements in the Kamonia study area. The majority (80-90%) of residents are immigrants or their offspring, these being people attracted by mining over the past 30 years. The remaining residents belong largely to the Tchokwe and Bakwafwiya tribes, which are the traditional occupants of this area of the DRC.

All traditional chiefs are men of these tribes. The chiefs mainly settle disputes, allocate land and maintain authority to assure them and their families with incomes in the form of tributes from village residents. Each village is headed by a *chef de village*, who also takes a substantial proportion of profits (as a percentage of gravel) from mine areas (*chantiers)* that are not held by concessionaires.

There are six major commercial centres in the area, each of which consists of more than one thousand households. Economic activity in two of the centres (Kamako and Kabungu) is greatly boosted by diamond trade with Angola. Most other towns or villages settlements are characterized by a greater or lesser mix of mining, trade and farming economic activity. An estimated 80% of people depend on incomes from mining, 15% on farming and 5% on trade.

Most farm production is for domestic, subsistence use and is very largely the responsibility of women. Major crops are manioc and a variety of vegetables. There is very little livestock in the area. Most soils are nutrient-poor with the result that new fields are cleared frequently.

The substantial cash incomes from diamonds support a large trade sector, consisting mainly of imported goods and some locally grown food. Most imports are transported by bicycles pushed over hundreds of kilometres. Each major commercial centre has several hundred enterprises consisting of market stalls, retail shops, diamond buyers and providers of telephone and money transfer services.

Mining is concentrated on river deposits or on old alluvial terraces. Beyond differences between rivers and terraces, methods of mining depend largely on the ease of reaching diamond-bearing gravels and the kind of equipment available for mining. Gravel is divided in a variety of share-holdings between miners, their sponsors, concessionaires, local chiefs and some civil servants.

The mining and trade of artisanal diamonds perhaps earns between $100-150 million for the Kamonia area. However, residents would be wealthier if leakages through payments for imported goods and as remittances to family members elsewhere in the DRC were lower. Considerable profits are also earned by traders once the diamonds leave the mining area. Conditions would also be improved if public funds from taxes on diamonds sales returned as government services or infrastructure. While some civil servants are present, there is essentially no public service or state infrastructure in the area.

There has been substantial environmental degradation in the area, largely as vegetation loss by clearing for agriculture, firewood harvesting, charcoal production, bush fires, diamond mining and the expansion of villages. The extent of these impacts has been accelerated by population growth due to immigrants attracted by artisanal diamonds.

Although artisanal mining has a poor reputation, it has improved the livelihoods of a great number of people. There are several ways in which Gem Diamond could further enhance these livelihoods. A more objective perspective on artisanal mining would also be in their interest, and perhaps that of the diamond industry as a whole.

1. INTRODUCTION

This report provides a summary of social and economic conditions associated with artisanal diamond mining in part of the Territoire de Kamonia. It was commissioned by Gem Diamond Mining Company of Africa RDC sprl (Gem) for four immediate purposes:

1. To describe the local, indigenous social and economic environment in which Gem is basing its operations.
2. To document artisanal mining in the area.
3. To assess the value of informal mining to local people.
4. To comment on the environmental consequences of existing land uses.

The need for such a study arises because large numbers of people live and mine diamonds within concessions allocated to Gem Diamond, and this artisanal mining is potentially competitive or complicating to the company's operations. Understanding as much as possible of this local environment therefore has considerable potential value in enabling better management decisions to be made. For example, practices that minimize potential conflict may be adopted and these should improve the productivity of Gem Diamond. Likewise, more effective ways of enhancing local livelihoods and public services may be found.

Several other indirect benefits should emerge from this work. Firstly, the research should provide a wider understanding of how rural economies function, both in the DRC and elsewhere in Africa. This is because the diamond-based economy of rural people is extremely unusual compared to the much more widespread rural economies that rely on food production and remittances. Perhaps the most unusual feature of artisanal diamond mining is that it provides miners and their families with cash incomes. Moreover, these incomes are obtained almost immediately the diamonds are found, indeed often on the same day. By contrast, cash incomes derived from marketable agricultural produce and remittances only become available after long and often variable periods.

Secondly, by focusing on resources that have immediate cash value the study helps question the common prejudicial view that rural Africans are beholden to farming and simple food self-sufficiency. It is obvious that anyone hoping to lead a normal, even barely decent life in the 21st century needs ready access to cash, even in a remote area of the DRC. Artisanal diamond mining may provide lessons on how this is achieved, and how rural people progress from food self-sufficiency to food and cash security. Notably, mining communities in the DRC have achieved these conditions entirely on their own, and thus without interventions from development policies or programmes led by government and international development agencies.

Thirdly, artisanal mining is often portrayed in a negative light, commentators frequently describing the industry as illegal, exploitative, and corrupt or criminal; conflict or blood diamonds are terms used abundantly.[1] However, there are also many positive aspects to the industry which need to be documented and brought to light. Some of these benefits emerge from this study, not least in showing how artisanal diamonds help improve their standards of living of large numbers of people in the DRC.

2. METHODS

Much of the material presented here was collected during two field trips to the DRC. The first, over 10 days in June 2007, was largely an appraisal to gain an overview of conditions and challenges in and around Gem's concession areas. This was followed by three weeks of field work in February and March 2008, which were more directed at compiling information on social and economic conditions.

Interviews and discussions were held with a wide variety of people: diamond diggers (*creusers*) and divers (*plungers*), farmers, market traders, importers of goods, diamond traders (*négociants* and

[1] See for example Dietrich, C. 2002. *Hard currency: the criminalized diamond economy of the Democratic Republic of Congo and its neighbours*. Occasional paper no. 4. Partnership Africa Canada.

trafiquers in *comptoirs*), employees of Gem Diamond, health service providers, money transfer owners and traditional chiefs (*chefs de villages*). Several reports on artisanal and diamond mining were also consulted.

