Republic of Congo
Mining Sector Review

October 2012

Oil, Gas and Mining Department
REPUBLIC OF CONGO

Currency Equivalents
Exchange rate effective August 31, 2011

Currency Unit  Franc CFA
USD 1.00 = FCFA 454

Fiscal Year
July 1, 2011–June 30, 2012

Weights and Measures
Metric system

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ACKNOWLEDGMENTS

This report is a product of the Sustainable Energy, Oil, Gas and Mining Department of the World Bank (SEGOM). The work team consisted of Remi Pelon (Mining Specialist in Mines, Project Team Leader), Cheickna Seydi Diawara (Consultant, former Minister of Mines in Mali) and Gotthard Walser (Lead Mining Specialist).

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The World Bank would like to thank the contribution of the Government of Republic of Congo and the Administration as a whole with particular MM Louis-Marie Djama, Director of Mines, and Jean-Claude Ontsira, Director of Geology, who have been closely associated with the work since launch, as well as MM. Elenga, Director of CRGM and Ngatsongo Oko, Director of Studies and Planning.

The World Bank also wishes to thank the very constructive participation of mining companies (particularly Patrick MM Stevenaert, MagIndustries; Jacques Mamousse, Alain Pillevuit, Florent Lager, MPD; Andre Baya, CongoIron; Robina Kayes, Core Mining), civil society organizations (especially WWF-CARPO, members of the EITI Congo), other development partners such as IFC (especially MM. Olivier Noel, Joseph Some, and Christian Mulamula) and UNDP (Mr. Jean-Felix Issanga ), as well as other experts involved in the study, including John Williams for the legal aspects and the BRGM team which conducted a comprehensive review of the geology section (Francis Bertrand, Joel The Metour et al.).
SUMMARY

In Republic of Congo approximately two-thirds of national GDP and 80% of exports come from oil. The country’s current economic performance has resulted from this national wealth that has been successfully exploited for 40 years. With existing reserves, recent discoveries, planned investments, and current trends of the price of a barrel, the post-oil period is probably still at a distant horizon. In spite of this privileged situation, the country is exposed to dangers of the "resource curse"; that is, heavy reliance on oil poses significant risks for macroeconomic balance and stability as well as for sustainable development and poverty reduction.

Given these challenges, the Government has rolled out a diversification strategy, framed in particular in the Poverty Reduction, Growth and Employment Strategy Paper (PRSP-2), completed on January 31, 2012. Taking into account the potential and comparative advantage of the different activities, this strategy document highlights mining as a priority sector. Admittedly, a successful diversification could not be confined to just the mining industry, but this Mining Sector Review still confirms the relevance of this choice since a number of well-known mineral deposits might be developed in the short or medium term and significantly stimulate the non-oil economy.

The share which the sector could represent in GDP is difficult to estimate without a comprehensive macroeconomic framework, but certain orders of magnitude can be worked out using illustrative modeling. As shown in the table below, our three basic scenarios characterize the potential contribution of the mining sector to the non-oil economy, according to key indicators—investments, exports, tax revenues and employment.

Table 1: Potential contribution of the mining sector to diversification
Source: World Bank, 2012 (see assumptions and analysis of the three basic scenarios in Chapter 4).

<table>
<thead>
<tr>
<th>Investment</th>
<th>Mining investment could vary between 1 and 8 billion dollars from 2013 to 2017. At a minimum that would double non-oil Foreign Direct Investment (FDI), the total of which was of the order of one billion between 2006 and 2010. Nevertheless, even in the best scenario, they would remain lower than oil investments which could reach 15 billion dollars for planned developments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports</td>
<td>Mineral exports could reach one billion dollars per annum by 2016 and in a very optimistic scenario be as high as 6 billion dollars by 2025 – which could represent up to three times the non-oil exports expected for the years to come (approximately 2 billion dollars per annum). This would be over half of the estimated level of oil exports at this time, around 10 billion dollars (the variations of the price of a barrel and mineral commodities will greatly determine these orders of magnitude of course).</td>
</tr>
<tr>
<td>Tax revenues</td>
<td>The mining fiscal revenues could exceed 130 million dollars per annum in 2020 in the lowest scenario and exceed one billion dollars in 2025 in the high scenario – which would respectively increase non-oil fiscal revenues by 10% to 80% (2010 base).</td>
</tr>
<tr>
<td>Employment</td>
<td>Direct employment could reach 18,000 during the construction phase and 9,000 in the exploitation phase, which would make the mining sector the leading sector in generating formal employment in Congo (in 2006 the two top two sectors, manufacturing and forestry, represented between 6,000 and 7,000 jobs; the oil industry employed only about 1,000 individuals).</td>
</tr>
</tbody>
</table>
Of course, such a contribution would also induce costs such as environmental impacts, which are difficult to quantify at this stage. In order to improve mining sector governance on environmental, social and other concerns, the Government will need to undertake a significant investment. Such an endeavor may be supported by development partners such as the World Bank, which, on the basis of best international practice, provides technical and/or financial assistance to promote efficient and transparent management of extractive industries in many countries of Africa and of the sub-region (such as neighboring Democratic Republic of Congo [DRC] and Cameroon).

The present study reviews the strengths and weaknesses of the mining sector in Republic of Congo and makes recommendations on several levels (corresponding to the respective chapters): how to improve knowledge of the sub-soil and management of mineral resources; how to facilitate successful launch of projects currently in the exploration phase; how to improve politico-legal and institutional framework; and finally how to optimize the contribution of the sector to sustainable development and diversification. In conclusion, a synthetic action plan is proposed, summarized below in Table 2.

**Table 2: Overview of the action plan proposed to improve mining sector management.**
*Source: World Bank, 2012 (see the complete table in the Conclusion).*

<table>
<thead>
<tr>
<th>Promotion of mineral potential</th>
<th>Improve the knowledge and promotion of mineral resources potential through airborne geophysics survey, geological mapping, and stimulation of exploration, as well as strengthening of geo-data management systems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution strengthening</td>
<td>Enhance geological services, capacities of negotiations with the mining operators, monitoring of mining operations (mining inspectorate), including environmental and social impacts, set up a modern mining cadastre system.</td>
</tr>
<tr>
<td>Improvement of political, legal and regulatory frameworks</td>
<td>Prepare a mining policy document, envisage selected revisions of the Mining Code, carry out a review of the mining tax regime on the basis of a better forecast of revenues, finalize and supplement mining regulation (including a Standard Mine Agreement).</td>
</tr>
<tr>
<td>Optimization of linkages and benefits</td>
<td>Set up a management framework optimizing the synergies between the non-oil mineral sector and the rest of the economy, in particular with policy notes or guidelines on employment and local procurement, promotion of realistic added value, facilitation of access to infrastructure (port, roads and railway) and energy, and support to transparency, social accountability and local benefits. <strong>In parallel, improve artisanal mining formalization and practices.</strong></td>
</tr>
</tbody>
</table>

With current knowledge of the sub-soil, one can affirm that Republic of Congo has considerable resources, in particular potash, iron, polymetals and industrial minerals. The profitability of operations will depend on many techno-economic factors, which are themselves related to more or less foreseeable international markets evolutions. But the launch of the most well-known deposits like Mengo (potash), Boko-Songho (polymetals), Nabeba, Zanaga, Avima, Mayoko (iron), et cetera, appears plausible in the short to medium term.
Stiff competition of other countries endowed with similar reserves and a better established mining tradition is a strong incentive for the Government of Congo to improve the politico-legal and institutional framework in order to attract investment. At the same time, the Government will have to protect its fair share of benefits and encourage operators to comply with good practices and to sufficiently involve civil society in order to create the conditions of transparency and social accountability.

International experience shows that good governance is essential if the mining sector is to have widespread and sustainable benefits, involving all stakeholders and fully integrated along the value chain. Failing that, the mining sector is likely to develop apart from the rest of the economy and to disappoint the local and national populations—the ultimate beneficiaries of natural resources development.
INTRODUCTION

1) The Republic of Congo, straddling the equator, covers an area of 342,000 square kilometers (km), of which forests occupy three-fifths, the rest being dominated by savannah. Congo shares its borders with Cameroon and the Central African Republic in the north, Angola in the south, Democratic Republic of Congo in the east and Gabon and the Atlantic Ocean in the west.

2) Its population was estimated at approximately 3.7 million individuals in 2009, with a density of 10.8 inhabitants/km². The demographic growth rate is approximately 1.9% per annum, with a strong proportion of young people less than 20 years of age (55%). The population is mainly agricultural (43%) and has only one (poor) access point to basic infrastructures (water, sewerage and electricity). In spite of an exceptional growth of 5.6%, 7.5% and 8.8% respectively in 2008, 2009 and 2010, poverty affects more than 50% (2005 data) of the population.

3) Oil has long been the principal resource of Congo. Since the first exploitations were launched in 1970, the oil sector has become the dominant economic activity and major source of income for the State. Crude oil, primarily produced offshore, is exported mostly to France, Italy and the United States while the main part of gas is flared, for lack of sufficient collection and processing infrastructures. Beginning in 2009, the deep water field of Moho Bilondo operations made it possible to ramp up production about 24% and propel Congo to a position among the largest African crude oil producers. This “black gold” represents more than 90% of the country’s exports and up to 80% of public revenues (2010 data).

4) The macroeconomic indicators are encouraging. The growth rate in real terms was 8.8% in 2010, with GDP per capita reaching $4532. In 2010, GDP nearly reached two-digit growth, driven up by a significant increase of oil production, by reinforcement of non-oil activities, in particular forest industry, construction and telecommunications. This trend accelerated thanks to progressive resolution of constraints related to infrastructures of transport and energy. Foreign debt has decreased considerably since achievement of the completion point of the Heavily Indebted Poor Countries (HIPC) Initiative in 2010, which enabled Congo to benefit from cancellation of its debt to the Club of Paris ($2.4 billion). Additionally, an agreement signed with creditors allowed Congo to write off a broad part of their private debt. Among these other determinants, the following improvements of the macroeconomic context should also be mentioned:

- Returned rise of international oil prices, coinciding with an increase in production of new oil-bearing fields and the rehabilitation of the crude oil refining public company, La Congolaise de Raffinage [CORAF];
- Increased production of liquid gas (butane and propane) following rehabilitation of the Nkossa platform gas plant, which had been damaged by an explosion and fire in 2007;
- Rise of tropical wood exports, as well as an increase of their price on the world market and improvement of the local processing rate before export (from 35% in 1998 to 60% in 2008);
- Budgetary consolidation, including structural reforms aiming at a more effective management of public finance.
5) The Government made development of the mining sector a priority to diversify the economy. The oil sector has long overshadowed other sectors of the economy, but the Government made diversification of the economy a strategic axis of development. The Poverty Reduction, Growth and Employment Strategy Paper (PRSP 1 and 2) directs interventions toward diversification of the economy. The forestry sector, which was the most dynamic of the economy before and immediately after independence, is always regarded as a booming sector and priority. But the PRSP also targets in a particular way the mining sector. It also includes a simplified diagnosis and recommendations for interventions that are still quite valid (see Chapter 3).

6) The present review of the mining sector, led by World Bank in partnership with the Ministry of Geology and Mining, aims to update and understand further these characterizations, to document the prospects and challenges of mining development and to prioritize actions that optimize the sector’s contribution to economic diversification and sustainable development. Following a bibliographical study, a first mission of collection of information was led, which allowed organization of a number of meetings between key actors in the sector. A workshop on the mining sector held in Brazzaville on June 1, 2011, provided an opportunity to present the work in progress and to consult stakeholders on orientations and possible recommendations. Finally several meetings and reviews by peers (see Acknowledgments) enriched and supplemented this report. It is divided into four parts: national geological endowment (focusing on minerals other than hydrocarbons); the potential for mining production; the political, legal, regulatory and institutional framework; and the contribution of the sector to diversification and sustainable development of the economy.

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1It is not always possible to separate the stakes from each other. Some are approached under different angles in several chapters, such as reinforcement of capacities and infrastructure challenges.
CHAPTER 1. GEOLOGICAL HERITAGE AND MINERAL RESOURCES
1. Regional geological and metallogenic characteristics

1) The sub-soil of Republic of Congo is characterized by the following rock formations, ranging from the oldest to the most recent ones (see Annex 1 for a more detailed description):

- A base of crystalline and metamorphic rocks of the Mesoarchaean age\(^2\) (Chaillu Massif, in the midwest, and Ivindo, in the north) and sediment of the Paleoproterozoic age\(^3\) (Bassin de Sembé-Ouesso, in the north) pertaining to the Congo Craton (see box below);
- A Neoproterozoic sedimentary cover\(^4\), involved particularly in the Pan-African chain of Mayombe, in the southwest;
- Sedimentary formations from the secondary, tertiary and quaternary eras that developed from east to west and then converged and now cover three-fifths of the surface of the country in the Congo Basin, the Batéké Plateau and the Coastal Basin.

**Box 1: Economic geology of the Congo Craton.**
*Source: E. Pereira Gomes, 2010*.\(^5\)

The portion of continental crust located in the central part of the African continent called Congo Craton behaves in a tectonic stable way compared to structuring of the mobile belts formed along the Proterozoic area that surrounds it. The Archaean hearts of the cratons are generally made of heavily metamorphosed rocks, as well as belts of green rocks (“greenstone belts”), and are often surrounded by the Proterozoic orogenetic provinces, called “mobile belts.”