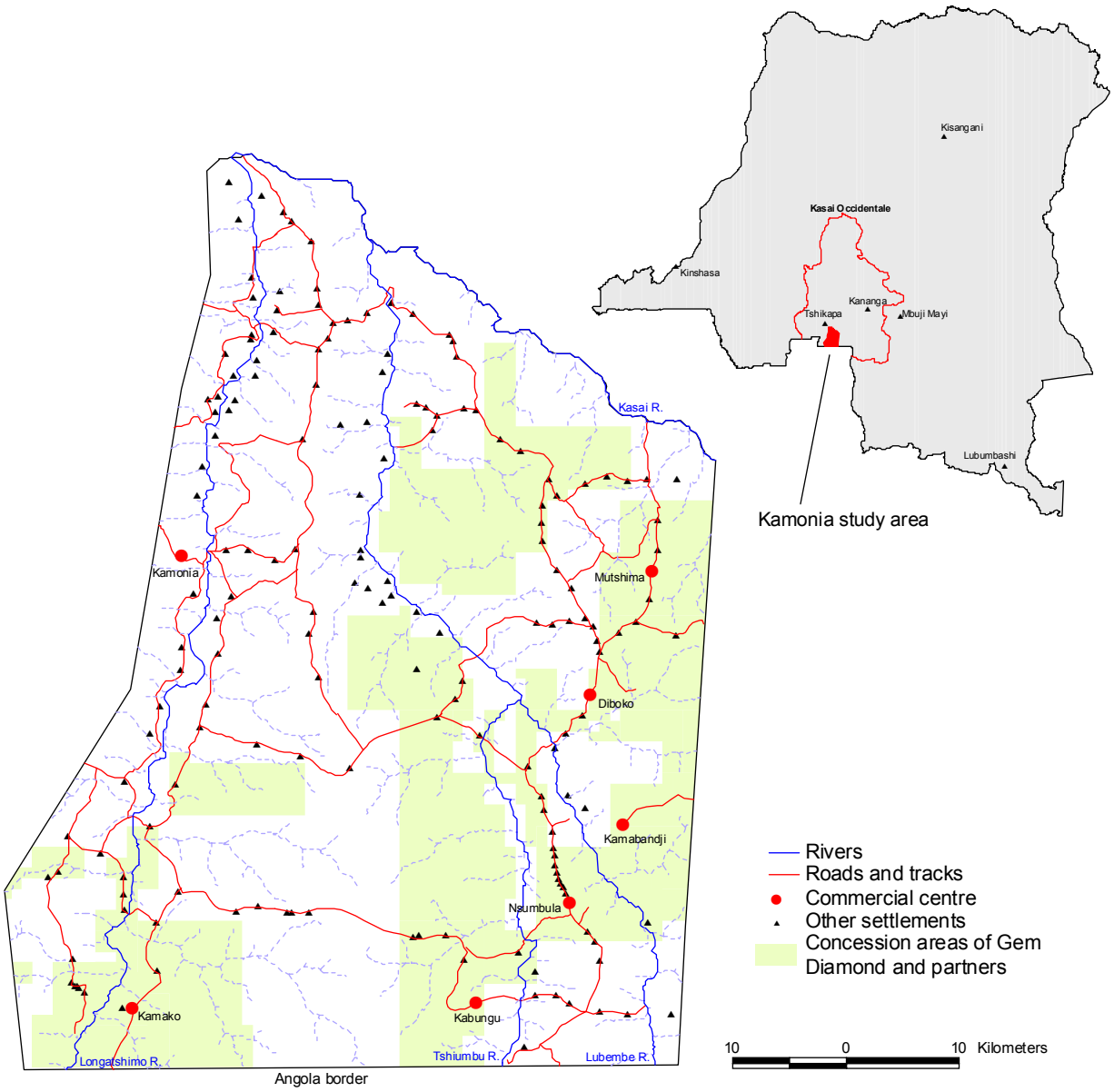

Figure 1. The area in Territoire de Kamonia, Democratic Republic of Congo on which this study focused. The area covers about 3,600 square kilometres.

Aerial surveys of the study area (Figure 1) were conducted in June 2007 and February-March 2008. In addition to providing an overview of farming activities, other land uses and environmental conditions, the surveys were used to map and photograph towns and villages. A total of 133 of these settlements were thus mapped and the photographs were used to estimate the number of households in each village or town. The locations of other settlements and estimates of household numbers were derived from field survey data provided by Gem staff at Longatshimo and from satellite images (Quickbird, Ikonos and Landsat) owned by Gem Diamond and those available on Google Earth.

The study area lies within the province of Kasai Occidentale, the capital of which is the city of Kananga. Tshikapa, with an estimated population of between 1 and 1.5 million people, is the nearest city to the study area. By all accounts, the economy of Tshikapa is very largely based on and around

the artisanal diamond industry.[2] The extent of the study area is somewhat arbitrary, its borders being chosen to encompass an area that covered substantial areas of artisanal mining and many of Gem's concessions. The area covers much of the drainage of the Longatshimo, Tshiumbu and Lubembe rivers, and extends northwards from the Angola border to include an area along the Kasai River.

3. SOCIAL ORGANIZATION

Although most people in the area are recent immigrants from other tribes in the DRC (see page 7), most of the study area has traditionally been occupied by people belonging to the Tshokwe (often spelt Chokwe) people. The tribe and language (known as Kitshokwe) is widely distributed across southern DRC and Angola. The present king of the Tshokwe lives in Angola. A circumscribed zone in the study area is occupied by the Bakwafwiya tribe.

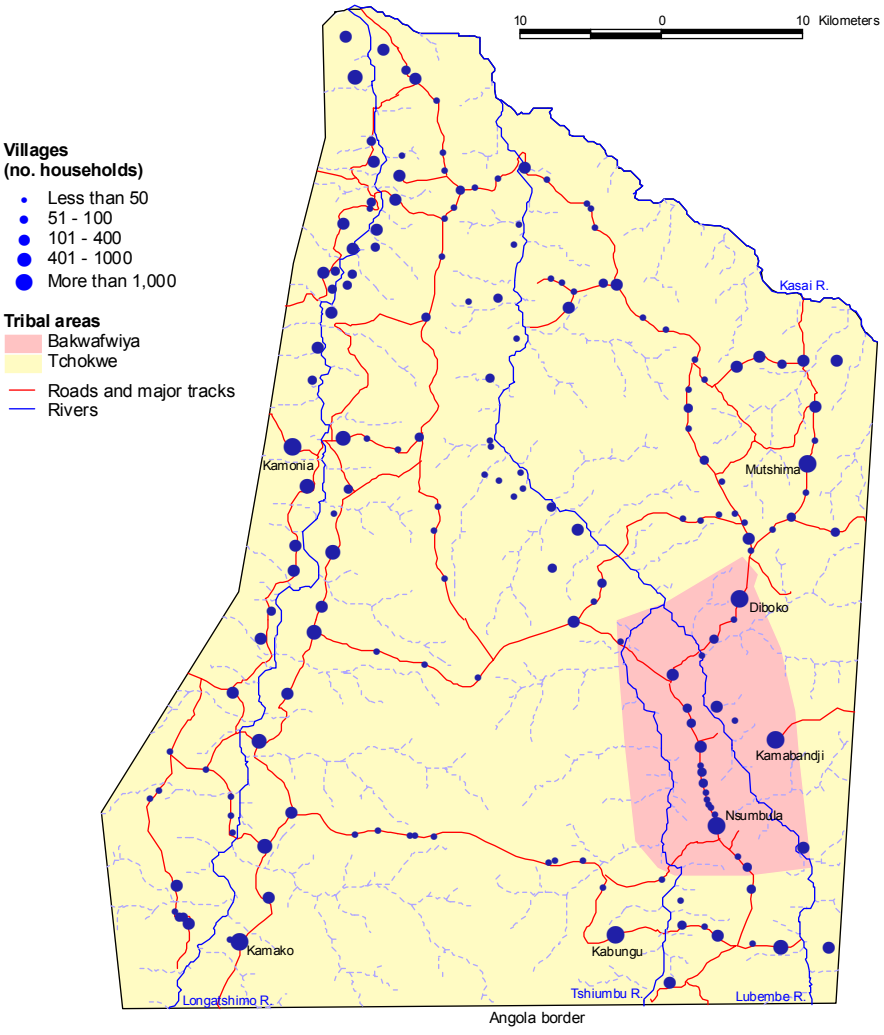

Figure 2. Settlement sizes and tribal areas in the study area.

Integration and marriage between immigrants and traditional residents occurs commonly, but all chiefs are members of the Tchokwe or Bakwafwiya tribes. Leadership is passed down among men from one generation to another. Marriages between members of the chief's family, for example between cousins, ensure that leadership is maintained within the royal clan. Before chiefs began obtaining

[2] Hayes, K., Smith, K.H., Richards, S. & Robinson, R.C. 2007. *Researching natural resources and trade flows in the Great Lakes region*. Report by Pact to DFID, USAID and COMESA.

incomes from artisanal mining (see page 17), they and their families were supported by payments of tributes, each household contributing a proportion of its harvest to the chief.

Each village has a chief (*chef de village*) while a *chef de groupement* presides over a number of local villages. The main roles of village chiefs are to exercise tribunal control in settling local disputes and allocating land. In addition, chiefs are required to maintain the power of leadership vested in their families. This power is claimed to offer their subjects protection from people living elsewhere. Much sorcery and superstition is evidently used to maintain this power, although it is increasingly ignored by younger people.

Anyone wishing to establish a home in a village requires permission from the *chef de village*. The same is true for village residents wishing to clear land for cultivation in areas surrounding a village, although control over these broader areas may be subdivided among members of the chief's family. Villagers then need authority from which ever royal family member holds control over the land where they wish to farm. Once permission from either the chief or his family member has been granted, farmers are usually expected to provide some kind of payment or tribute, for example as a percentage of each harvest.