The presence of this craton in Republic of Congo is important, because it contains a significant number of gold and iron deposits in central Africa. Thus, iron deposits concentrated at the borders of Cameroon, Republic of Congo and Gabon are associated with Archaean and Paleoproterozoic rocks. The deposits of Belinga, Minkebe, Kokomegu (Gabon), Nabeba, Avima (Republic of Congo), Udders, Nkout and Mbalam (Cameroon) are among the most known in the area. Mbalam is a world-class deposit overlapping the Congo–Cameroon border. This deposit is located in vast sequences of itabirites (formations of iron known as “ribboned” which constitute the principal iron deposits of the world) that belong to the Archaean Complex of Ntem. Iron deposits located in the southeastern part of Gabon and the northwest of Republic of Congo were formed in a geological environment quite similar to that of the Mbalam deposit.

2) The “greenstone belts” constitute the main part of existing mineralizations in the Congo Craton and a great diversity of mineral resources is associated with them: iron, manganese, copper, nickel-cobalt and gold in particular. Apart from these areas, principal mineral resources are lead, lead-zinc and copper in the Niari basin; uranium, gold, wolfram, tin, molybdenum and diamond in Mayombe; as well as deposits of potash and sedimentary, uranium-bearing phosphates in the Coastal Basin.

3) The presence of similar geological environments in central Africa, West Africa and

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\(^2\)Age between 3.2 and 2.8 million years.
\(^3\)Age between 2.5 and 1.6 million years.
\(^4\)Age between 1 and 542 million years.
\(^5\)E. P. Gomes (June 10, 2010), Mining Potential of Basin of Congo and Its Surroundings, in preparation, the World Bank.
throughout the world indicates that the mining potential of Republic of Congo could reveal itself greater than what is known today, provided that activities of geological knowledge development are carried out successfully. For example:

a) The majority of the types of deposits identified in Congo can be found in similar metallogenic environments throughout the world, such as in Australia, Canada and Scandinavia, but in a more numerous way because of older mining activity and, therefore, of a more intense exploration and complete mining inventory. This is the case for deposits of iron oxide, copper or gold polymetallic volcanic massive sulphide, exhalative sedimentary deposits minerals of the group of platinum associated with base metals sulphides (Ni-Cu-PGE) or stones and precious metals.

b) The Paleoproterozoic domain known as Birimian, which is similar to the west African craton, contains: i) world-class ribboned iron deposits (Simandou-Nimba in Guinea, Liberia and Sierra Leone); ii) manganese deposits (Mokta in Ivory Coast; Ntsuta, Tambao, Kiéré in Burkina) and metals associated with zinc in the sulfurous Massifs (Perkoa, Nabenia-Tenga); iii) titanium and volcano-sedimentary iron deposits group; iv) tin, rare earths, niobium-tantalite\(^6\) associated with orogenetic bodies of leucogranitic type; and v) Paleoproterozoic diamonds (Borsalogho, Comoé, Akwatia).

c) Post-Paleoproterozoic mineralizations encompass: i) uranium in the Neoproterozoic sedimentary cover; ii) diamonds of Mesozoic age (Guinea, Sierra Leone); iii) lateritic Ni-Co deposits; and iv) vast bauxite deposits (Guinea)\(^7\).

d) In Democratic Republic of Congo (DRC) and Zambia, “Copperbelt” copper and cobalt deposits contain approximately a third of the world’s reserves of cobalt and more than 10% of the copper reserves; they present similarities with the Niari formations in the southwest of Congo. In addition, mineralizations in lead, zinc, nickel, germanium, gallium, uranium, manganese, gold, silver and platinum group elements (PGE) can also be found there. Added to them are deposits of tin, tantalum, lithium, molybdenum, beryllium, and wolfram, niobium, arsenic and gold.

2. Status of cartography and mining inventory

4) Historically, the various geological work completed until now in Congo can be divided as follows:

a) Significant geological cartography works were undertaken by BUMIFOM (Mining Office of Overseas France, distant ancestor of the current French Geological Service, BRGM) before independence as well as by many university researchers, leading to publishing of various geological maps at a scale of 1:500,000\(^8\).

b) After independence, reconnaissance, research and prospection, works were also carried out by several assistance and cooperation missions—the BRGM, the Environmental Development Fund (EDF) and the United Nations Development Program (UNDP)—as well as by national companies such as the National Company

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\(^6\)More commonly known under the name coltan (colombo-tantalite).


of M‘fouati Mines (SONAMIF) and the Congolese Mining Research and Development (SOCOREM) with technical assistance of Soviet technical assistance.

c) The Mineral Plan of the Popular Republic of Congo\(^9\) published in 1983 summed up the results of this former research, made an inventory of the then-identified substances and mineral ore deposits and defined objectives for later development of the mining sector.

d) The last map, completed in 1993 by F. Desthieux (assisted by national geologists) consisted, according to the statement of its author \(^{10}\), of a compilation of already published maps at 1:1,000,000, including the French Equatorial Africa geological map at 1:2,000,000 by Gérard (1958) and the geological map of Republic of Congo at 1:500,000 by Dadet (1969) relating to only the southern zone and summarizing post-1969 works. The only new data used for its update were those (specifically) resulting from thesis works and scientific publications, supplemented by the interpretations of aerial photographs, in particular for the northern part, which hitherto was not the subject of any work.

5) **In spite of their relative abundance, works completed so far and geological and mining knowledge acquired still remain very fragmentary.** Their one-off nature and focus on the southern part of the country does not allow for a complete geotectonic and metallogenic model through a correlation with regional structures recognized in neighboring countries following more complete inventory works. It also does not make available to potential investors sufficiently detailed geological or thematic maps, on appropriate scales, to be used as support for the inventory and control of all phases of mining research activities.

6) **The existing geological maps are of old designs.** They do not integrate the knowledge and modern methods of geological, geophysical or geochemical acquisition and do not reflect recent data collected through isolated works, undertaken by mining companies, or by correlation with structural data obtained through teledetection methods in neighboring countries.

3. **Status of geological and mining information management**

7) **The history of conflicts in Congo had a disastrous impact on geological and mining documentation.** Indeed local resource centers and libraries were destroyed everywhere in the country, including within the administration and university and training structures. The majority of documents were either destroyed or dispersed. A significant number of reports from geological and historical mining research campaigns are available to the Directorate-General of Geology (DGG), but in disorder and in a very poor state. Carrots and samples of old works have not been preserved.

8) Recent internal efforts made it possible to locate and start an inventory of reports still available to the DGG’s Resource Center, and to engage in negotiations in order to repatriate documents available in France in the BRGM’s files, to reconstitute the collection holdings of the Ministry of Mines and to install the tools essential for its management and its consultation.

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\(^{10}\) MME-DGM: Explanatory note on the geological map at 1:1,000,000, 1993.
9) The Mining Research and Prospection Service of the Ministry of Mines receives a significant number of periodic reports from mining companies on activity, but the Ministry lacks adequate means for their treatment or for compilation and dissemination of the unconfidential geological and mining data they contain.

4. Potentials and major types of identified deposits

10) The studies of Congo’s sub-soil, however, have already revealed many indices and deposits of noble elements and precious metals (gold, money and cobalt); precious stones and heavy minerals (diamonds, ilmenite, rutile, zircon and monazite); “strategic metals” 11 (Ti, Sn, W, Nb, Ta); ferrous and nonferrous metals (Fe, Zn, Cu, Pb); solid fuels (uranium, peats and bituminous shales); and industrial minerals (barytine, potash, phosphates and limestones for cement). The following paragraphs review the main minerals existing in Congo as well as their type of respective deposits identified to date.

11) Gold. Placer deposits have been exploited over time in an artisanal way, essentially for gold, but also for tin, tungsten and colombo-tantalite. These deposits are typical of the rivers throughout the country, in sectors of Kellé, Mboma and Elogo in the northeast and in the coastal basin (Kouilou), and come from strong concentrations in pegmatites, some of which remain undiscovered in Archaean Chaillu Massif and Ivindo. Gold, the total production of which is estimated to date at 10 tons (t), would come from remobilization of primary mineralizations, similar to those known in south and west Africa, or elsewhere in central Africa, associated with Pan-African greenstone belts. Gold traces are, in particular, known to exist in the formations of Mayumba, and are sometimes associated with the ferruginous volcanogenic rocks of Zanaga and Mayoko or with the polymetallic deposits (Pb-Zn-Cu).

12) The areas with strong gold-bearing potential are the areas of Mount Avima (equivalent of Bélinga in Gabon) and Kellé-Me Bomo in northwest Congo, as well as Chaillu Massif (deposits of Mayoko). Indeed, there are many alluvial indices that could justify the research of primary mineralizations in the context of greenstone belts (volcanogenic formations of age ranging from Archaean to Paleoproterozoic).

13) Diamond. Republic of Congo has a real diamond potential, although still little known, which lies on a favorable geotectonic position in the edge of the great producing zones of Angola and DRC. The current potential is primarily constituted by the alluvial resources found in the zones of the Kouilou bedrock, Chaillu or Kellé Mbomo, where diamond is produced in parallel with gold. But other zones in Likouala, the western Basin, Niari and Lekoumou are also famous for their diamond potential. Diamonds were actually found across the country, without their primary source or any deposit of economic interest being identified. The BRGM 12 was commissioned to estimate the diamond potential of the country as a basis for re-integrating the Kimberley Process 13.

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11 Called such because of their new importance in high technology industries (aeronautics, telecoms, etc.).
13 The Kimberley Process is an international certification mechanism for the export of rough diamonds, with the objective of preventing sales of conflict diamonds on the international market.
14) In the four identified diamond-bearing zones, sectors of interest defined from the available data cover a surface of approximately 26,000 km² and the estimate gives an order of magnitude of approximately 8 million carats.

Map 1: Possible origin/source of diamonds in the Republic of Congo.

15) **Potash.** Potassium is one of the seven most abundant elements on the earth’s crust. Very significant accumulations of potash, which one finds at the bottom of old lakes and seas, allow its economic exploitation. In Congo, evaporites are known in the formations of Loemé, which shelter a great number of potash and magnesium deposits: Pointe Noire, Makola, Holle and Kouilou are examples of these stratiform deposits associated with sedimentary deposits of salts and gypsum of lower Cretaceous origin. These deposits, located close to each other, are distributed along salt layers that extend from the southern coast of Gabon, crossing the area of Pointe Noire (RC) for more than 50 km, the enclave of Cabinda (Angola) and finally the coast of DRC. Sylvinite is the mineral most generally exploited in the world, but in the old mine of Holle, carnallite was more abundant.

16) **Magnesium.** According to MagMinerals, the company that holds the license in Mengo, 20 km east of Pointe Noire, the total deposits would represent approximately 800 billion metric tons of resources of magnesium salt\(^\text{14}\).

17) **Iron.** Significant iron ore deposits are associated with volcanogenic formations of the Archaean Chaillu Massif in Lekoumou (Mayoko, Zanaga, Bambama, and Madzoumou),

originating from quarzites rich in magnetite and hematite, which become altered in hot and wet climates. The ore is in general detrital, associated with much altered metamorphic rocks rich in ribbon-type iron formations (“BIF”). Altered and disintegrated ferruginous quarzites with low-grade iron (hematite and magnetite) are often covered by an exceptional grade hematite crust that can be the subject of a first production phase and Direct Shipping Ore (DSO\textsuperscript{15}).

18) As an example, prospection in the mountains of Avima carried out by Core Mining showed that the area contains at least 690 million tons of inferred resource at 58\% Fe\textsubscript{2}O\textsubscript{3}. That is equivalent to what is found in the eastern iron deposit (“BIF”) of Bélinga in Gabon.

19) **Polymetals.** Polymetallic deposits with predominant Cu, Pb and Zn are common in Bouenza and the basin of Niari, up to the metallogenic province of Katanga (DRC). The most widely known are located in Boko-Songho, Mfouati, Mpasa and Mindouli. These are stratiform and discordant deposits of “Mississippi Valley”-type (MVT) in the west of Congo, in contact with schisto-limestones or shale-sandstone. Cu-Pb-Zn ores are strongly oxidized (malachite, azurite, cerusite, calamine). Sulphides seem rare there.

20) The most important district is that of Yanga-Koubenza-Palanda, which shows an important potential of Pb (some estimate more than 1 Mt). Former work had indicated Pb resources of 8\%, Zn of 7\% and Cu of 9\%. In Boko Songho, Cu-Zn-Pb were exploited by SOCOREM between 1979 and 1983. In parallel, complementary prospections between 1980 and 1991 identified additional resources (for instance Djenguele Kalomba and Malembe).

21) **Phosphates.** Slightly uranium-bearing phosphates exist in the marls of Madingo. They are of Cenozoic age (Senonian to Eocene) and form lenticular layers (< 10 meters [m]) in a narrow band that crosses the Coastal Basin.

22) **Peat.** Coastal plain peat bogs and those of the Basin of Congo, and many existing building material deposits supplement the list of Republic of Congo mining potentials.

23) **Bituminous sandstone.** Bituminous sandstone indices are recognized in Cretaceous deposits of the Série de Contact, in the paleovalleys notching the crystalline basement and throughout the western edge of the chain of Mayombe. The occurrence of such indices confirms the oil potential of the Bassin Côtier on-shore domain. Bituminous sandstones fall within the scope of the Mining Code insofar as they are considered for non-energy use.

24) **Industrial minerals.** Additional studies would be needed to provide supplemental information on industrial minerals.

5. **Recommendations**

25) **Chances to develop mineral resources can be considerably reinforced by a better knowledge and understanding of the national geological endowment.** To stimulate

\textsuperscript{15}Direct Shipping Ore (DSO): iron ore, the high grade of which allows for direct export without processing.
research and exploration and to adequately promote its resources, the Government must improve knowledge of the sub-soil. The availability of more and better geological data leads to a greater interest on behalf of explorers and mining operators and, all other things being equal, puts the host country in a better position for exploration and exploitation. That is all the more true in the current context of high commodity prices. Geological data acquisition is, consequently, a high-yield public investment\textsuperscript{16}.