The authority of a chief in allocating land is of obvious importance since this ensures that he and his family sustains power to obtain incomes from tributes. In other words, the authority to allocate usage rights over land and its natural resources is pivotal to the maintenance of chiefs' incomes and wealth. Against that background, it is easier to understand the role of chiefs in acting as *chefs de chantiers* (literally, chiefs of mining areas, see page 17), and in expecting homage and tributes from mining concessionaires. Even Congolese diggers and divers are expected to pay tributes, not least because of the claim that the tributes will bring the miners good fortune. As one commentator put it: tributes will be comparatively cheap and readily accepted if they are offered preemptively to a chief. By contrast, tributes demanded by a disgruntled chief will be costlier and need more negotiation.

It should be noted that local residents have **no** lease or title rights to land. As a result, land has no capital value and cannot be used as collateral. Occupants thus have little incentive to invest in, or add value to land. They run the further risk of having traditional usage rights being expropriated, as is happening in many parts of Africa when rural folk lose their rights of access to land and its natural resources. Self evidently, local residents cannot sell or transfer any property or other assets that are tied to land.

Both the artisanal diamond and trade industries are very largely in the hands of immigrants from other areas of the DRC. For example, various informants indicated that at least 80% of all diggers (*creusers)* and 95% of traders were immigrants. While this dominance reflects the enterprising nature and purpose of immigrants, several people also suggested that local Tchokwe and Bakwafwiya people remain poorer participants in these industries because they are less competitive and active. The limited pursuit of diamonds by members of these local tribes is perhaps also constrained by the superstition that being seen to be wealthy is dangerous and carries the risk of being killed.

4. DEMOGRAPHY

Approximately 34,000 families were found to live in the area (Figure 3) of which about 14,000 were in the largest commercial centres of Kamonia, Kamako, Mutshima, Kamabandji, Diboko, Kabungu and Nsumbula. Another 31 towns had between 200 and 800 families, 39 villages contained between 100 and 200 households, while the remaining 109 villages had less than 100 households.

No information was available on the average number of people per household, but an average of 9.6 people per family was recorded during a survey in the Mbelenge area.[3] This average was skewed by a

[3] SRK. 2007*Environmental and Social Report for Mbelenge Diamond Mining Project, DRC*

few very large households and so a figure of about 9 per household is likely to be more representative. Using the figure of 9 household members suggests that there are about 306,000 inhabitants in the study area. As discussed below, a very high proportion of the population are immigrants who arrived and settled in the area over the past 30 years after artisanal miners began to arrive in the late 1970s. Data on the age structure of the population are lacking, but two features seem clear. The first is that there are comparatively few elderly people as a consequence of most adults being recent immigrants. The second characteristic is the very high proportion of young children under the age of 10. This could be due to many immigrants having only settled and married in recent years and/or high rates of child mortality.

What proportion of the population consists of immigrants and their offspring? Most informants estimated between 80 and 90%. Taking the lower conservative 80% means that about 245,000 people would be immigrant in origin. Most of these people are from the Bandundu area of the DRC, the rest being from places scattered across the country. Immigration has led to very high population growth and to the formation of the seven large commercial centres listed above. For example, Nsumbula consisted of only several families 14 years ago, but now has about 1,500 households. Most people agree that immigration has slowed or stopped in recent years, however.

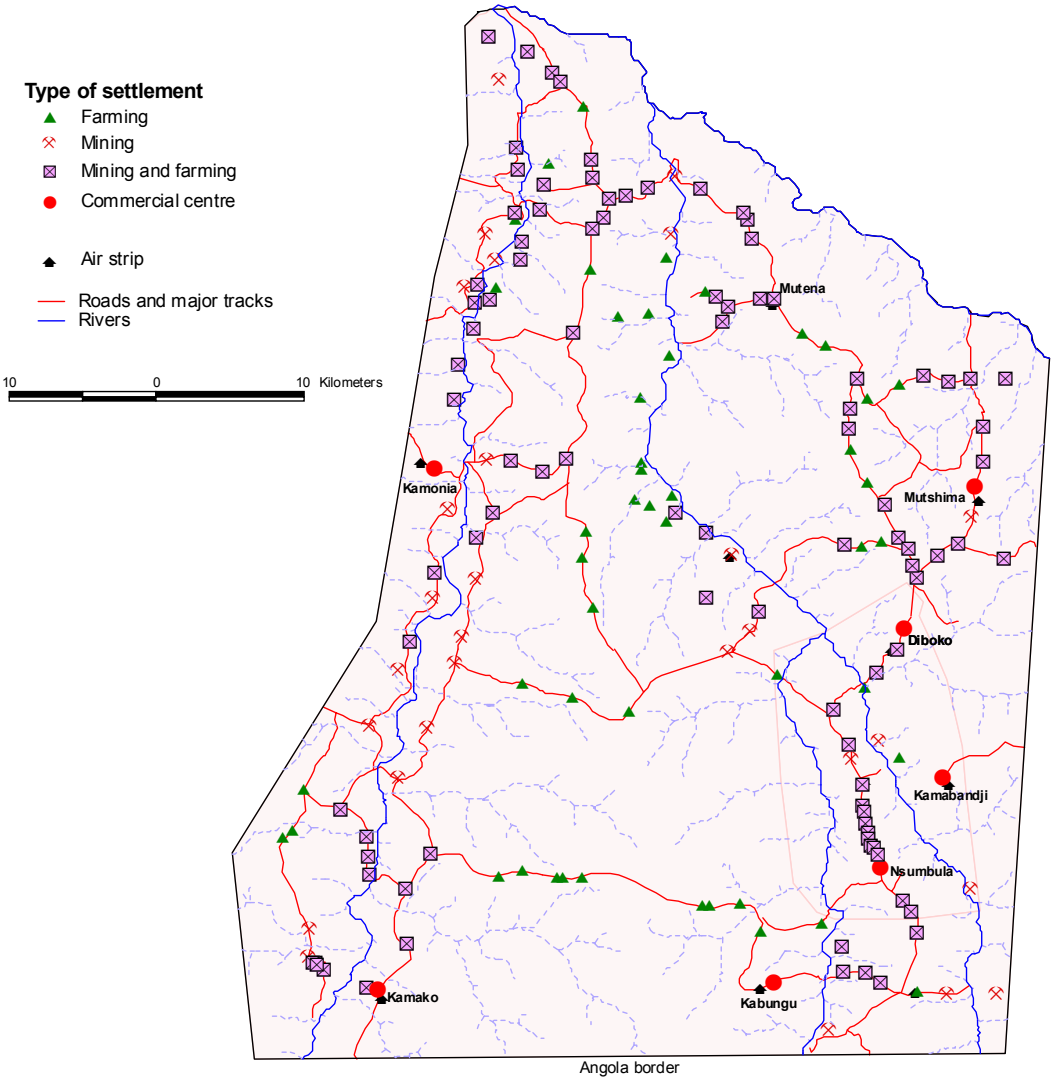

Figure 3. The distribution of different types of settlements and air strips.

Over and above the substantial variation in population size (Figure 2), towns and villages also differ greatly in the nature of economic activity (Figures 3 and 4). Most very small villages are predominantly occupied by farmers, the households being small, poor and almost wholly dependant on agricultural produce and natural resources harvested from surrounding areas (such as bush meat and fire wood). These farming villages are mainly located on higher ground away from the main north-south flowing rivers. The huts are built entirely of mud, sticks and thatch. Residents have little or no cash income and there are few or no vendors. Forty-eight villages (27% of all settlements in the study area) were classified as farming villages.

Figure 4. The four major kinds of settlements: farming (top left), mining and farming (top right), commercial (lower left) and mining (lower right).The great majority of villages are elongate in shape, most houses being built close to roads or tracks that run through the settlements.

Twenty-eight (16%) villages were classified as mining settlements where residents depend very largely on artisanal diamonds. All these villages would have started as a result of rich sources of diamonds being found nearby, the first homes being hastily constructed tents or huts covered with tarpaulins or grass. With time and the discovery of additional diamond deposits nearby, residents built more permanent houses. Almost all of these have corrugated iron roofing which could have only been acquired with cash earned from mining. All the mining settlements are close to sources of diamonds in the major rivers and adjoining terraces.

The same is true of most mining and farming settlements, of which 95 (53%) were mapped. These evolved once mining villages developed into even more permanent communities, the key transformation from 'mining' to 'mining and farming' settlement occurring when substantial numbers of miners married. Their wives then started farming, adding this as a significant economic activity to the village. And as the settlements grew, considerable numbers of residents became traders of imported goods and locally-grown food.

The seven (4%) large commercial towns of Kamonia, Kamako, Mutshima, Kamabandji, Diboko, Kabungu and Nsumbula are the fourth kind of settlement. Economic activity in each of the towns is dominated by trade, almost all of which is on the basis of cash incomes from diamonds mined locally, although two of the towns also derive much of their income from diamonds mined in Angola. This is very largely the case in Kabungu, and less so in Kamako which is surrounded by many local artisanal mining areas *(chantiers)*. Kamako is also close to a vibrant market on the DRC/Angola border where vendors from both countries sell goods each Wednesday and Saturday.

Figure 5. The presence of air strips close to the larger towns clearly indicates the local presence of wealthy traders who can pay for air transport to import goods and export parcels of diamonds.

5. ECONOMIC ACTIVITY

It is clear that the economy of the area is dominated by three activities, in increasing importance: farming, trade and mining. Each of these is described in a section below. Most households derive incomes from two, and often all three activities. The fathers and sons in some homes work part time or full-time as *creusers*, while mothers and daughters farm and process food, for example. Other families may focus more on trade and farming, or solely on trade and mining. Incomes from farming are largely in-kind, while income from mining and trade is cash, either as Congolese francs or US dollars Various informants suggested that about 80% of people depend on mining, 15% on farming and 5% on trade. The great majority of those depending on mining and trade were reported as being immigrants to the area (see page 7).

Several other natural resources harvested from areas surrounding the settlements can be added to incomes associated with farming: firewood, building materials (thatch and poles), bush meat, wild fruit and fish. These items are all used for domestic, subsistence purposes. Charcoal and bricks also come from local natural resources but are mainly produced for sale.

5.1 Farming

Agriculture is dominated by the production of crops and vegetables. There is thus very little livestock production. Only one small herd of cattle was seen during extensive aerial surveys in June 2007, and no cattle were seen during surveys in March 2008. Various explanations were offered for the absence of cattle (risk of theft, lack of labour, cattle disease and the poor nutritional quality of pastures), but none of these seem especially convincing. Perhaps the answer lies in a combination of these factors. Other livestock (goats, sheep, pigs, chickens and ducks) are all confined to villages, but the small number of these animals in each village means that they are only used occasionally for food.

While no data are available on the volume of production of different crops, it is obvious that the most important staple is manioc (or cassava and locally known as *chomba*) which provides tubers and leaves that are eaten as a spinach. Other common plant foods are: sweet potatoes (both tubers and leaves are eaten) maize, beans, peanuts and - to a lesser degree - yams, bananas, plantains, lemons, paw paws, peppers, aubergines, dates, tomatoes, onions, gem squashes and okra. Most annual or seasonal crops are planted just before the rainy seasons. Planting thus occurs in September and October before the short rains, and then from January to March before the long rains.

Figure 6. Perspectives on farming, clockwise from top left: forest cleared for maize fields; planting manioc; leaves of manioc being ground into a spinach; okra, aubergines and tomatoes on sale in Kamako market; sweet potatoes and a paw paw tree; yam plants and banana.

Manioc, maize and peanuts are cultivated in fields, most of which are less than a hectare. Apart from limited intercropping with manioc, all other crops are cultivated in small gardens close to homes. The substantial amounts of maize meal that are imported and sold in markets raise the question why little maize is grown locally. One or more of the following answers seem plausible. First, the crop is grown on select patches of better quality soils found in forested valleys which are much more limited and

localized than soils used for manioc. Second, most suitable patches in forests are far from settlements, and so the labour requirements to tend maize fields are more demanding than those for manioc. Third, some people suggested that maize is just not a popular food. Finally, farmers place more emphasis on manioc production which is less risky and more reliable because it is a hardier crop, requiring less fertile soils and less rainfall than maize.

There is a high degree of variation in effort applied to the growing of manioc. Many fields are cleared, planted and then largely left alone until tubers and leaves are harvested on occasion. Other fields are weeded regularly (often every two weeks during the growing season) and the same fields are used to intercrop sweet potatoes, peanuts, beans and sorrel (a type of spinach). While men help with the initial clearing of new fields, all other work is done by women. This is also true for the cultivation of other crops and vegetables. No draught animal power, ploughs or other mechanical implements were seen in the area.

Farming is thus very largely the preserve of women. Groups of women often work collaboratively to tend fields far from their homes, for example planting or weeding in one field today, and then tomorrow in a field belonging to another member of the group. A woman may simultaneously farm several fields of manioc, each of which may be off in a different direction from the village. While all households in a farming village have fields and gardens, the proportion of families that do any farming is much lower in settlements where mining and trade dominate the economy.

The overall nutritional quality of soils in the area is low because of their sandy nature. Fields are therefore usually cultivated for only one or two years before the fertility of the soil has been exhausted. Farmers then clear new fields, the abandoned fields becoming rapidly over-grown with grasses and shrubs. This kind of shifting cultivation has caused large areas of woodland and forest to be progressively denuded and converted into dense thickets of shrubs and grass (see page 22).

5.2 Trade sector

The availability of substantial cash incomes from mining has led to the development of a large trade sector. By way of illustration, the following table lists businesses lining the main streets of Nsumbula (a commercial centre with about 1,500 households) and Tchinjinde (a mining town of some 500 families close to the Angola border).

Enterprise	Nsumbula	Tchinjinde
General retailers	30	14
Comptoirs	26	21
Fuel sellers	20	1
Telephone services	19	4
Local produce retailers	14	7
Pharmaceutical goods	12	4
Clothes	11	4
Motor mechanics/hardware	5	2
Money transfers	3	2
Money exchanges	2	0
Churches	4	1
Clinics	2	2
Tailors	1	0
Total	**149**	**62**

From walking around the market and other streets in Nsumbula, there are probably another 100 clothing retailers, 200 produce sellers, 100 general retailers, dozens more telephone services and *comptoirs*. The town also has a large population of prostitutes.

The great majority of goods are imported. This is also true for food stuffs, which are largely comprised of dried fish (from Lake Tanzania and Dar es Salaam), maize meal, beans and pumpkin seeds, palm oil, dried worms (from Katanga), sugar, salt and other condiments. Local produce consists mainly of vegetables, manioc flour, charcoal, traditional alcohol, palm wine and some meat. Young boys fetch and sell water in many towns.

Figure 7. Perspectives on the trade sector. Clockwise from top left: maize and manioc flower, shop fronts for money transfer and telephone services, dried fish, goods in a typical general retail shop, a tented market that developed within two weeks at the Lubembe River, and women selling palm oil and charcoal. Most market vendors are women.

Figure 8. Cargo bicycles, each of which may carry several hundred kilograms of goods. Three people help push one up a track on the left, while the one on the right transports 244 empty beer bottles over a distance of about 250 kilometres from Nsumbula to Kananga, an exercise in recycling of note! The bicycle is called a djikalu *and the man that pushes it is a* mayanda *(plural:* bayanda*).*

The majority of trade takes place in the largest commercial centres and in settlements where mining is the dominant economic activity. The rate at which vendors shift themselves and their goods to capitalize on new trading opportunities can be remarkable. For example, a market village consisting of 250-300 separate enterprises sprung up over a two-week period when a rich source of diamonds was found near the Lubembe River ferry in February 2008 (Figure 7 and 10). There were about 50 *comptoirs* in the village in addition to all kinds or retailers of clothes, food and pharmaceutical goods. One shelter even operated as a cinema, showing films on a TV. The total number of vendors and their families in this new village was close to one thousand, and there were perhaps another one thousand miners and associates at the *chantier* itself.