26) **On the basis of the preceding analysis, a geological data management and acquisition program should be launched to make up the obvious deficit of** geological, geophysical and geochemical information that characterizes the country, compared to its neighbors, Basin of Congo. Several priority components can be identified:

a) **To invest in geophysics airborne surveys.** Broad zones are not covered by geophysics data, and existing data must be reorganized and reinterpreted using technologies and modern approaches. A geophysics data acquisition campaign mobilizes airborne means (a plane or helicopter makes flights over areas of 400 m to 500 m and the data is used for a regional synthesis) and uses magnetism and radiometry techniques. This type of public investment is all the more necessary as the particular geographical and geomorphological condition\textsuperscript{17} and lack of infrastructure make exploration comparatively more expensive or risky than in other regions.

b) **To improve geological cartography.** General knowledge of the country’s mineral resources is limited and partly outdated. The Government should update and supplement the geological cover by means of modern technologies and a standard approach going forward (using airborne geophysics and regional geochemistry data in particular). As an example, detailed cartography works (square degrees at 1:200,000 scales) were completed in Gabon during the last 20 years, with a joint financing of donors and the Government anxious to prepare for the after oil\textsuperscript{18}. As in all countries of the world, national geological information can be applied not only for the mining sector but also for hydrogeology, risk management, the environment, etc.

c) **To improve geo-scientific information management.** The acquisition of geological information alone is not valuable enough to justify public financing. Once acquired, geological data must be preserved, interpreted and transformed into useful products, and managed and disseminated in order to promote long-term development of the mineral sector, as well as other possible land uses. Geological data are not well preserved, and existing information is dispersed and inaccessible. Some data is even outside the country. This national heritage must be safeguarded, computerized, valued and made accessible to the greatest possible number of people. The government must encourage creation of modern, GIS-type\textsuperscript{19} computerized management system.

\textsuperscript{16} This is captured in the Charter of Natural Resources, which sets out key principles for sustainable development of mineral resources, cf. [http://www.naturalresourcecharter.org/](http://www.naturalresourcecharter.org/).

\textsuperscript{17} Dense equatorial vegetation and broad quaternary sedimentary cover.

\textsuperscript{18} See *Conclusions and Summary of Recommendations* at the end of the report for a more detailed justification.

\textsuperscript{19} GIS: geographic information system.
During this research, the Department of Mines was in discussion with various partners to develop a comprehensive program of geology. The 2012 Budget Law provided substantial funding (86 million CFCA, equivalent to 200 million USD) for different activities, largely corresponding to previous recommendations: i) national airborne geophysical campaign, ii) up to 17 geological maps at 1:200,000, iii) prospecting of some selected mining targets, iv) training etc. Enhanced supervision of that program, including for technical specifications, will be critical to ensure optimum and rational utilization of public funds and management of geological information oriented for development.
CHAPTER 2. MINING PRODUCTION POTENTIAL
MINING PRODUCTION POTENTIAL

1. History

1) An overview of Congo’s mining history can distinguish four periods, as described in the table below and the following paragraphs.

Table 3: Historical evolution of mining production in Republic of Congo.

<table>
<thead>
<tr>
<th>Period</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonial period</td>
<td>• Partially mechanized mining activities of small scale</td>
</tr>
<tr>
<td>1960‒1989</td>
<td>• From independence to the fall of the Soviet block, development and efforts of the mining sector, on both the artisanal and industrial level</td>
</tr>
<tr>
<td>1989‒2005</td>
<td>• End of industrial operations, political turmoil, poor dynamism in mining</td>
</tr>
<tr>
<td>2005‒2012</td>
<td>• Since the new Mining Code of 2005, kickstart of mining exploration, and of certain old targets of polymetals, potash and iron</td>
</tr>
</tbody>
</table>

2) Mining production is very marginal today and for several decades has been only artisanal, but Congo knew several episodes of industrial production in the past.

a) Mining productions in Congo began before the twentieth century with artisanal exploitation of base metals, in particular copper and lead in Niari and Nyanga. Mechanized exploitation of base metals started in the Pool department in 1900, by a Dutch company in Renéville. It then extended modestly to gold, cassiterite and wolfram, as well as to colombo-tantalite, corundum and diamond on a multitude of indices and small deposits such as the gold-bearing flats of Mayombe, Chaillu and the north of Congo. These deposits were exploited between 1938 and 1959 by small mining companies (Dimonika, Mining Company of Kouilou, CAMCK, Mining Company of Dolisie, SONAMIS, etc.) and individual owners registered with and approved by the colonial Administration.

b) Following independence in 1960, there was a boost in gold mining. The last active European gold mining companies departed and the Government authorized all interested Congolese to exploit alluvial gold throughout the territory.
c) In the year 1970, the Congo Potash Company (CPC) exploited the potash deposit in Holle, about 40 km to the northeast of Pointe Noire. The exploitation of potash began there following its fortuitous discovery in the 1960s by a trade union associating the SPAEF, Mines Domaniales de Potasses d’Alsace and BUMIFOM during the course of an oil prospection in the vast Coastal Basin. The mine produced only from 1969 to 1977, and operations ceased following enormous water damage, which drowned the whole mine in a few days.

d) There was a small amount of industrial production of copper in Congo from 1979 to 1983 by the national company SOCOREM in Boko Zongo and Yanga in Kouilou, in the east of Pointe Noire. However, it ceased after withdrawal of Soviet technical assistance and the subsequent fall of commodity prices. SOCOREM, the Congolese research and mining company, was created in 1979 and disbanded in 1994. The output during this period was 70,000 t of concentrate containing 51% Pb, 30% Zn and 4% Cu (the equivalent of 2800 t of copper metal). The Mining Company of Mpassa (SMP) also produced a combined total of 200,000 t of metal at the Mpassa mine.

2. Current artisanal production

3) Current artisanal production consists of diamonds, gold and industrial minerals that miners are mainly exploiting in an informal way. Artisanal mining takes place on almost all the territory, except in the Congolese Basin and Bateke Plateaus, where there is no gold mining or artisanal mining reported. It remains first and foremost a village activity and would represent between 5,000 and 25,000 direct employment opportunities, according to sources. In addition to diamonds and gold, which are further discussed in the following paragraphs, other substances are also exploited in an artisanal way or with the use of small-scale mechanization: gypsum, clay, limestone, marble, salt, shale, sand and gravel, rubble and semi-precious stones (for example, the garnets of Sandare). Taking into account the current boom in construction, a significant quantity of construction geo-material is probably extracted around consumption areas, namely Brazzaville and Pointe Noire, but no reliable statistics are yet available in this field.

4) Congo is a relatively minor diamond producer on the international level, but it shares borders with very important countries on continental and international levels. The statistics of production available (listed by the United States Geological Survey [USGS]) present discrepancies that are difficult to explain: 22,000 carats in 2007 and 110,000 carats in 2008, for example. Following the exclusion of Congo from the Kimberley Process in 2004, in 2006 BRGM evaluated production at 110,000 carats per annum. Sixty percent of this production came from the department of Likouala. The same source (undoubtedly the most in-depth on the subject at this stage) estimated that an

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20BRGM estimates the number of artisanal miners at 5,000 in its 2004 study; the study on artisanal and small-scale miners in Africa carried out by Karen Hayes (PACT) in 2008 estimates this total at 25,000.
21A geo-materials inventory of Congo is announced by the Ministry of Mining and Geology in cooperation with UNDP.
22Because the level of diamond exports was much higher than the national production capacity, and Brazzaville was denounced as a “hub” of illegal diamond trafficking, Congo reintegrated the Kimberley Process in 2008 after having implemented the necessary monitoring measures.
objective of producing 300,000 carats per annum over a period of 4 to 7 years was ambitious but realistic given the mining potential of the country, provided reforms to oversee the sub-sector. Such production would approach that of the Central African Republic but would remain very far short of two other southern neighbors of Congo, Democratic Republic of Congo and Angola, which appear, for gems as for diamonds of industrial quality, among the biggest world producers (see table below).

Table 4: World diamond production (gem quality and industrial quality).
Source: USGS, 2011.

<table>
<thead>
<tr>
<th>Gemstones (thousand carats)</th>
<th>Industrial (thousand carats)</th>
<th>2009</th>
<th>2005–2009 Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botswana</td>
<td></td>
<td>24,000</td>
<td>24,380</td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td>17,791</td>
<td>21,883</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td>10,946</td>
<td>13,697</td>
</tr>
<tr>
<td>Angola</td>
<td></td>
<td>8100</td>
<td>7895</td>
</tr>
<tr>
<td>Congo</td>
<td></td>
<td>3600</td>
<td>5260</td>
</tr>
<tr>
<td>South Africa</td>
<td></td>
<td>2400</td>
<td>5240</td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td>60</td>
<td>3,289</td>
</tr>
<tr>
<td>Namibia</td>
<td></td>
<td>2300</td>
<td>2,261</td>
</tr>
<tr>
<td>Guinea</td>
<td></td>
<td>2400</td>
<td>1,307</td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td>500</td>
<td>666</td>
</tr>
<tr>
<td>Lesotho</td>
<td></td>
<td>450</td>
<td>327</td>
</tr>
<tr>
<td>Central African Republic</td>
<td></td>
<td>300</td>
<td>322</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td></td>
<td>200</td>
<td>310</td>
</tr>
<tr>
<td>Guyana</td>
<td></td>
<td>179</td>
<td>263</td>
</tr>
<tr>
<td>Ivory Coast</td>
<td></td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td>Tanzania</td>
<td></td>
<td>150</td>
<td>201</td>
</tr>
<tr>
<td>Brazil</td>
<td></td>
<td>182</td>
<td>187</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td></td>
<td>100</td>
<td>124</td>
</tr>
<tr>
<td>China</td>
<td></td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Venezuela</td>
<td></td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>126</td>
<td>95</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>74,100</td>
<td>88,060</td>
</tr>
</tbody>
</table>

5) **Artisanal production of gold is low but is likely underestimated.** Official statistics of the colonial Administration established total production of gold between 1935 and 1962 at 8633 kilograms (kg). For the following period, an official report on management of gold mining in Congo published the following statistics:

The “peak” in production between 1965 and 1970 can be explained by the proactive role played by the Mining Administration in collecting from gold washers via official collectors financed by a public treasury account. Since then, Administration financing has been limited, and the State has divested by authorizing opening of a private gold purchase counter. The current artisanal production of Congo, evaluated by the USGS at 100 kg of gold per annum, appears largely underestimated. It corresponds to about one-third of the estimates of artisanal gold production in Gabon (300 kg) and is lower compared to production recorded during periods when prices were much less attractive.

3. Exploration activities

6) Prospection and mining exploration activities have re-dynamized in the past few years. Since the end of political and social disturbances in 1990 and enforcement of the new mining code in 2005, there is renewed interest from investors, which is reflected in relatively intense mining exploration and development activity. This may lead to substantial investments in the medium term. In the fourth quarter of 2010, the Directorate-General of Geology posted 48 valid prospection licenses held by 28 different companies and 49 valid research permits held by 26 companies.

7) This momentum is observable for a great number of substances and is focused in four departments. The researched substances are diverse—including gold and related substances, rough diamonds, iron, potash, platinum, chromium, uranium and bauxite—and therefore all the geological units are concerned (the coastal plain, the Chaillu and Ivindo Massifs, the Sembé-Ouesso Complex, Mayombe, and western Congo). In addition, the status of the valid mining titles in the fourth quarter of 2010 shows a concentration of prospection in the departments of Kouilou, Cuvette-Ouest and Niari for gold, iron, uranium and phosphates. Prospection for diamonds is widespread throughout the four departments.

Figures 2: Distribution of prospecting licenses at the end of 2010.
Source: Ministry of Mines and Geology, 2011.

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In particular, the company METRA SARL, accredited in 1995, recorded production varying between 12 kg and 55 kg per annum until 1999 in the regions of Kouilou, Sangha and Cuvette-Ouest.

According to USGS.
Likewise, the status of valid exploration permits in the fourth quarter of 2010 shows a concentration of mining prospection in the departments of Kouilou, Niari and Cuvette-Ouest, in large part for gold, iron and potash. Exploration for gold, diamond and polymetals is also intense in numerous departments.

**Figures 3: Distribution of exploration permits at the end of 2010.**
*Source: Ministry of Mines and Geology, 2011*

8) **With regard to exploitation, only four licenses have been granted to date** (at least since enforcement of the Mining Code of 2005) to three companies, for well-known areas. Even if it is difficult to clearly envision their development in the future, these licenses unquestionably correspond to the most advanced projects in Congo:

a) The exploitation license for potash in Mengo in the zone of Pointe Noire (Kouilou) held by the Canadian company, MagMinerals Potasses Congo (MPC), a subsidiary of
MagIndustries, was repurchased in August of 2011 by the Chinese company Evergreen.

b) (Exploitation licenses for polymetals in Boko Songho and Yanga-Koubanza, and Mindouli-Passa.) The first two, located in the zone of Mfouati/Boko Songho are held by SOREMI SA, a private company not listed on the stock exchange, with a majority American shareholding, while the third, in the department of the Pool, was granted in June of 2011 to the Chinese company Lulu Mining.

9) **Projects under exploration may be schematically gathered in three sets, forming a “pyramid.”** The progress of exploration projects and their probability of reaching entry into production is often hard to assess. At least two essential stages can be retained: i) the prefeasibility stage, during which the project owner has the mineral reserves (tonnage and grade) certified independently with a known margin of error according to the density of completed samplings; and ii) the feasibility stage, during which the project owner has the profitability of the deposit guaranteed on the basis of market assumptions (demand, supply and price).