No banking services are available in any of the commercial centres or towns. However, money transfer businesses are abundant and well-established for people to send funds to relatives and other recipients elsewhere. The system is simple: a client deposits the money he or she wishes to transfer and the business charges a service commission of between 5 and 10%. The client is given a code number which he or she transmits (generally by telephone) to the recipient, who then collects the funds from a nominated, partner transfer shop in his or her town. One modestly-sized money transfer shop in Nsumbula reported making an average of 50 to 60 transfers per day. Most transfers were for $100-200. Taking a conservative estimate of 50 daily transfers of $100 each means that this business alone was transferring $100,000 in a month of 20 working days. There are probably at least 10 money transfer businesses in Nsumbula and so $1 million could be transferred each month.

No figures are available on the total volumes and values of imported goods, but these are obviously substantial. All goods are transported either by air from Tshikapa or from Kananga, generally by bicycle. Traders complain that air cargo is expensive and that they receive no compensation for damages. Air companies also use unfair rates of currency exchange in charging for their services.

The use of bicycles to transport goods is impressive (Figure 8). A journey between Kananga and Nsumbula takes up to 12 days over a distance of about 250 kilometers. Traders operating between Sankuru and Luebo (170 kilometres) spend one week pushing their bicycles. The incomes of these traders vary. One trader bought goods worth $100-200 and then sold them for double the value at his destination. Another earned $45 per round trip over two weeks, and thus obtained a monthly income of $90. The pushers often pay $5 to policemen at each road block, and there may be many such ‘payment points’ on a long journey. Some traders work for themselves, while others are commissioned by shop owners.

Since money becomes available whenever diamonds are found, there is a fairly even volume of trade throughout the month. This is unlike an environment where trade booms when employees are paid at monthly intervals. Some traders are indeed concerned that formal employers, such as Gem Diamond, would disrupt the benefits of steady sales if all their employees were paid at the end of each month.

6. ARTISANAL MINING

This overview of mining begins with a description of the methods used, which are quite different in rivers and alluvial terraces. An assessment follows of how shares in a mining operation (*chantier*) are divided among different people and interests, while a final section discusses the sale of diamonds, especially at a local level before the gems leave the region for export to Kinshasa and beyond.

Before proceeding, however, some comments on the scale of this industry. One measure comes from the number of *comptoirs* found in even small towns (see page 11), and there must be at least 1,000 of these diamond buying offices. Another indication of scale is from the estimate that one person in each household is directly involved in mining, usually as a digger (*creuser*) or diver (*plunger*). Leaving aside the small proportion of strictly farming families, there could thus be at least 30,000 miners in the area covered by this study. Over $54 million would be earned per year if each of the 30,000 households earns just $5 per day from mining. In fact, a daily income of $10 is probably more realistic (see page 21) and artisanal mining then earns $109 million each year for miners in this relatively small area of the DRC. If about 2,000 comptoirs and dépensiers each earn $50 per day, another $36 million could be added to incomes from diamonds.

6.1 Mining methods

Over and above differences between river and terrace mining, much of the variation in method relates to the ease of reaching diamond-bearing gravels and the kind of equipment available to the miners. Deeper gravels are naturally harder and take longer to reach, and miners are at an advantage if they are supported by wealthy patrons (*dépensiers*) who supply appropriate equipment. Miners who discover a source of diamonds are also at an advantage because they can position themselves in places considered to be over the richest deposits. They may also obtain early support from the wealthiest *dépensiers*.

Four methods are used to bring gravel to the surface of a river. The first, least sophisticated way is used by *plungers* diving off dugouts (*pirogues)*, holding their breath and then bringing up buckets of gravel. A long pole is typically held off the side of the boat, and stuck vertically down to the river bed. This steadies the boat, marks the area to be mined and is used as a hand hold by the divers to avoid being swept by the current. The need for divers to surface regularly is the major constraint to this method, since they spend lots of time ascending and descending, and mining can only be done in shallow water, perhaps no deeper than four metres. And a *pirogue* can only hold limited amounts of gravel at a time.

Second, long, thin hoses attached to compressors are used to supply divers with air, enabling them to spend longer filling buckets or bags with gravel which can be obtained in deeper water. Other than compressors, this method also requires bigger boats (usually inflatable ‘rubber ducks’ or floating platforms), and the divers often wear wet suits. Considerable financial backing from *dépensiers* is thus needed by people mining in this way. The operations are referred to as *tran-tantans*, after the noise made by the engines driving the compressors.

Figure 9. The four methods used for alluvial mining, clockwise from top left: diving off pirogues*; divers with hoses from compressors; dredgers and a* musapa *created with sandbags.*

The dredging of gravel is the third method. This requires the use of an anchored platform carrying a compressor to supply air to divers, and a suction pump to which large hoses are attached. The divers use the hoses first to remove sand overlying the gravel, and then to dredge up gravel which is processed through a sorting barrel to remove larger, unwanted gravel. The remaining concentrate of gravel is stored in bags until it can be washed and sorted later (see Figure 12).

The fourth method is to divert the flow of the river, either to expose the river bed completely or to create calm, shallow backwaters from which gravel can be removed with comparative ease. Such diversions are locally called *musapas*. Barriers of sandbags, rocks or sticks are used to stem the flow of water. Although groups of miners can pool their labour to build small *musapas*, these are usually organized by wealthy *dépensiers* who are, in effect, mine managers. Indeed, the various degrees of financial and organizational backing that characterize different methods of alluvial mining strongly influence the potential of finding diamonds. In essence: the more support and equipment from *dépensiers*, the better the yield. With increasing levels of backing and management the nature of mining changes from artisanal to commercial in nature.

While a good deal of river mining is orderly and calm as each team of miners operates on its own, discoveries of rich deposits can result in a considerable bustle as dozens of teams frantically compete for the best spots, which are usually in potholes (Figure 10). Divers may jostle underwater, even cutting the air hoses of competitors in a scramble to get at the gravel. Dredgers are then in a commanding position because of the greater volumes of gravel that can be hauled aboard by their operators.

Figure 10. Pirogues, inflatable boats and dredging platforms vie for position over a pothole on the Lubembe River.

By contrast, terrace mining is not nearly as competitive, mainly because it takes longer to reach diamond-bearing terrace gravels and each team of diggers works a clearly identified area. Two approaches are used to reach terrace gravels, the difference between the two being dependant on the thickness of sand overburden. An open pit, which is roughly four by four metres (known as *quatre fois quatre*) is excavated where the overlying layer of sand is comparatively shallow, for example less than 10 metres. Deeper gravels are reached down *majimba* holes (singular: *dijimba)*, which can extend down to 30 metres. The great majority of these shafts are one metre in diameter, although *dombola* holes with diameters of two or three metres are dug if resources are thought to be particularly rich. Once the deep layers of gravels are reached, *creusers* then excavate laterally, filling bags with gravel to be hauled to the surface. There is a substantial risk of collapse where there are many such shafts and much of the underlying gravel has been removed.

Figure 11. Left: creusers *in an open* quatre fois quatre *pit (note the level separating the overburden of sand from the* machanga *gravel; middle: an active dijimba hole; right: part of an old chantier of thousands of majimba shafts.*

Each open pit or *dijimba* is excavated by a team of *creusers*, usually five to seven men who have worked together previously. Terrace mining is broadly divided in three phases: (a) getting to the gravel by removing the overburden or digging *majimba* shafts, (b) excavating and stockpiling the gravel (*machanga*), and (c) washing the gravel to recover the diamonds. However, samples of gravel

are tested regularly to assess its profitability throughout the excavation process. The miners distinguish between layers of upper, mostly barren gravel, referred to as *bingalagala*, and the diamond-bearing, usually lower lying *machanga* gravel. Older, deeply weathered gravels of the basal Kwango Formation are commonly called *Exeter*, a brand name for local tins of bully beef, because the kaolinised gravels have a texture reminiscent of the maroon colour and fatty texture of bully beef. Pits and *majimba* holes are abandoned once all the accessible gravels have been removed or successive tests consistently give poor yields. While abandoned terrain is often rapidly covered in vegetation, the vertical holes of 5–30 metres remain hazardous to pedestrians.

Bags of stockpiled *machanga* are carried to the nearest suitable source of water where the *creusers* set about washing the gravel (*tamisage*) using a sieve (*tami*). The team of *creusers* work together to share and speed up the work, but also to ensure that all the diamonds are held for their joint benefit. The washing can indeed be a tense process, especially if there is the chance of particularly valuable diamonds being found. In that event, the man (called the *tamiseur*) actually sieving the gravel may use one or more dexterous tricky moves to keep the large gem for himself.

Figure 12. Two tamiseurs *washing gravel in the Longatshimo River.*

6. 2 Share-holdings

Production from each alluvial or terrace mining area (*chantier*) is shared between several interest groups. However, the ways in which the shares – usually as percentages of gravel – are divided and sub-divided are varied and complex, each group of stakeholders clearly hoping to minimize risk and maximize profit.

Shares or cuts of gravel are usually negotiated at the start of a mining operation. The primary division of shares is between the *creusers*/*dépensiers* and either the concessionaire or the *chef de chantier,* who is normally the local *chef de village*. A concession owner is obviously not involved if the *chantier* is outside a concession, and he may be excluded if the *chantier* is developed without his knowledge. This happens quite often when alluvial *chantiers* are mined quickly over a few weeks. In the absence of a concessionaire, the *chef de chantier* normally takes 30% of all the gravel, and he should then further sub-divide this share with the *chef de groupement* and possibly with policemen, soldiers and

officials of the department of mines. It is the *chef de chantier* who normally registers a *chantier* with the local office of the department of mines.

The presence of a concession holder, however, leaves the *chef de chantier* side-lined as a minor share-holder. The primary division is then between a concessionaire, who usually takes 30-50% of the gravel, and the diggers/sponsors who hold the remaining percentage. Any minor shares that the *chef de chantier* hopes to get have to be negotiated from these major shareholders. The emergence of concessions has therefore left *chef de chantiers* poorer, and often discontented because as *chef de villages* they traditionally expect to receive tributes from people who obtain resources on their land (see page 6).

While some *creusers* work independently on terrace chantiers, the majority are supported by *dépensiers* who help equip and feed the miners. Gravel is normally split 50-50 split between the *dépensiers* and *creusers*, but only after the *dépensiers* first recover the costs they have incurred. The *creusers* may also be obliged to sell their diamonds to the *dépensiers* who can further benefit from being able to buy at low prices. The splitting of shares or profits on river operations may, by contrast, be more complicated because there are more shareholders: *dépensiers*, divers, dredge or boat owners, compressor owners and boatmen, for example. The frantic activity during some alluvial mining over rich potholes also makes it more difficult for concession holders and *chef de chantiers* to get their shares.

Dépensiers are usually fairly wealthy people with varied business interests, although many also have diamond buying offices (*comptoirs*). They often support several teams working on different *chantiers*, thus spreading the risk of their investment, and spend much of their time checking on each team in succession.

6.3 Trading diamonds

While buyers occasionally travel to *chantiers*, the great majority of diamonds are sold in *comptoirs*. Each such office is usually staffed by a *négociant* and *trafiquer*: the *négociant* negotiates prices with the seller, while the *trafiquer* is the actual buyer. A *négociant* may receive a percentage of the value of the diamonds to reward his efforts in persuading sellers to accept the lowest possible prices. Smaller *comptoirs*, however, are usually owned and run by a *trafiquer* alone. Indeed, there is a great variation between *comptoirs*, some with turnovers of only a few hundred dollars per month while others buy and sell diamonds worth tens of millions of dollars each year.

It is generally agreed that *comptoirs* are lucrative, but starting such a business is hard. A good deal of capital is required and both the *négociant* and *trafiquer* need a thorough knowledge of the diamond business, especially in able to assess gem quality and values. Prices paid by buyers in Antwerp must be monitored since these are the prices that determine the carat values at each transaction along the chain of trade. This can be a long chain: *creusers* may sell their gems to small *comptoirs* in local villages, who then sell on to bigger *comptoirs* in commercial centres such as Kamako and Mutshima, and they then sell up the chain to buyers in Tshikapa and/or Kinshasa. A general principle that holds for all sellers, be they *creusers, dépensiers* or *trafiquers*, is that the more they have to sell, the further they will go to find good buyers and thus prices. A *creuser* who finds a particularly valuable diamond may incur the cost (and perhaps risk) of traveling to Kinshasa to offer it directly to a wealthy, exporting *comptoir*. It might even pay him to sell such a stone directly in Antwerp but it is difficult to travel that far. Getting a visa may take three months, for example.

A further principle that holds in the trade is that risks increase in direct proportion to the value of a diamond. Much can be lost if too much is paid for a valuable stone, but profits can also be very high if a seller can be convinced to accept a low price. The key is negotiation, especially in persuading *creusers* that their diamonds have much less value than they assume. Unfortunately, *creusers* are indeed often ignorant of true market values. More astute sellers may contest offers that are considered

too low, and public auctions can be held if there is a serious dispute over a valuable diamond. This may happen, for example, between *creusers* and *dépensiers*.

Figure 13. Many comptiors *are decorated ornately to suggest that they pay generously and immediately with cash.* Creusers *also gain status among their peers by dealing with the biggest, wealthiest* trafiquers*.* Comptoirs *sometimes initially pay elevated prices to* creusers *if their chantier is thought to be rich, especially in high quality gems, since the generous prices should encourage the* creusers *to return with subsequent finds.*

The economies of several border towns, notably Kabungu, Kamako, Mille Ouite, Mwamwengo and Tchinjinde, are boosted or indeed maintained by trade in diamonds mined in Angola. Not surprisingly, few people are prepared to discuss the value of cross-border sales which Angolan authorities increasingly attempt to stop. Several factors, however, contribute to the continued sale of Angolan diamonds: (a) artisanal miners are not allowed to sell diamonds in Angola, at least in theory (b) many miners wish to repatriate their earnings to family members in the DRC, and (c) higher prices are paid in the DRC, especially for large, valuable diamonds. Angolan prices are lower because diamond sales are taxed more heavily, and because the power of sellers to negotiate is weakened by the fact they cannot trade openly and freely.

7. PUBLIC AND SOCIAL SERVICES

While there are few other places in the world where government public services are so lacking, there is at least a theoretical administration which is structured as follows. Below the central government in Kinshasa is the province of Kasai, which is headed by a governor based in the capital of Kananga. The province is divided into districts that consist of several territoires. The territoire of Kamonia is further divided into sectors, which are the lowest level of formal administration. More local, traditional leadership depends on the *chefs de groupement* and *chefs de village*.

All water, transport, electricity and telecommunication services are provided by the private sector, as is most road maintenance, schooling and health services. Some public servants are to be found in larger towns and villages, notably policemen, *chefs de poste* of the *Département de Mines*, soldiers, health workers, teachers and officials of the immigration services (DGM). However, the presence of these people is largely symbolic. While the lack of effective public service is certainly due to poor supervision and control from higher authority, a more important factor is the extremely low salaries paid to government staff. These vary between $20 and $40 per month, and their payment is often irregular. It is simply not possible to live on these kinds of incomes in a society where the cost of living for most families amounts to several hundred dollars each month (see page 21). Civil servants are thus obliged to use their time and positions to obtain additional incomes. While these are corrupt, the supplementary incomes are a necessity for people earning such pittances.