*Figures 4: Pyramid of the major mining exploration projects in Republic of Congo.*


![Pyramid Diagram]

- **Feasibility**
  - Bankable feasibility in market conditions
  - Zanaga (Fe), Nabeba (Fe – phase 2), Mayoko (Fe), Mindouli-Mpassa (Cu, Pb, Zn)

- **Pre-feasibility**
  - Drilling campaigns, definition of resources, certification of reserves
  - Mengo (KCl), Boko Songho et Yanga-Koubanza (Cu, Pb, Zn), Nabeba (Fe – phase 1)

- **Situation mid-2011**
  - Avima (Fe), Mayoko Moussondji (Fe), Sintoukola (KCl), Badondo (Fe), Kola (KCl), Reneville (Au), Makola (KCl), Loango (KCl), Tchizalamou (KCl), Kingoula (Au), Youkou (Fe), Malambani (Au, Di), Hinda (PO4, U), Kakamoeka-Pambou (Au), Holle (KCl), etc.

4. **Prospects for industrial production**

10) **Several industrial mines could start in the short run.** The most advanced projects confirmed existence of rich deposits of metals and minerals that benefit from a favorable market. These projects also benefit from an overall favorable politico-economic context. The macroeconomic framework of Congo, with high prices of oil and sustained production, is excellent. In addition, the Government has resolutely included the mining

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25The Australian standard of the Joint Ore Reserves Committee (JORC) and that of the United Nations International Framework Classification for Reserves/Resources (proven and probable reserves; measured and indicated resources) are most commonly used.

27
sector in its strategy of development and shows a clear will to support it to diversify the economy.

11) **The potash project of Mengo is the most advanced to date.** MPC is certified for its Mengo project for proven reserves of approximately 33.5 million t of potassium chloride (KCl), sufficient for 28 years of production at the rate of 1.2 million t/year. Complementary resources (“inferred reserves”) up to 209 million t could extend the life of the mine for 54 additional years. In 2011, this potash project, the feasibility of which was established in 2008, is one of the most advanced among all the “greenfield” projects that are not yet in construction in the world. The purchase of MagIndustries by the Chinese company Evergreen Industry Group\(^{26}\) announced a decisive change. The first production is now planned for mid-2015.

12) **More generally, the potash deposits of Congo benefit from unquestionable assets when compared to others in the world.** In addition to the Mengo project, several other less advanced potash exploration projects are indexed primarily in Kouilou, in particular Sintoukola Potash (Elemental Minerals), and Holle Potash (Holle Potash Corp.). The projects in Congo are generally of good grade (20%–25%, comparable with the mines of Saskatchewan). They are exploitable at the average depths of 300 m, whereas the deposits of Saskatchewan are exploited to more than 1000 m depth\(^{27}\). Congo is rich in sylvinite, the more exploited mineral in the world, and in carnallite, the richest in byproducts (Mg). In Congo, exploitation can be done by dissolution\(^{28}\), which implies investments and less costly extraction\(^{29}\) compared to concurrent underground mines in Canada and elsewhere. On the African continent, the only other district known to be so rich to date is in Ethiopia/Eritrea. Lastly, and perhaps most importantly, the projects under study are between 20 and 100 km from the port of Pointe Noire, which is very advantageous compared to the 1700 and 2500 km inland for certain mines in Canada. Additionally, the area of Pointe Noire has an important natural energy potential; the greatest part of the gas is still flared currently.

13) **It will nevertheless be hard to penetrate the international market of potash.**

   a) A certain confidence prevails on the side of international demand, driven by growth of agricultural markets and demand for manure\(^{30}\). The strongest demands come from China, the United States, India and Brazil, followed at a distance by Indonesia and Malaysia. The prices of potash remained relatively stable for many years (around $150–$200/t) before climbing abruptly at the time of the 2007 food crisis, to reach $700 to $900/t in 2008. They fell since to $300/t and recently have risen to $400/t\(^{31}\). Today analysts forecast a short- to medium-term price around $600/t, a symbolic

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\(^{26}\)Acquisition completed with the Toronto Stock Exchange at the beginning of August 2011 for a total of $121 million.

\(^{27}\)Which on the other hand presents significant hydro-geologic risks, given that the aquifers are not very distant from rich layers.

\(^{28}\)The method of dissolution consists of digging wells at regular intervals, injecting water, which, percolating in the targeted subsurface layers, dissolves potassium salts that are then pumped to the surface. This method of extraction does not have a visible quarry on the surface.

\(^{29}\)U.S. $0.55/lb, 2000 estimate.

\(^{30}\)Potassium is a nutritive element for the growth of plants and amplifies the development of harvests.

\(^{31}\)This price is, however, only speculative because there is no centralized market for potash; exchanges are generally made on the basis of annual contract with prices specific to producer countries.
value that makes a great number of current exploitation projects theoretically viable.

b) However, very significant investments (> $13 billion worldwide) have been made since 2008, primarily for “brownfield” projects (investments perceived as less risky), but also for several world-class “greenfield” projects controlled by major companies: Rio Colorado (Argentina, Vale), Jansen (Canada, BHP), the Eurochem projects (Russia) and Legacy (Canada). On the whole, there were more than 70 projects in 25 countries throughout the world in 2010 to satisfy the increasing demand. The vast majority have reached only the stage of delimitation of resources, but more than a dozen projects are now beyond the stage of feasibility. Many exploration projects are now located in new countries that sometimes offer significant tax advantages to compensate for the country’s risk. However, the Canadian province of Saskatchewan will always represent the “Saudi Arabia of potash,” with 30% to 50% of world production. Enormous additional capacities are in the course of construction, and exploration in this region is always very dynamic.

14) In the same way, iron deposits of Congo have undeniable comparative advantages. Many iron ore deposits associated with the volcanic sedimentary formations of the Archaean Chaillu Massif and Ivendo have very good tonnage/grade and generally favorable granulometric characteristics. Moreover, the production costs announced by the companies involved are cause for optimism: DMC announced $50/t for iron in Lekoumou (Mayoko), Core Mining $23/t for Avima, and $20/t for iron in Nabeba. It is necessary to distinguish in the table below between the two “structuring” projects Zanaga and Nabeba-Mbalam that imply processing plants, the Avima project which plans large quantities of DSO with no processing plant, and the more modest DSO export projects. The area of Mayoko can take advantage of high-grade ores exploitable in DSO and, of a historical haulage rail line: the line of the Chemin de Fer Congo Ocean (CFCO), which in the past transported Gabonese manganese. If this railway proves operational and its capacity can be optimized, it would represent a decisive advantage because the majority of African iron projects with which Congolese iron projects enter into competition will imply colossal investments in railways. Lastly, access to hydroelectric energy, theoretically possible considering the potential of Congo, would be also a major advantage for a large-scale project like Zanaga.

Figures 5: Major iron exploration projects in Congo.

<table>
<thead>
<tr>
<th>Project</th>
<th>Company</th>
<th>Resources/reserves</th>
<th>Targeted production</th>
<th>Entry into targeted production</th>
<th>Remarks</th>
</tr>
</thead>
</table>

32In addition to grade, physiochemical parameters of the deposit decisively influence the value of the ore. The critical factor is granulometry, which determines which process will be used to turn minerals into iron metal. The ore in fine particles cannot be loaded directly into steel furnaces. It is necessary to agglomerate, either in the form of sinter (in general integrated into the iron and steel industry), or pellets (in general completed by the ore producer). The production costs increase enormously if it is necessary to concentrate, in particular because of the energy consumption of the crushing operations.

33Such values are still very hypothetical at this point. They would represent half of the production costs in China and would even be lower than those known in Brazil (U.S. $30–$40/t).
| **Zanaga** | MPD Congo (Xstrata) | 4.0 bil t @ 33.9% of iron | 30 mil t/year expected | 2018 | Resources in conformity with JORC Code. $7 bil investment |
| **Avima** | Core mining (Sevestral) | 690 mil t @ 58% | 35 mil t/year expected | 2016 | $4-5 bil investment |
| **Nadeba (North) – MBalam** | Congo Iron (Sundance Resources) | 415 mil t @ 62% Fe, of which 252 mil t in the Congolese side @ 63.6% Fe | 35 mil t/year (1st phase of 25 years) | 2016 | Cross-border project with Cameroon (Mbalam). $3.3 bil investment |
| **Mayoko** | DMC (African iron) | 33 mil t @ 55% of iron | 5 mil t/year | 2013 | Shallow supgene hematite. $250 mil investment |
| **Badondo** | Congo Mining (Equatorial Resources) | 3.6–6.1 bil t @ 30%–65% in the process of confirmation | Drilling began in the second half of 2011 | - | - |

15) **International and regional competition at the market entry will be tough.**

a) On the demand side, strong steel consumption by China and other emerging economies, Asian or not, has created an increasing demand for iron ore (this in spite of a significant rate of steel recycling). By signing an agreement in 2010 with Vale that implied a 90% price increase, the Japanese companies (Nippon Steel and Sumitomo) shook a 40-year old system based on annual delivery contracts that had previously guaranteed steel plants an iron price around $100/t. Iron recorded historic prices on the spot market in 2011 ($179.50/t as of Friday April 8, 2011 on the Chinese spot market, as compared to $60/t at the end of 2008). Unless a major global crisis and prolonged recession happen, the raw materials deficit is expected to continue at least until 2013.

b) Nevertheless, the number and prospectivity of iron projects under development is impressive. Iron is an abundant mineral, exploited in about fifty countries, primarily in open cast mines. The world’s iron deposits are relatively numerous and their average grade is usually high (between 30% and 60%). China is the first world producer, but Australia and Brazil largely dominate the overseas market, each accounting for approximately one-third of world exports. The greatest proportion of ore transported in the world is hematite concentrates. Three major players—Rio Tinto, BHP Billiton and Vale—largely dominate this market, but Asian (China, India, 34$110/t in 2009. Prices are expressed in U.S. cents/dry (metric) unit ton, a unit ton containing 10 kg of iron metal. The reference price generally used is that of fine-grain mineral.
Korea, Japan) and Russian iron and steel giants actively attempt to reduce their
dependence on these few majors while investing in the mining sector.

c) In particular, in west Africa and central Africa, many projects are in direct
competition with the projects in Congo. A target of significant investments, Africa
(which supplies only 4% of world iron) will represent, according to experts, more
than 15% of production within ten years. This is taking into account the many
projects under development, in particular in west Africa (Guinea, Mauritania, Sierra
Leone, Liberia and Senegal) and central Africa (Cameroon, Congo Brazzaville).
Republic of Congo, Gabon and Cameroon together form one of the richest iron-
bearing areas of the world35.

<table>
<thead>
<tr>
<th>Project</th>
<th>Company</th>
<th>Country</th>
<th>Forecast of production/expansion</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mbalam</td>
<td>Sundance Resources</td>
<td>Cameroon</td>
<td>35 mtpa</td>
<td></td>
</tr>
<tr>
<td>Prioskolskye</td>
<td>MMK</td>
<td>Russia</td>
<td>35 mtpa</td>
<td></td>
</tr>
<tr>
<td>Belinga</td>
<td>CMEC/Gov</td>
<td>Gabon</td>
<td>30 mtpa</td>
<td></td>
</tr>
<tr>
<td>Tonkolili/Marampa</td>
<td>African Minerals</td>
<td>Sierra Leone</td>
<td>25 mtpa</td>
<td></td>
</tr>
<tr>
<td>Pilbara, Baffin Island, Creek</td>
<td>Fortescue</td>
<td>Australia</td>
<td>105 mtpa</td>
<td></td>
</tr>
<tr>
<td>Sino</td>
<td>Citic Pacific</td>
<td>Australia</td>
<td>28 mtpa</td>
<td></td>
</tr>
<tr>
<td>Anglo American</td>
<td>Global</td>
<td>35 mtpa</td>
<td>King expansion programs of the 4 largest mining companies</td>
<td></td>
</tr>
<tr>
<td>Valé</td>
<td>Global</td>
<td>120 mtpa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rio Tinto</td>
<td>Global</td>
<td>84 mtpa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BHP Billiton</td>
<td>Global</td>
<td>111 mtpa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arcelor Mittal</td>
<td>Global</td>
<td>45 mtpa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16) Lastly, SOREMI’s copper and polymetal project could rapidly come into being.
Boko Songho and Yanga Koubanza deposits were exploited in the past under much less
favorable price and technological conditions. This type of deposit represents attractive
grades but insignificant tonnages in comparison with the large producers of Chile, or
even of Zambia or the Democratic Republic of Congo. On the other hand, production of
cathode (pure metal) by the process “SX-EW”36 is well proven and requires only limited

35The deposits have similarities with iron of Brazil that the same geological province held close 100 million years
ago, before the tectonic separation of Africa and Brazil.
36SX-EW (solvent extraction/electro-winning): extraction by solvent and by electrolysis. It is a two-stage process
that first extracts and concentrates copper ions of a solution resulting from lixiviation of the ore, and then
investment. The other advantage of this mining project is its proximity to infrastructures which fit its low volume: the CFCO railway line passes on the concession, and the current fret allows loading copper cathodes. Failing this, the Pointe Noire–Brazzaville road (currently being rehabilitated) also passes very close to the operation site, which would allow export by trucks. However marginal it is at the international level, such production would nevertheless enhance interest in potential Niari formations of base metals (Pb-Cu-Zn) and would undoubtedly promote a re-launch of exploration for base metals in the provinces of Niari and Bouenza.