Each village has a *chef de poste* of the *Département de Mines* who is responsible for the local administration of *chantiers*. While each *chantier* is supposed to be registered annually, most are not since they are old and they continue to be mined sporadically. The *chef de poste* may also help determine share holding agreements between concessionaires and *creusers*. Foreign concessionaires and companies are inspected and monitored by the *Département de Mines* to a much greater degree than local miners.

Figure 14. A private open air school in Nsumbula (left) and a private clinic (right). One maternity clinic charges $12 for a confinement, while a 'doctor' in private practice charges $2.50 per consultation. Conditions treated most frequently at the Gem Diamond clinic at Nsumbula were: malaria (19% of all cases), gastro-intestinal infections (19%), respiratory problems (18%) and muscular-skeletal complaints (18%).[4] HIV infection rates are thought to be high but figures on its prevalence are not available.

Levels of education among children are extremely low as a result of problems of both supply and demand for education. Thus, few children have access to schooling but many who live close to schools also do not attend classes. Although parents often recognize the need for their children to be schooled, as reflected in the motto that "French is money", the perceived value of education is obviously not high. This might be due to the financial costs of schooling, the fees for a child at primary school amounting to $50 per year, for example. But there are also opportunity costs, such as girls not being available for domestic work and boys not being able to work as artisanal miners. In addition, few parents have been schooled, and the quality of local schooling is perceived to be poor since teachers are not trained and are often not at work for reasons related to their low salaries. In response to these constraints, wealthy people who recognize the value of education send their children to good schools in major centres, such as Kinshasa, Kananga and Lubumbashi.

Although it is comparatively easy to build schools to increase the supply of education, more emphasis on improving demand is needed. Alternatives to the standard 12-year school curriculum also need to be found since few parents and children are keen to spend that long at school. One useful approach would be to compress formal education into shorter curricula which could be offered to older children. These would be cheaper and less time consuming than formal schooling, and could equip pupils with an education equivalent to that obtained after 12 grades. Similar approaches could be used for vocational training.

8. ECONOMIC ASPECTS OF ARTISANAL MINING

Incomes obtained from artisanal mining obviously dominate the economy, at first attracting and then largely sustaining about 30,000 families. In addition to being sources of income in a broad sense, diamond incomes are especially useful because they are paid (a) as cash and (b) immediately. This is quite different from the sporadic remittances that so many rural families receive, and it differs greatly from incomes obtained from almost all other primary resources produced by rural people in Africa. Compare, for example, cash incomes from diamonds with those that might be obtained from agricultural production. A farmer producing manioc, maize, vegetables or meat would have to package and perhaps refrigerate these foods before transporting them to distant markets. These would be hundreds of kilometres away from the Kamonia area, and they would only be accessible using air cargo or extremely poor roads. Transport costs would thus be very high and the farmer would have no

[4] The figures are based on 2,777 cases treated at Nsumbula between June 2007 and February 2008

guarantee that the produce would arrive intact and unspoiled. Retrieving income from the products that are eventually sold could be difficult and time consuming.

People who function in cash economies have many more options than those limited to barter economies. For example, a range of goods and services are available if enough cash is in circulation, and cash can be moved, allowing people considerable latitude in where they want to live. Such options are simply denied to anyone who is not reasonably cash secure. These comparisons may seem flippant to people accustomed to living in modern, western societies, but they do help illustrate the benefits of cash incomes from mining. Another way of making the point is to consider a fanciful scenario in which all diamonds suddenly disappeared from the area. The consequences would be massive: many people would lose their only source of income, most of the trade sector would disappear, and levels of poverty and malnutrition would increase dramatically. The changes would also be immediate, since there are no other resources to which people could turn their attention in this area of the DRC. There are no timber resources of note, farming is unproductive, markets are remote, no other minerals are known to be available, and there is no manufacturing or tourism industry. Of course, most people would move away to search for cash incomes elsewhere.

What happens to the roughly $100-150 million earned from diamonds? A considerable proportion is obviously spent locally on food, clothing, services and such household assets as building materials and furniture. Discussions with several people suggested that an average family spends between $10 and $20 per day on routine necessities. About half of the spending is on food, which is either purchased or obtained from farming as in-kind expenditure. Taking $10/day as a conservative estimate is equivalent to household incomes of $300 per month or $3,600 per year.

But much of the income from diamonds is spent elsewhere, partly as a result of the high dependence on imports. Many earnings therefore ultimately go to producers and wholesalers of the goods elsewhere. But remittances also represent a major leakage, since large sums of money are sent to the family members of immigrants in the DRC. The funds are mainly sent through money transfer businesses of which there are many in the larger towns (see page 13). Interestingly, remittances should decline over time as dependants elsewhere die off and miners increasingly have local families.

In addition to these leakages, two other factors reduce potential incomes and benefits. The first is the relatively low prices paid to local *creusers*, while considerable profits on sales are earned once diamonds are sold up the supply chain to Kinshasa and beyond. Some people estimated prices in Kinshasa to be double those paid locally, while other people put the figure at 10-20% higher. Some of the difference between these estimates probably relates to the size and quality of diamonds, since profits on higher value diamonds are usually greater than those on small ones. In addition, local incomes from high value diamonds usually leave the area because people spend their winnings elsewhere, often returning relatively penniless.

Second, few or no benefits from state taxes on diamonds return in the form of government services or infrastructure. The main effect of all these leakages is that considerable revenue is lost to this area of the DRC, and people would be much better off if more earnings were used locally. The artisanal mining industry would also be seen in a better light if there were more obvious social benefits and less of the income from diamonds 'disappeared' to other places and beneficiaries.

What about Gem Diamond's potential earnings? In the eyes of local people, will most of these also 'disappear' into state revenues, investments in other countries and income for foreign employees and shareholders? Or how can Gem Diamond use its returns to maximize local benefits? One obvious way is to employ as many local people as possible, while another is to purchase as many as possible of its goods from local suppliers. Schools and clinics are logical investments, but problems of staffing and maintaining those services are difficult to solve in the absence of effective government support. The company could do more to provide infrastructure which require less recurring support, such as roads and water supplies. Gem Diamond could buy diamonds from artisanal miners, paying fairer prices

than those offered by local *comptoirs*. A more radical recommendation is for Gem Diamond to find ways of spending its tax obligations on local infrastructure and services instead of to the DRC state in Kinshasa. The government would not be enthusiastic about this happening, but several people suggested that the matter could be negotiated. In essence, the company would obtain tax rebates for the costs of services and infrastructure that the government should normally provide.

9. LAND USES AND ENVIRONMENTAL CONSIDERATIONS

Much of the Kamonia area was pristine prior to the arrival of the many people attracted by artisanal mining. Farmers in small, scattered villages cleared land for cultivation, hunted, harvested fire wood and building materials and fished. However, the impacts of these land uses were on a limited scale because relatively few people lived here. Indeed, these kinds and scales of land use continue in nearby areas where artisanal mining does not occur.

Artisanal mining and the increased population have led to three major changes. First and most obviously is the much higher rate of vegetation loss. In order of extent and impact, the losses are caused by clearing for agriculture, firewood harvesting, charcoal production, diamond mining and the expansion of villages. Very large areas of savanna woodland have been slashed, burnt and cleared for manioc, while many patches of forest have been cleared for maize. Most fields have been abandoned after one or two years (see page 11), and more virgin plant cover was then cleared for new fields. The many *chantiers* are conspicuous scars in the surrounding landscape and are viewed by many people as much more of an environmental eye sore than fields, a point discussed below. Pioneer plant species, especially trifford weed (*Chromolaena odorata*), have rapidly covered abandoned fields and chantiers, but it may take many years before more climax plant communities are restored. Tall forest would take at least several decades to recover.