17) Decisions about investment will depend on a great number of factors, sector-related and not, on which Government can act. Republic of Congo must accelerate its efforts to improve business climate in general; it is one of the least favorable in the world. Congo is ranked 181 on a list of 183 countries in the 2012 “Doing Business” report. A survey of 151 companies in 2008 identified a long list of constraints, with a level of complaint among the highest ever recorded. More specifically, a sector investigation such as the one carried out annually by the Fraser Institute informs about the criteria that companies take into account when deciding to invest in a given deposit or mining district. Among those, legal and regulatory framework and good management of the sector are clearly highlighted: not just the mining legislation itself, but also its stability and the predictability of its interpretation, the capacity of the Government to implement it efficiently and in a transparent manner, the tax system, the cadastral management and the environmental and social aspects. As an example, 83% of the companies surveyed in 2011 recognized that mineral potential in the Democratic Republic of Congo is in itself encouraging for investments, but 70% noted that the uncertainties of the Administration and enforcement of the legal framework in place was a very strong dissuasion, and even sufficient reason not to invest in the country.

18) The entry into production of large industrial mining projects will require proactive support from the Government, for infrastructure aspects in particular. The Zanaga project (currently estimated at a $7 billion investment) would necessitate, according to its owners, the creation of very ambitious infrastructures such as a long pipeline, a new deep water port to ship out 30 million t of iron ore and a power station to meet needs estimated at approximately 260 megawatts (MW). Such a project requires proactive support of the Government, through an enhanced coordination of the administrations and technical departments involved, as well as ad hoc procedures to meet deadlines (administrative authorizations, access to tax and customs advantages granted through Conventions and the Mining Code, clearance of equipment, etc.). Likewise, a project like Mbalam-Nabeba, with its isolated geographical location and its cross-border dimension, requires enhanced monitoring.

19) No diamond or gold deposit of industrial size has been discovered to date, but there is progressive revival of exploration.

a) For diamonds, no primary deposit that would justify industrial exploitation has been

precipitates copper deposits in an electrolyte concentrated on cathodes (electrolysis process).

37See the study on the business climate published by the World Bank in 2009.

38See the Mining Sector Survey, downloadable from http://www.fraserinstitute.org.

39These aspects are reviewed in more detail in Chapter 4.

32
discovered; exploration is carried out in the placers on a limited scale. As an example, Motaba Mining holds a mining prospecting permit for rough diamonds (in this case in the zones of Mimbely and Bangui-Motaba) and oversees artisanal miners exploiting rivers by facilitating their access to small equipment.

b) For gold, several junior mining companies were involved in research and prospection on the eve of the 1990s turmoil, for example, Samax Gold (then Ashanti Gold) in Diamonika, Kakamoeke and in Ngongo in the mineralized gold province of Mayombe, which in 1998 established the presence of primary mineralizations in a zone known for gold panning for many years. Since the passing and adoption of the new Code, many more gold prospecting permits have been delivered. A score of them were active in 2011 in Niari, Sangha and the Cuvette Ouest. Junior companies explore already known deposits in high-grade places, as well as primary deposits with resources significant enough to stir the interest of major companies, such as Congo Gold S.A in the department of Kouilou (Kakamoeka-Pambou, Sounda-Banga) and M2C-Mexivadas-Zamarat Mining Ltd. in the gold-bearing zone of Ngouaka-Bangadi-Bambougna, famous since the year 1960 for the 1-kg gold nugget found there. The surge in gold prices reflects a strong demand from China and India and the crisis of confidence in western economies that push investors toward “safe-haven assets.” It is possible that there will be a new boom in exploration by junior companies and gold washers.

5. Recommendations

20) The growth of industrial mining projects in Congo will depend on a great number of factors linked to international markets and the attractiveness of the country to investors. The mineral potential of Congo is remarkable in many aspects but is not enough to overcome competition from other countries with equivalent resources. An investor subject to obligations of short-term profitability will judge the country on the basis of guarantees that it can obtain. The business climate in general, for which Republic of Congo has a poor reputation, must be improved. With no currently operational industrial mines, it can refer only to old industrial episodes, and there remains uncertainty about Government policy and sector management. Indeed, in Congo, as in several countries of the region, more and more often deposits stir the interest of non-traditional investors from emerging economies like China. Implications of this trend are difficult to conceptualize or to generalize, but the State would probably find it beneficial to maximize and diversify the potential candidate pool. To this end, launching and success of one or more exploitations of world size, and respect of the agreed stabilization clauses, will have value as test cases for subsequent investors.

21) On the basis of the preceding analysis, a certain number of projects could be implemented to promote entry into production of large mining projects.

c) Capacity building for the sector administration. The Government has a big role to play in ensuring that announced mining operations come into being within reasonable time frames. This is a multifaceted role. The Government needs to ensure the transparent delivery of licenses, monitor international market trends, negotiate mining

40Together the two countries represent 25% of the gold consumption in the world.
agreements in an appropriate and informed manner, ensure regular follow-up on technical or legal aspects of the specifications, perform systematic review of feasibility studies, respect deadlines, comply with good environmental and social management practices and, more generally, respect the rights and obligations of mining companies. All these facets require qualified personnel, with appropriate tools, who are able to go to project sites and who are trained in international practices.\footnote{This recommendation about capacity building is cross-sectional and overlaps with recommendations in Chapters 3 and 4.}

d) **Improving basic infrastructures.** Part of the infrastructures of large mining projects will have to be developed by or in partnership with the private sector (see Chapter 4). At the stage of research and development, there are many decisive factors influencing investment decisions: access to the bulk ore port, development of railway corridors, access to stable energy at a competitive price, access to reliable and authorized air transport and of course the quality of roads.

e) **Reinforcing interdepartmental coordination.** Project owners have to deal with a multiplicity of ministerial authorities. It is essential to ensure a common understanding of challenges and constraints of the mining industry and the construction of large projects. Coordination between departments could, for example, be implemented through establishment of a large investment coordination unit for each large project that advances beyond the prefeasibility stage.

f) **Reinforcing cooperation at the regional level.** In addition to the Mbalam-Nabeba project, which is trans-border in nature and thus requires discussion and agreement at the highest level between Congo and Cameroon, other iron projects depend on future infrastructure decisions. To avoid blind competition and strengthen the position of the State with regard to investors, a forum of discussion about iron and railroads could be organized on a regional scale, involving (at least) Congo, Cameroon and Gabon.

22) **Concerning artisanal mining,** priorities should be on the one hand to improve formalization of artisanal mining through incentives to form cooperatives and other associations and increased awareness and training campaigns and on the other hand to facilitate the transition toward small-scale mining through improving performance, productivity and environmental responsibility.
CHAPTER 3. POLITICAL, LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK
1. Political framework

1) The diagnosis concerning the mining sector formulated in the first PRSP is still valid at the present time:

Congo possesses a sub-soil that is rich in mineral or fossil substances. However, it is still little explored. In spite of the still largely incomplete geological knowledge, several indications of gold, diamond, potash, basic metals, iron, bituminous sandstone and other mineral substances of agricultural and industrial uses have been recorded. Activities related to prospection and explorations are undertaken by private companies only.

The mining sector still has to face the following problems:
   1. Insufficiency of application texts for Law 4-2005 of the Mining Code;
   2. Lack of leadership in planning for the sector;
   3. Insufficiency of suitable facilities and materials for the Administration, and an absence of training, retraining and upgrading of Administration personnel;
   4. Lack of organization of artisanal gold and diamonds mining;
   5. A very limited knowledge of the national sub-soil and an absence of basic geological infrastructures for research and interpretation;
   6. Weakness in follow-up on public–private sector partnership agreements;
   7. Lack of capacity within the technical staff in the administration.

2) Writing a basic policy document for the sector should be a priority. The “leading plan for the sector” that the PRSP calls for does not exist yet. A specific strategy document or sector-based policy should function as a fundamental reference that helps orient both the Administration and mining operators. It should be created in a consultative manner through a real dialogue between different parties involved.

2. Institutional framework

3) The definition and implementation of the mining policy of the Government of Congo is the responsibility of the Ministry of Mining and Geology. The ministry, created in September of 200942, is organized as follows:

Figures 6: Organizational chart of the Ministry of Mines and Geology.
Source: Ministry of Mines and Geology, 2011.

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42Instead of Ministry of Mines, Mining Industry and Geology.
4) The Ministry of Mining has had a staff of about 100 people and a budget of about $9 to $10 million (equivalent to 4000 to 5000 million FCFA) per year since 2008 (increasing regularly). The Medium Term Expense Scheme records a global execution rate of this budget of 56.4%. The Priority Action Program (PAP) for 2011–2016 has a cost of about $12 million (equivalent to 70 million FCFA). The 2012 Financial Act grants an exceptional investment budget of 86 million FCFA.

5) The main Directorates of the Ministry are as follows:

   a) The General Directorate of Mining, created by Decree 205-313 on July 29, 2005, helps the Minister in the field of mines and mining industry. This directorate: i) proposes laws and various decrees that govern mining and the mining industry, and controls their application through audit, research and other missions; ii) manages the national mining heritage and ensures its promotion and valorization, including follow-up on statistical, economic and stock data; and iii) creates texts pertaining to the concession of mining titles for exploration and exploitation, and sets up and organizes the related databanks.

   b) The General Directorate of Geology, created by Decree 2010-314 on July 29, 2005,
must: i) elaborate on and supervise the application of regulations related to geology; ii) achieve, coordinate or control all activities related to geological, geophysical or hydrogeological research of the national sub-soil, including those undertaken by private companies; iii) produce geological, metallogenic and thematic cards for the national territory; iv) contribute to the actualization of geological data; v) manage and promote the national geological heritage; vi) conceive and achieve programs of prospection and valorization of geo-materials, location and promotion of small mining developments.

c) *The Directorate of Research and Planning*, created by Decree 2009-233 on August 14, 2009, must: i) elaborate on the Ministry’s strategies and plans for priority actions and Medium-Term Expenses Scheme, undertake economic and financial studies and statistical analyses and interpretation; and ii) ensure preparation, follow-up and assessment of the operation of projects, including involvement in the management and supervision of the public tenders of the department. The Directorate has a research department, statistics department and planning department.

d) *The Directorate of Administrative and Financial Affairs*: collects taxes and transfers them from the Finance Manager in the Ministry of Finance to the Ministry of Mining.

6) **Two institutions recently created by decree should progressively become key actors in management of the sector.**

   a) *The Project of the Geological and Mining Research Center (CRGM in French)*. Law 10-2010 (enacted October 6, 2010), created the Geological and Mining Research Center and mandates that it will be a public institution of administrative and technical nature under the umbrella of the Minister of Mines. The Center will: i) initiate, undertake and evaluate research activities that present an interest in the development of geological and mining knowledge of Congolese soil and sub-soil; and ii) contribute to the valorization of research results, with a view toward the promotion and development of the mining sector. The objective of the Center is to remedy lack of competence concerning geological mapping, reconnaissance and/or prospecting of general interest.

   The project decree for the bylaws and organizational chart of CRGM is under way. Such a center, enjoying sufficient autonomy of management, could remedy inadequacies of current personnel in managing geological heritage. However it would be desirable to further clarify its assignments vis-à-vis existing administrative bodies, the Directorate General of Geology in particular. In fact, in several countries competition or rivalry has arisen between different institutions with overlapping mandates for the acquisition, management, diffusion and promotion of geological information.

   b) *The Office for Expert Appraisal, Evaluation and Certification of Precious Mineral Substances (BEEC)* was created by Decree 2008-338 on September 22, 2008, as an organization that specializes in expert appraisal, evaluation and certification of precious mineral substances. Its missions are: i) appraisal and certification of precious mineral substances; ii) evaluation of stocks of precious mineral substances; iii) the
issue of expert certificates; iv) recording of statistics; v) follow-up on financial transactions and the fight against fraud and smuggling; and vi) administration of the Kimberley procedures concerning import and export. The BEEC includes a service of expert appraisal, evaluation and certification of mineral substances, a statistics service and an administrative and financial service. As an administrative body in charge of control and validation of the Certificates of the Kimberley Process\textsuperscript{43}, the BEEC operates under the supervision of a permanent secretariat and follows the application modes of the certification system of the process as defined by Decree 2008-337, enacted September 22, 2008.

7) \textbf{In spite of recent efforts, these sector-based institutions are marked by a lack of capacity.} The lack of human resources is strongly felt in all the Directorates\textsuperscript{44}. The problem of capacity also affects the facilities, means, organization and conservation of documents. Indeed, conflicts have led to destruction of all documentation and a disorganization of the services. For a long time, the mining sector remained a second priority, suffering from the priority given to hydrocarbons until an independent Ministry of Mines, fully separated from oil and gas, was created.

8) \textbf{A complete institutional survey is needed to quantify in more detail needs in terms of capacity building} (personnel, facilities, systems) and harmonization of competences (geological services, mining inspection). It would also permit a detailed description of tasks and procedures, and would support the CDMT in view of the role that the State wants to play in the mining sector in years to come.

3. \textbf{Legal and regulatory framework}

9) \textbf{The Mining Code of 2005, liberal in nature, is relatively simple and attractive and does not disregard the role of the State.} The mining activity in Congo Brazzaville is governed by Law 4-2005 of the Mining Code, enacted on April 11, 2005. According to its writers, this code aimed, among other objectives, to open the mining domain to private investment, free enterprise and competition, and to alleviate administrative procedures and fiscal and customs systems, as well as to reinforce protective measures concerning the environment and the management of impacts on the long-term development of Congo. A short text, with a classic, and at first glance, a relatively simple structure, it is clearly oriented toward development of the sector and attracting investments, while maintaining the State’s role of protector and catalyst of development. It is actually the State that “protects and guarantees the valorization of the national mining heritage so defined in the interest of national development” (Article 11). Research and mining operations, which are very expensive, very risky and require a high technical level of expertise, are a matter reserved for the private investor; on the other hand, works of recognition and geological cartography of general interest are a matter of Government responsibility.