Figure 15. Examples of environmental degradation, clockwise from top left: forest edges trimmed and held back by frequent bush fires; the scars of chantiers*, abandoned fields and a bush fire; the confluence of the clear Kasai River and the turbid Lubembe River carrying suspended sediments; and forest being cleared for maize production.*

A second change is the increased loads of sediments in the rivers, especially as suspended particles. Much of the turbidity evidently comes from strip-mining upstream in Angola, but local mining provides additional sediment. Most local sediments are from the erosion of open-cast *chantiers* while smaller amounts of sediment are added during the washing of gravel. The turbidity may have several effects: reducing visibility so that predatory fish and other organisms cannot readily see their prey; clogging the gills of fish and thus impairing respiration; and increasing deposition of sediments which may bury eggs and larvae, and change habitats. One study in this area of the DRC found the diversity of macro-invertebrates to be low in very turbid water and higher in clearer water.[5]

Finally, much of the area is burnt each year. The fires are set to clear new fields and to clear dense undergrowth which then allows access for hunting and collecting firewood. While burning is an age-old practice, the extent and frequency of burning has increased as a result of the greater number of people and expansion of settlements to areas where no one lived previously. The most obvious impact of the fires is in limiting the growth of woody plants, especially in curtailing the spread of forests (Figure 15).

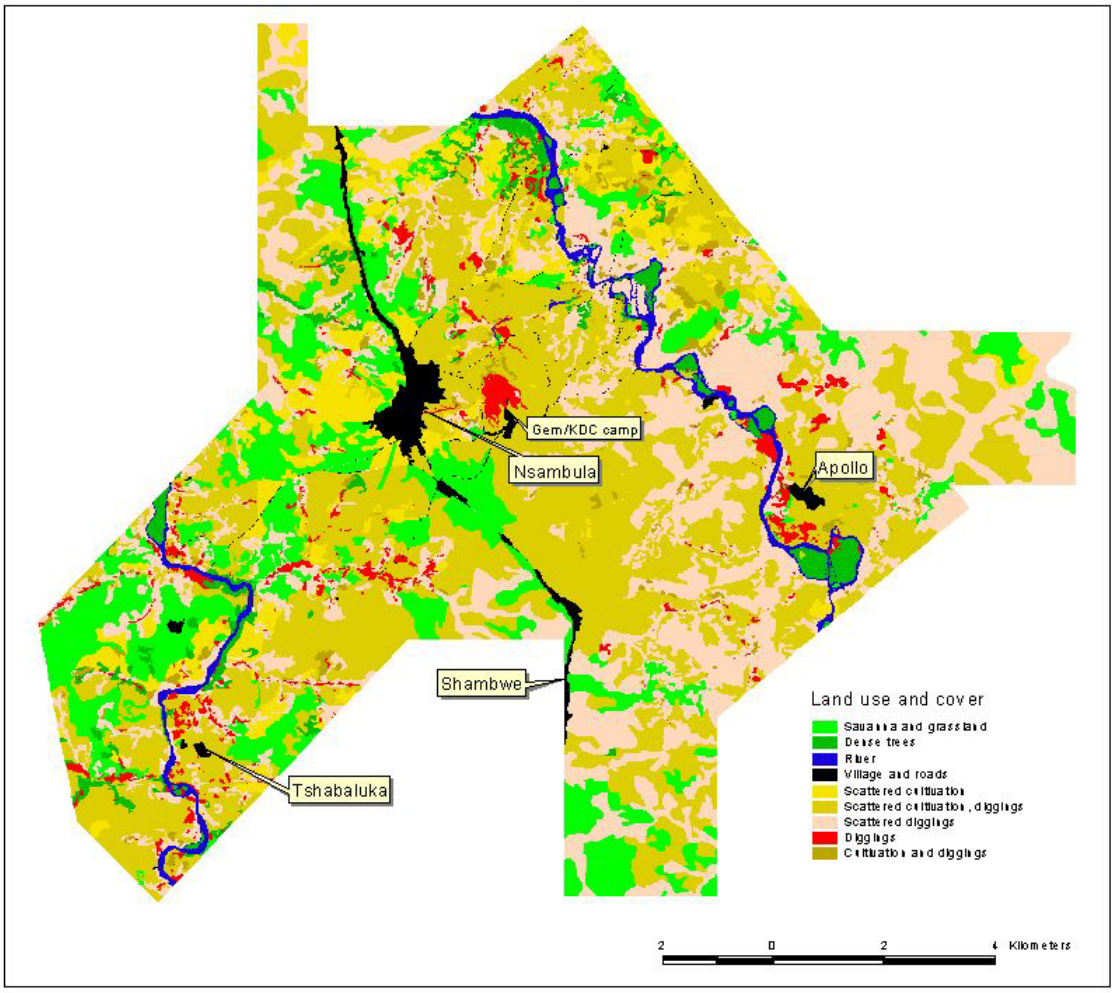

Figure 16. A preliminary classification of vegetation types and cover around Nsumbula and the Gem Diamond/KDC camp.[6]

[5] Graham. M. 2007. *Establishment of an aquatic baseline condition of the Kasai River, Democratic Republic of Congo (DRC), with reference to the Mbelenge alluvial diamond mining operations.* Unpublished report for SRK Consulting, South Africa.

[6] The classification covers parts of concession numbers for which Quickbird images were available, and was adapted from mapping done by Heather Wilson for Gem Diamonds.

An indication of the extent of clearing for cultivation and artisanal mining is provided in Figure 16, which is a preliminary classification of land cover. The map shows that by far the greatest area around Nsumbula has been disturbed, leaving rather small areas of savanna (on higher ground away from the rivers) and dense forest along the rivers. More work is needed to verify the classification, but the broad patterns will remain correct in showing that environmental degradation has been severe. This kind of land cover classification also serves as a baseline before Gem Diamond begins more extensive mining operations.

CONCLUSION

It is clear that a great deal of natural vegetation has been lost in the Kamonia area. Much of the loss is directly (due, for example, to terrace *chantiers*) or indirectly (as a result of population growth) linked to diamond mining. Environmental degradation can thus be added to the many other offensive aspects of artisanal mining, such as its association with bloody conflicts, smuggling and illicit trade, competition with commercial operations (such as Gem Diamond) and the absence of safety measures and government controls.

But how valid are these negative attributions? Take, as a case in point, the photographs in Figure 17. Our interpretation of these images draws heavily on predispositions about environmental health, artisanal mining and on how rural people are expected to live. Why is the open-cast *chantiers* more of an eye-sore than the fallow fields? Aside from their pleasing greenery, the abandoned fields are symbolic of traditional farming methods. This is how rural people have lived for generations, in apparent harmony with their environment. There appears to be much order, and little mess. And fields that surround villages provide bare necessities to which everyone has rights. The homes, lifestyles and means of production all appear natural and respectable.

Figure 17. Compare the appearances, costs and benefits of an open-cast chantier *(left) and the abandoned manioc fields now covered in trifford weed (right).*

By contrast, the artisanal mines appear messy, somehow unnatural, and out of place in a rural African landscape. But these differing perspectives rely entirely on arbitrary judgments which define what we consider better or worse, acceptable or unacceptable. For example, consider the comparative values for local people of a hectare of land cleared for manioc and another hectare cleared for diamonds. Compare, too, the meager opportunities available to a family reliant on crops and those made possible from cash incomes. The results of these comparisons bring new meaning to what is conventionally thought to be good – or bad – about rural livelihoods, environmental costs and artisanal mining.

As this study has shown, artisanal mining provides support to tens of thousands of families in the Kamonia area. The environmental degradation that results is regrettable, but this should not be blamed on people eager to earn cash incomes similar to those of rich consumers in Europeans or North Americans. Likewise, greater objectivity is required in judging artisanal miners whose efforts end up being misused, for example by militias or corrupt governments. And are artisanal diamonds that evade taxation less ethical than taxed diamonds if the tax revenues are never used to provide public services?

This is not to proclaim the glory of artisanal mining. But it does suggest a need for more objective views on the pros and cons of the industry.

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