10) \textbf{The 2005 Mining Code also integrates a large number of good international practices concerning mining legislation.} The separation of mines and quarries activities, the list of mining titles adjusted to stages of the mining cycle, their respective

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\textsuperscript{43}A non-falsifiable document delivered by the BEEC certifying that a set of raw diamonds is in conformity with requirements of the Kimberley Process certification system.

\textsuperscript{44}Because it cannot find the appropriate staff, the Ministry has to maintain retired employees.
rights and obligations, the procedures of allocation based on principles of “first come, first served” and “security of tenure”, as well as the restrictive list of reasons for withdrawal of these mining titles are similar to legal provisions of other countries that have encouraged the emergence of an industrial mining sector. Artisanal mining is subject to special authorization, and some special arrangements have been planned for its management. In addition, measures for protection of the environment, however difficult they may be to implement and harmonize with other sectors (as studied further), are based on coherent principles. Some more innovative arrangements also favor a sustainable development. Among others, there are the creation of a mining fund for the dismantling of sites at the end of operations, and the possibility of setting up a national committee of consultants and industrial security to ensure permanent technical control of mining operations.

11) The Mining Code of 2005 returns many points to other regulations and conventions, which offer some advantages in terms of flexibility, but also some inconvenience in terms of clarity. There are many mentions of future texts that are supposed to specify or decide other details, some of which are essential. For example, surface tax and other rights relative to mining titles, as well as their rules of perception, must be defined in a separate text45. This allows their revision in a more flexible way every time that it is useful, without frequently overhauling the entire mining code. In the same way, the Code dictates that the State must coordinate with the mining investor to specify rights and obligations of the parties, in parallel with delivery of the research or exploitation permit. It is thus possible to adapt incentives and imperatives to every mining project according to their respective risks and opportunities46. However, if the negotiation margins are made too important, the State exposes itself to pressure and the investor may remain uncertain for a long time. In the same way, if some application texts do not pass or if there is a risk that they may be changed suddenly, the investors will lack clarity. This risk is particularly strong in Congo, as no text embodies the official policy for the sector.

12) The regime of conventions should be modernized. It is unclear, for example, what the reasoning is behind entering into conventions with holders of artisanal and small-scale mining permits. The list of mandatory provisions in the convention is minimal, while the list of optional provisions is long. The minimum amount of expenditure, for example, should, by logic, be a mandatory clause, yet it is not. This shortcoming illustrates that the regime of conventions set out in Sections 98 to 101 of the Mining Code does not communicate a clear idea of the convention or its contents. In addition, the regime does not adequately specify the process for and timing of (before or after the permit stage) negotiation. Finally, these loosely defined conventions may contain provisions too favorable to one or the other of the parties and thus contradict the objective of stability. This regime of conventions should be modernized and provide guidance, for example, for situations where a convention is not necessary, others where it would be at least partially standardized (model agreement) and finally others where larger investments and mining projects require heavy infrastructure, with negotiable conventions of stability that must be approved by Parliament.

13) In addition, the Mining Code has a number of weaknesses that call for

45 This law was indeed enacted on December 30, 2010. It fixes the rates and rules of perception of the rights for mining titles.
46 Knowing that no conventional disposition can waive the legal obligations of the enterprises.
improvements. The Mining Code of 2005 lacks a preamble that rigorously defines the terms used in the law with clarity and that legitimizes mining operations within the overarching framework of the 2002 Constitution. For example, the Code does not specify how or when mineral resources become the property of mining title holders. In addition, organization of the Code could be improved to make it less confusing. Currently, the list of conditions for applying for a mining permit is located in the section on small mines and quarries, whereas it should be either common or among the articles pertaining to the mining permit. Finally, in contrast with the strength and severity of penalties for infringements of the provisions of the Code, the provisions concerning remedies are lightweight and short. Article 181 refers to the existence of remedies against an administrative decision related to application of the Mining Code of 2005 without specifying what they are. There is no reference to the rules and procedures that apply to the prosecution of offenses or for defense against such lawsuits, nor for any possible recourse.

14) Finally, the question of the nature and degree of participation of the State should be clarified. Participation of the State in the mining sector can serve as a mechanism to ensure that foreign private investment in mining is made under the best conditions for the economy, environment and people involved. The private sector’s expertise is needed to develop the country’s mineral resources, and State participation in mining therefore should be consistent with the objective of attracting investment. At this stage, investors cannot predict the future level of State involvement; legally the State may act as both regulator and operator. The State expressly reserves the right to create a public body that may undertake mining activities (exploration and exploitation), either directly or as a joint venture with private or public companies. The Code also allows the State to hold a minimum of 10% of all mining operations, but this participation is not clearly stated as free, and no maximum amount or other details are given. Beyond this participation, the Government envisions the creation of a mining company similar to SNPC, a company active in the oil field. These two industries are, however, very different and the marketing of their products are different as well: it is more difficult to process iron ore than it is to refine crude oil, and it is more difficult to put metal or minerals on the market than fuel. A comprehensive review of international experience should be undertaken and serve as a guide for the Government’s policy and management of its participation in accordance with the principles of independence, stability, efficiency and transparency.

15) Aspects regarding taxation, management of mining titles, environmental and social impacts as well as artisanal mining are discussed in more detail in the sections that follow.

4. Tax system

16) The tax system of the mining sector in Republic of Congo is based on a classic taxation system. The taxes from mining activities are added to the General Tax Code and are similar to many African countries: fixed rights (for the registration or transfers of title, for example), surface rights (which vary according to the surface and validity period of the warrant) and mining royalty discriminated by categories of mineral or fossil substances (according to potential margins of profit that such or such category might yield). To these taxes are of course added the income tax of 30% for mines (similar to the general regime) and 20% for quarries. The participation of the State to a level of 10% is
rather typical of west Africa. However, note that this free participation of the State in the capital of mining companies is debated between partisans and opponents about what can be considered a supplementary tax on dividends.

17) **The main elements of the tax system are currently similar to those in the region and on the continent.** The table below comparing regimes shows that royalties, income tax and participation of the State in Congo are comparable to that of other countries that are rich in this resource.

**Table 6: Comparison of tax systems applicable to iron in several African countries.**
*Source: Governments, World Bank, 2010.*

<table>
<thead>
<tr>
<th>Country</th>
<th>Royalties for iron</th>
<th>Income tax</th>
<th>State participation</th>
<th>Applicable law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea</td>
<td>3.5%–7%</td>
<td>35%</td>
<td>15%</td>
<td>Mining Code of 1995</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>3.0%</td>
<td>30%</td>
<td>NA</td>
<td>2009 Mines and Minerals Act</td>
</tr>
<tr>
<td>Liberia</td>
<td>3.25%–4.5%</td>
<td>30%</td>
<td>NA</td>
<td>2010 Mineral Policy of Liberia</td>
</tr>
<tr>
<td>Republic of Congo</td>
<td>3.0%</td>
<td>30%</td>
<td>10%</td>
<td>Mining Code of 2005</td>
</tr>
<tr>
<td>Gabon</td>
<td>0.5%–5%</td>
<td>35%</td>
<td>NA</td>
<td>Mining Code of 2000</td>
</tr>
<tr>
<td>Cameroon</td>
<td>2.5%</td>
<td>35%</td>
<td>10%</td>
<td>Mining Code of 2001</td>
</tr>
<tr>
<td>Mauritania</td>
<td>2.0%</td>
<td>25%</td>
<td>10%</td>
<td>Mining Code of 2010</td>
</tr>
<tr>
<td>Senegal</td>
<td>3.0%</td>
<td>25%</td>
<td>10%</td>
<td>Mining Code of 2004</td>
</tr>
<tr>
<td>Mozambique</td>
<td>3.0%</td>
<td>32%</td>
<td>5%</td>
<td>2002 and 2007 Mining Law</td>
</tr>
<tr>
<td>Namibia</td>
<td>BM 3%, indst'l 2%</td>
<td>35%</td>
<td>NA</td>
<td>1992 Mineral Policy</td>
</tr>
<tr>
<td>South Africa</td>
<td>4.0%</td>
<td>28%</td>
<td>26% (BEE partner)</td>
<td>2004 MPRDA</td>
</tr>
</tbody>
</table>

18) **Some benefits available to mining operators are consistent with the goal of attracting new investors.** A country without an established mining tradition, which seeks to maximize its comparative advantage, must provide clear incentives to entice early investors. For example, exploration expenditures can be integrated (under conditions defined in the convention) into the opening balance sheet of an operating company, which allows the company to offset these costs more easily. In addition, some exploration expenditures for an unsuccessful search can be depreciated under another license. Finally, several types of deductions are allowed under the income tax law: i) provision for recovery of deposits; ii) provision for renewal of large equipment, infrastructure and mining equipment; and iii) provision for environment protection. The convention is expected to clarify the modalities of set-up and use.

19) **The Government should, however, exercise caution in granting advantages and exemptions with a view toward ensuring long-term benefits.** Sharing mining rent between the State and an investor (often of foreign origin) is still controversial in the eyes of the public, which does not immediately see positive impact the sector. For example, temporary exemption from income tax for early investors is a common practice; during the early years of production, companies use profits to repay the initial investment. However, i) the duration of such exemption must be carefully defined so as not to obliterate future State revenue; ii) the duration of the stability clause for fiscal, customs, financial and exchange control must be reasonable; and iii) the benefit of new more favorable terms (Article 166) is a clause that appears “generous” if it is the Government’s entry position in negotiation and if it is not accompanied by a parallel clause that allows the State to participate more in benefits, for example, if international prices significantly and durably increase. In all cases, the State’s bargaining power with the investor depends
largely on its ability to anticipate project revenues on an informed basis. It is therefore essential that the State develops better negotiation skills and financial projection capacities.

20) **However, theoretically attractive aspects of the tax and customs regime prove very complex, and there is little incentive in practice.** This judgment on the actual application of the Code typically refers to provisions for repatriation of profits and customs.

a) **Repatriation of profits.** The Mining Code provides financial guarantees for free trade and transfer of dividends. However, there is a 2000 CEMAC\(^47\) regulation governing foreign exchange that sets forth harsh conditions for repatriation of currencies and transfers of funds. This regional regulation seems to ignore the mining sector’s specificities and can be perceived by the private sector as a disincentive to investment.

b) **Customs regime.** The Code in theory permits exemption from all rights and duties during entry (with exception of the computer fee) for equipment, materials, supplies and machinery for mining operations. For materials intended for re-export or resale, the Code authorizes temporary exemption from all duties and import/export taxes. In both cases, the list of equipment must be approved by decree. In practice, this poses many problems, especially in the exploration phase where needs change rapidly based on results and funding. More broadly, customs is a major concern for mining companies. Despite theoretical advantages, these companies claim to pay high tariffs, face extremely long customs clearance, particularly complex procedures and regularly divergent interpretations of regulations.

21) **In addition, some ambiguities regarding the calculation and recovery of mining royalties have been recorded.** The rate of mining royalty varies as follows:

- Precious metals and precious stones: 5%;
- Mineral or fossil substances other than those of categories 6 and 7 (i.e. ferrous substances and fossils, the radioactive and non-metallic kinds): 3%;
- Mineral substances of category 6 (mineral and thermal waters): 1%;
- Mineral substances of category 7 (geo-materials): 5%.

According to Article 157, these rates apply to the sales value of “mine mouth,” which, contrary to what this article seems to imply, can differ appreciably from the export market price when costs of transportation are significant. Moreover, an export duty of 2% is added to royalties of 5% for precious metals and precious stones when they are acquired through a counter (Article 71) or declared by any person possessing or not a mining stock (Article 75). This clause is a source of confusion because it could be viewed as a royalty rate of 7% (higher than in the neighboring countries). Recovery is supposed to take place after a dialogue between the operator and Mining Administration occurs: periodicity of these meetings and independence of decisions about the value of the

\(^{47}\)Central African Economic and Monetary Community
products need to be specified.

22) **The tax system should be studied in more detail on the basis of the first lessons learned in Congo.** The Government does not seem to be fully equipped to master specific tax instruments of mining. Similarly, the private sector seems to face a tax burden that is far greater than what legal texts suggest. Further study of the tax system should have the specific objectives of: i) better managing the surface fee as a key instrument for managing mining rights; ii) clarifying calculation of mining royalties; iii) consideration of an adjustment mechanism that accounts for evolution of market prices (“windfall tax”); iv) consideration of provisions for revenue sharing with local communities; v) review of exemptions that may, in some cases, go against State interests; and vi) consideration of mechanisms to regulate tax revenues so that they give priority to strengthening the capacity of sector institutions. To be complete, such a study should include not only principal taxes but also all elements of parafiscality (too often overlooked but essential for investors). Creating an exhaustive list of taxes and duties would allow the State to better anticipate, collect and account for revenues in the sector and allow investors to better prepare. This work should be done in close collaboration with mining companies, which are in a position to identify all taxes that are applied to projects on the ground.

### 5. Management of mining rights

23) **The management of mining rights constitutes a privileged domain by which public powers exercise their role as planners and regulators for the mining sector.** The mining titles for mineral or fossil substances covered by Article 15, Title 3, Chapter 1 are listed in the table below.

**Table 7: Major mining rights in Congo.**  
*Source: Mining Code, 2005.*

<table>
<thead>
<tr>
<th>Title</th>
<th>Validity</th>
<th>Main features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospection permit</td>
<td>1 year; renewable once only</td>
<td>Non-exclusive, non-transferable, non-mortgageable, priority for transformation into research permit</td>
</tr>
<tr>
<td>Research permit</td>
<td>3 years; renewable twice for a period of 2 years each time, in return for surface area reduction and fixed duties payment</td>
<td>Exclusive for covered substances, can go with permits for other substances, compulsory mining convention, maximum of 1000 km² (2000 km² in sedimentary); transferable, assignable, priority for granting of an exploitation</td>
</tr>
<tr>
<td>Artisanal mining permit</td>
<td>3 years; renewable tacitly for same period</td>
<td>Exclusive, artisanal operating mode, transferable, assignable</td>
</tr>
<tr>
<td>Small-scale mining permit</td>
<td>5 years; renewable</td>
<td>Just for quarries and small mines; exclusive, transferable, assignable, mortgageable</td>
</tr>
<tr>
<td>Exploitation (mining) permit</td>
<td>25 years; renewable for 15 years as many times as necessary</td>
<td>Exclusive for covered substances, limited to the surface of deposit; transferable, assignable, mortgageable</td>
</tr>
</tbody>
</table>

24) **Cadastral management in Congo rests on principles that have been largely tested**
and used in other countries. The “first come, first served” rule is affirmed as a basic principle in the granting of prospection permits, and a maximum of 6 months is given for the Administration to answer all requests for title, from the date of deposit. It is necessary to note that this principle is respected in Congo “considering equal financial and equal technical expertise,” which gives a certain degree of freedom to the Government. But it also can be interpreted by investors as potentially discriminatory. Moreover, the security of tenure is assured, notably by Article 57 of the Code, which specifies that “the operation permit is assigned on demand to the holder of a research permit who, at the end of the activities of research, demonstrated the existence of an exploitable deposit and presents a technical and economic program of operation.” Lastly, the security of tenure and stability of advantages that have been granted are guaranteed in the mining conventions, including the research and exploration phase.

25) However, the Mining Code contains some shortcomings that are harmful to cadastral management. In particular, delivery of the mining permit (Article 59) is submitted not “[upon] approval by the Government of a bankable feasibility survey” but solely [upon demonstration of] “the existence of a deposit and the presentation of a technical and economic program of operation.” Neither the date of first production, nor financial projections (royalties, dividends, revenue from taxes) seem controllable. Also, the principle of superimposition of titles is allowed for minerals of different categories, which opens the door to potential legal conflicts between permit holders who reside on the same deposit and are working with two different minerals. In addition, no disposition for auctioning abandoned or retired permits is allowed. The application of the rule of “first come, first served” is difficult in these cases. When a title falls into public domain again, and when sufficient geological information has been gathered, a technical and financial bid can overrule potential investors in a competitive and equitable manner, as long as good practices of transparency are respected.

26) Some clauses relating to management of mining titles should be detailed in a Decree. There is no explicit provision on the shape and location of an exploitation permit area, whereas such rules are set for the exploration permit. Similarly, the Code does not provide for existence or creation of an institution with administrative and financial autonomy responsible for managing mining titles, processing applications, granting those titles, ensuring security of tenure, managing the settlement of disputes between title holders and/or applicants, publication of information and statistics etc. Such an institution would ensure good governance of mining titles and give confidence to investors if it is well established and directed by the principles of professionalism and transparency, and isolated as possible from political influence. Finally, the exact modalities for processing applications and granting mining titles are not spelled out.

The mining title management system itself should be modernized and reinforced. Allocation and cancellation of mining titles, monitoring and evaluation of operations by different administrations involved, production of reliable statistics, resolution of land uses conflicts are all tasks that make necessary the establishment of an efficient mining cadastre. In countries with a long mining tradition, the mining title registry has a structure of superimposed layers, linked to multiple detailed databases (geological, environmental, infrastructure, resources of other administrations, etc.), permitting an automatic and almost instantaneous treatment of requests for titles, approval of reports, automatic reminder for application of rights and obligations by the State and by operators according
to deadlines defined in the mining code and in conventions, environmental follow-up and anticipation and management of litigation and disputes (superposition of permits or conflicts in a protected area for instance). The Congolese General Directorate of Geology has an embryonic cadastral management system of mining titles, which now needs to be reinforced and formalized. Computerization makes it possible to reduce delays in collection, treatment and consultation of more and more abundant information, improving the precision and quality of presentation in order to translate the maximum number of management rules into transparent procedures and minimize improvisation, discretionary decisions and possible mistakes. Continuous updating and the addition of reliable reference maps would allow operators to verify availability of land parcels, history of permits and status of titles belonging to a potential partner. Administrative bodies and all those concerned with follow-up on activities of mining operators would have a source of reliable and easily accessible information through the registry and its related databases.

6. Environmental and social management

27) **The wealth of tropical forest and biodiversity in Congo requires, even more than elsewhere, good practices for environmental management of the mining sector.** The forest covers 22.5 million hectares (ha), which can be developed up to 80%. To ensure harmonious management of its natural resources, Congo has set up a forestry policy that aims for the conciliation of development objectives with requirements of conservation. The National Forest Domain facilitates management of this policy, and application of the Forest Code and its various application texts. It is divided into forest development units covering three sectors: south, center and north. The forest shelters a large number of species of plants, birds, mammals, reptiles and bugs, all of which must be protected and conserved. The network of protected areas covers 3,655,402 ha, representing 10.68% (about 11%) of the national territory. Financed in major part by foreign aid, it is composed of three national parks⁴⁸, six reserves, two domains for game hunters and four sanctuaries (two of which are for gorillas and two for chimpanzees). See Table 9.

28) **The legal and regulatory framework requires general respect for the environment by mine operators.** Law 003-91, enacted April 23, 1991, deals with environmental protection and requires the management, maintenance, restoration and protection of natural resources and goods of traditional heritage, taking into account historical aspects of native life, culture, the arts and archaeological vestiges. With regard to mining, it also explicitly requires prevention and mitigation of pollution and other nuisances; preservation of renewable and non-renewable natural resources; and management, processing and elimination of oil and mining waste.

29) **More specifically, the Code requires Environmental Impact Assessments (EIA) and corresponding Management and Rehabilitation Plans as primary tools of sustainable development.** The provision of mining authorization or a permit to operate a deposit of solids by the Ministry of Mines is subject to validation of the EIA and the Management and Rehabilitation Plan (MRP) by the Ministry of the Environment, based in turn on obtaining a favorable opinion from the technical committee chaired by the Directorate General of the Environment. Similarly, the Mining Code requires that the

⁴⁸The national park of Odzala (1,350,600 ha), the park of Nouabale Ndoki (1,386,590 ha) and the park of Conkouati (504,950 ha).
recipient of a mining convention, during research and exploitation of minerals (including hydrocarbons), submit an EIA and MRP to the administrative authority for approval with forms established by the current legislation. The Code also provides for establishment of technical committees and dialogue contexts to monitor the measures adopted in these plans. Decree 2009-415, enacted November 20, 2009, sets the field, contents and procedures of survey and the environmental and social impact. The EIA and notice must meet the standard plan annexed to the decree.

30) **However, practices for preparation, validation and monitoring of EIAs should be improved.** Legal and regulatory frameworks characterize these tools as safeguards against negative environmental and social impacts of industrial development projects, mining in particular, but in practice they lack efficiency and credibility. Observers note a gradual improvement in EIAs since 2008, when evaluation and validation sessions were undertaken. But reports generally suffer from weak environmental statistics, lack of guidelines and local norms for companies and consulting firms, obliged to rely, in general, on generic models of EIAs. All mines under development have submitted either their EIAs for validation (MPC and SOREMI) or Terms of Reference for public audiences (MPD, Congo Iron). But civil society denounces a lack of information, consultation, expertise and monitoring in these studies. Effective involvement of civil society organizations, whose mission is conservation and/or advocacy for interests of the local population, is very important and sensitive.

31) **Furthermore, management of mining activities within or near protected or reserved areas should be clarified.** The classification of reserves and protected areas in Republic of Congo, as defined in Law 37-2008, enacted November 28, 2008, on Fauna and Protected Areas, is complex and relatively specific to Congo (see table below). Rules for mining titles in each of these types of reserves are not clearly stated. The only explicit mention, in the case of national parks, leaves room for interpretation: “within national parks, any forms of exploitation of soil, sub-soil and natural resources, as well as any work and construction, except those provided for by the act of creation or by the development plan of the park and those needed for its development and surveillance, are forbidden” (Article 12). As an example, the national park of Conkouati-Douli, proposed for UNESCO classification, is governed by Decree 99-136, enacted August 11, 1999, which states that the park is “purged of any right of use,” meaning that any activity that may have a negative impact on the ecosystem is prohibited. But some activities may be authorized in the eco-development zones peripheral to the national park: “a buffer zone of five kilometers will be respected in the eastern and southern boundaries of the national park within which no granting of permits of mining, oil, forestry or agricultural exploration or development will be given or carried out.” However, the same decree states that rights to explore and develop that were granted before creation of the park are still valid, although with some conditions. Finally, the Government might theoretically use a public interest clause, according to the Forest Code of 2000, to “downgrade” a zone and open it to logging, and then to mining development.

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49Most of the EIAs submitted to date concern oil and mining sectors, which come under Category A (high impacts) according to Law 003-91.

50It does not follow, for example, the international classification of the International Union for Conservation of Nature (IUCN).
Table 8: Protected areas in Congo.
Source: WWF-CEDEV.

<table>
<thead>
<tr>
<th>Type of protected area</th>
<th>Description</th>
<th>Examples</th>
<th>Year of creation</th>
</tr>
</thead>
</table>
| Special reserves or sanctuaries of fauna           | Areas preserved with an aim of protecting specific communities of fauna and/or flora, particularly threatened species, as well as the biotopes essential to their survival (Article 5, Subparagraph 7, of Law 37-2008)                                                                                                                               | Dimonika (1360 km²)  
Lossi (35,000 ha) | 1988  
2001 |
| Fauna reserves                                    | Areas assigned to fauna conservation, propagation and management, as well as to the rehabilitation of its habitats. (Article 5, Subparagraph 6, of Law 37-2008)                                                                                                                                           | Lesio Louna (44,000 ha)  
Mount Fouari  
Nyang-North,  
Nyang-South,  
Mount Mavoumbou (18,000 ha)  
Fouari Mount Lekoli-Pandaka | 1999  
1958 |
| National parks                                    | Areas intended for protection, rehabilitation and sustainable conservation of fauna, flora and biological diversity, as well as protection of sites, landscapes or geological formations presenting particular scientific, aesthetic, cultural or entertaining value (Article 5, of Law 37-2008)                                         | Nouabale-Ndoki (1,386,590 ha),  
Odzala-Kokoua (1,350,600 ha)  
Conkouati (504,950 ha) | |
| Zones of hunting interest                         | Areas of conservation and exploitation of fauna where hunting, tourist, entertaining or scientific activities are organized (Article 5, Subparagraph 8, of Law 37-2008)                                                                                                                             | Lefini (4000 km²)  
Mboko  
Tele Lake | |
| Integral natural reserves                         | Areas preserved in view of promoting the free interaction of natural factors without any external intervention, except those necessary for the maintenance of the natural status of the place (Article 5, Subparagraph 5, of Law 37-2008)                                                 | Tchimpounga Patte d’Oie | |

32) **The management of overlaps between mining projects and forest areas must also be clarified and operationalized.** Maps of mining and forest titles show broad superimpositions. Decree 2009-304, dated August 31, 2009, set up an inter-ministerial dialogue committee to mediate superimposed use of forest ecosystems. This committee should play a significant role in arbitration decisions because of the many superimpositions between mining projects under development and protected or sensitive areas. In practice, this committee is not operational\(^{51}\), and even if forest activity and no conflict resolution mechanism is in place, there are not even exchanges between various stakeholders from the two sectors.

33) **On the social side, the Mining Code and related agreements cover, in a standard manner, fundamental rights of workers, but they are weak with regard to**

\(^{51}\)This committee was created under authority of the Prime Minister. In his absence, it should be entrusted to another authority, such as the Minister of Planning.
engagement with local communities.

a) The Labor Code covers employment contracts and general conditions, hygiene and safety of work spaces. For wages, mining agreements refer to the collective agreement of the applicable branch. Preference is given to nationals and residents at the time of recruitment of personnel, as well as in the procurement of goods and services.

b) The Code also includes provisions that authorize holders of a license or authorization to enjoy the rights of land occupation while taking into account the landowners’ and users’ rights. In particular, without explicitly recognizing the particular relationship of indigenous people to their environment, the Mining Code acknowledges customary law. There is compensation for occupation of areas as rights of way. Issues of compensation may be settled amicably. The decree that is referred to in Article 112 would provide for methods and modes of evaluation of this compensation. Any other guideline on compensation and management of relocations in event of expropriation would provide significant supplements.

c) However, the Code remains deficient with regard to discussion of the participation of local communities in mining projects. Neighboring populations sometimes benefit from mining projects through use of communication ways, other transport installations and power lines created by mining title holders, if they ask for access and provided that their use does not hinder research or exploitation. However, the regulation does not mandate any benefits for these communities. Additionally, public consultations are required before delivery of authorizations and permits, but implementation methods of these consultations is not specified. Consequently there is not any proactive measure for the consultation and participation of local communities in the mining projects.

7. Management framework for Artisanal and Small-scale Mining (ASM)

34) The Mining Code sets forth appropriate principles to the various scales and formalization of artisanal mining. It foresses specific authorizations for artisanal mining activity in a strict sense on the one hand and small-scale mining on the other hand.

a) The exploitation of alluvial deposits by artisanal means is regarded as artisanal exploitation, (Article 39). It is conducted under the terms of an authorization of artisanal exploitation, which is granted to any grouping, association or person of Congolese nationality, delivered by means of a miner’s card. The Mining Administration delimits, on the basis of requests, the area covered by the card and specifies operating conditions in the authorization. This card is exclusive, transferable, transmissible and valid for three years, renewable once. It requires sales record keeping.

b) Is deemed to be a small mine, any exploitation which is characterized by the size of the implemented technical, human and financial means. Small-scale mines follow the

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52In 2011, FedMines worked with trade union UNICONGO to draw up a collective agreement on mining.
same regime as quarries. A mining authorization is delivered on the basis of complete documentation, including a feasibility study and environmental impact study (including the environmental protection program and the remediation plan). Operating authorization is exclusive, transferable, transmissible, assignable, valid for five years and renewable once. The holder has the exclusive right to benefit from an exploitation license when activities reach a size that justifies the granting of such a license.

35) Efficient application of these principles requires careful monitoring by the Central Mining Administration and enhanced capacities. The Central Mining Administration is responsible for granting titles and handling requests, undertaking surveys, assessing eligibility of applicants and validity of documents attached to requests, record keeping and monitoring respect of the rights and obligations of artisanal miners scattered over the whole territory, many of whom do not spontaneously formalize their work. For multiple reasons (fear of repression, tax avoidance, superstition, competition with the informal sector, etc.), artisanal miners may indeed be reluctant to register and declare their production. Therefore, the Mining Administration cannot control either production or the number of assets for gold mining or small-scale mining. In recognition of this challenge, in certain countries, some of these responsibilities have been transferred to decentralized authorities, in coordination with the Decentralized Mining Administration.

36) Capacity-building programs should supplement regulation and make pragmatic and innovative proposals. Several decrees and orders have to be passed to apply the law, such as the form and contents of the miner’s card. Certain provisions, such as ability of the Minister of Mines to decide by simple decree which substances fall under authority of artisanal exploitation (Article 44)—and thus the legality or not of exploitation of a substance—should be reviewed. The effectiveness of the fiscal regime for artisanal and small-scale mining (the general regime) should also be studied, and proposals that create incentives for formalization should be considered. Lastly, specific proposals should be made to support constructive relationships between artisanal miners and large-scale mining companies (including junior exploration companies). The relationships between artisans and exploration companies are indeed regular, the latter following the tracks opened by the former.

37) In parallel, reforms that improve traceability in the trade of precious stones should also be pursued. Following its exclusion from the Kimberley Process in 2004 and its rehabilitation in 2008, Congo has taken a number of measures to improve traceability. The BRGM, in its study of the country’s diamond potential, recommended guaranteeing fair remuneration to producers to encouraging fair trade practices to consumers.

8. Recommendations

38) Political framework. The highest priority should be given to the drafting, consultation and dissemination of a sector policy document which should in particular:

53Congo-Brazzaville’s production of diamonds in 2001 did not exceed 50,000 carats, but approximately 5.5 million carats were registered in terms of diamond exports from Congo-Brazzaville to Belgium, that is, a hundred times more.
1. Clarify if the State will seek to take part in future mining operations, to what extent and in which form;
2. Specify the respective role of institutions, for example that of the CRGM relative to the Directorates of Mining and Geology, or institutions in charge of management of mining revenues (royalties, etc.);
3. Indicate to what extent decentralization will or will not be extended to sector management;
4. Indicate basic principles that will govern negotiations of tax provisions applicable to each operator, in particular with regard to possible exemptions;
5. Clarify the regime responsible for creating mining infrastructures (public–private partnership type);
6. Specify policies, laws, regulations and good practices applicable to mining environment management;
7. Define policy orientations to oversee relationships with local communities, in particular the most vulnerable populations (women, children, indigenous populations), and principles governing benefit-sharing;
8. Define possible orientations and incentives that can be used to add value to the territory, and the possible measures that can maximize use and development of a local supply chain (local content/linkages).

39) Institutional, legal and regulatory framework. The identified priorities may be broken down essentially as follows:

1. **Sector institutional capacity building.** Efforts to improve legal and/or regulatory framework need to be supported by capacity building. Fairer, more transparent and more effective legislation should correspond to an Administration that is more involved, more equipped and better trained in good international practices. This can require significant institutional reform, for example creation of a mining inspection department with sufficient resources. In all cases in Republic of Congo, an institutional study of the sector should be conducted to quantify and anticipate needs in terms of training, equipment and management systems for each institution concerned.

2. **Negotiation capacity building.** With existing flexibility in negotiating mining conventions, it is critical that the Government teams have enough capacity in all key disciplines (mining law, tax, operations, infrastructure etc.).

3. **Mining code and associated regulation.** For Congo to have a clear, fair, and efficient legal framework that favors a sustainable development of the sector, revisions of selected provisions of the mining code should be planned, as well as supplemental regulations on particular aspects like mining title management, artisanal mining and environmental and social management.

4. **Analytical works.** Additional studies are needed on: i) the convention regime and a possible model one, ii) fiscal regime; iii) participation of the State and options for a possible state-owned company.

5. **Taxation.** Launch an additional study on the tax system and para-fiscal levies to
be applied.

6. **Cadaster.** Set up a modern computerized cadaster and conduct associated trainings.

7. **Environmental and social management.**
   a. Harmonize mining regulation with the legal framework concerning protected areas and forests (to better oversee mining exploration in these zones).
   b. Support the operation of the Inter-ministerial Dialogue Committee.
   c. Enhance the EIA process: define clear directives and standards for development of terms of references and the process of the study; swear in a qualified and independent national expert; improve monitoring and evaluation of the environmental management plan and monitoring throughout all the phases of projects; improve dissemination of information and participation of local or national communities.
   d. Incorporate into the project management plan, a plan for improved participation of the communities most affected by the mine (and its facilities and infrastructure) in sustainable development. Such a plan should be developed in dialogue with representatives of affected communities and administrative authorities in accordance with international best practices.

40) **Particular case of ASM sector.** Provide technical and organizational support to artisanal miners; improve the legal and regulatory framework to facilitate formalization and respect for traceability requirements. Concrete measures still need to be defined in a precise way, but they could include complementary diagnostic work in the ASM sector and capacity building for the directorate of the ASM sector or creation of a dedicated agency (see box below).

**Box 2: Recommendations for an ASM monitoring agency.**

*Source: BRGM, 2004.*

<table>
<thead>
<tr>
<th>The structure set up would have in particular these roles:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- To help artisanal miners and small miners draw up their projects and at different stages (i) request a professional card or (ii) request mining titles;</td>
</tr>
<tr>
<td>- To help artisanal miners and small miners run their sites using practices that come closer to state of the art, in order to (i) optimize exploitation of resources and not waste them; (ii) respect the environment; and (iii) operate within a safe and secure environment;</td>
</tr>
<tr>
<td>- To put adapted material at artisanal miners’ disposal, against remuneration;</td>
</tr>
<tr>
<td>- To provide mediation between artisans and representatives of the authority in charge of the mine police, encouraging the former to provide full transparency to the latter, and suggesting the latter show flexibility in the application of their instructions;</td>
</tr>
<tr>
<td>- To provide mediation between mining artisans and operators to reduce territorial conflicts. For this purpose, the reservation of zones for artisanal activity could constitute a targeted means of conflict prevention. This role supposes a better knowledge of the gold and diamonds potential;</td>
</tr>
<tr>
<td>- To support the joint development of gold mining and small-scale mining among artisanal miners in the</td>
</tr>
</tbody>
</table>

54A study of artisanal and small-scale mining was launched in mid-2011 by UNDP in collaboration with the Ministry of Mines.
zones endowed with double potential. This supposes not only technical support, but also capacity to monitor supply chains and mineral traceability.
CHAPTER 4. CONTRIBUTION OF THE MINING SECTOR TO DIVERSIFICATION OF THE ECONOMY AND SUSTAINABLE DEVELOPMENT
CONTRIBUTION OF THE MINING SECTOR TO DIVERSIFICATION OF THE ECONOMY AND SUSTAINABLE DEVELOPMENT

1. General points

1) **The mining sector’s contribution to the economy, sustainable development and poverty alleviation in Congo, like elsewhere, is not easy to assess.** As shown in preceding chapters, which have attempted to characterize the country’s mineral and mining production potential, any projection attempt is dependent on multiple unknown factors applicable to each promising deposit: certification of reserves and sub-soil resources (always with a geo-statistic margin of error), investment decisions in the context of uncertain and often volatile international markets, success of entry into production (technical risks being far from being negligible, all the more in countries without a mining tradition and difficult geographical conditions) and more generally the country-risk.

2) **In addition, and for varied reasons, public opinion tends to question the sector’s positive contribution.** Widespread “resource curse” expression points to a paradox in which exploitation of mineral resources seems to create more poverty than richness, and more conflicts than prosperity. It is possible that in Congo the oil experience predisposes public opinion against the mining sector. Moreover, tax revenues are often generated very late in the cycle of a mining project: the ad valorem tax is paid only when the operator starts production, generally after years of exploration and development, and corporate taxes are not paid until a mine reaches the point of profitability. These long delays cast doubt on mining contracts with operators and instill concern that the State has “sold off” the national geological heritage. The non-renewable nature of mineral resources and the “destructive” nature of the extractive industry cause some mistrust of the contribution of the sector to real sustainable development. Finally, examples of other mining countries struck by massive poverty (such as the neighbor DRC) add to this latent suspicion.

3) **However, this contribution can be significant and development of mining is a winning strategy for countries with comparative advantages that are ready to invest in good governance of the sector.** The evolution of private investments in the mining sector of certain African countries that have undertaken reforms is spectacular. The average growth rate of 12 African countries in the mining sector moved from 0.3 % in the year 1990 to 5.7 % in the year 2000. Naturally, reform of the mining sector is only one of the great reforms among those undertaken by these countries. Notwithstanding, this sector is the one that contributed most to the growth of these countries. It is still too early to determine if revenues or creation of employment opportunities associated with mining

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55This supposed “curse” has several aspects. Many authors have attempted to show that the countries benfitting most from export of resources have poorer economic growth. They evoke in particular the “Dutch disease,” which relates to the negative effect of extractive industries’ revenues on other exports. Although this mainly concerns oil countries, the phenomenon can affect mining countries and involve an overvaluation of the exchange rate related to the massive inflow of currencies. Resource-rich countries thus specialize in exploitation of these resources, to the detriment of their manufacturing sector. By pushing currency and wages up and soaking up investments, production of minerals could affect other industries. Another more direct aspect of this “curse” is the fact that an economy too dependent on mineral exports is exposed to currency risk and volatility of commodity prices.
sector growth have a significant impact on poverty in African countries. Nevertheless, a clear improvement (18% increase on average) is noted with regard to the Human Development Index (HDI), calculated by the UNDP during the year 2000 for a great number of countries. This implies that benefits associated with the mining sector boom are undoubtedly more significant than what is generally acknowledged.

4) **A certain number of obstacles and challenges must be overcome to optimize the sector’s contribution to diversification of the economy.** Synergies between the mining sector and the rest of the economy must be optimized, at local and national levels. Many African countries today consider mining a possible engine for their economic development and try to dis-enclave mining projects to better link them to other sectors of the economy, either directly—through creation of businesses and secondary industrial activities—or indirectly, by ensuring better integration of associated infrastructures (roads, railroads, ports and power stations). These aspects are particularly significant in Republic of Congo, and for this reason, the following paragraphs emphasize infrastructure, local procurement, employment, training, and in general value addition and good governance of the sector.

5) **Even without the capacity to plan with certainty, it is possible to quantify the contribution of the mining sector to the economy by reviewing possible scenarios.** It is essential to take the announcements of exploration companies with caution. All the projects in progress will not come to life simultaneously because the market will not be able to absorb all new production at the same time, and access to infrastructure will necessarily limit newcomers. Moreover, all information is not available because unquoted companies are not subject to the same obligation of information disclosure as companies quoted at the stock exchange. Consequently, as long as no decision of investment is made, the sector evolution can only be approached by using scenarios, the assumptions and validity of which must be re-examined periodically.

2. **Definition of scenarios**

6) **Three basic scenarios have been created to represent various possible outcomes of mining development in Republic of Congo in the years to come.** They are schematically classified by order of probability and are presented in the table below. The respective assumptions and conclusions drawn do not fall within “forecasts” but rather represent a simplified model based on information collected within the scope of this review. These scenarios are inspired by the most advanced projects, which provide a sufficiently reliable baseline: MPC, SOREMI, Congo Iron on the one hand and Zanaga, MDC on the other, which have reached the feasibility and prefeasibility stage, respectively. They do not constitute in any way expert judgment of these very projects. Lastly, it should be noted that these scenarios do not take into account the possible development of industrial minerals or bituminous sandstone.

<table>
<thead>
<tr>
<th>Table 9: Possible scenarios for mining development in Republic of Congo.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source:</strong> World Bank (based on available information mid-2011).</td>
</tr>
</tbody>
</table>

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56 The companies themselves invite readers to review their “forward-looking” statements with caution.

57 This aspect will probably be increasingly significant as Chinese companies repurchase Canadian or Australian exploration junior companies; see the examples of MagIndustries and Sundance in August and September of 2011.
### Scenario A
A polymetals mine (Cu, Pn, Zn) of the Boko Songho-type (SOREMI) will enter into production in 2013; A potash mine of the Mengo-type (MPC) will enter into production in 2014; Efforts are made to better oversee and consequently increase artisanal production of gold and diamonds.

### Scenario B
Scenario A
+ an iron mine of the Mayoko-type (DMC) starting in 2015.

### Scenario C
Scenario B
+ an iron mine of the Zanaga-type (Xstrata) starting in 2017.

7) **Scenario A.** It represents the most basic scenario, probable given the reported progress of current projects. It depends on the following main conditions: i) global demand justifies entry into production of mining projects in countries deemed at risk; ii) companies like MPC (Evergreen) and SOREMI seek to secure financing for their projects, make the decision to invest and successfully launch production; iii) the Government facilitates their entry into production (thanks in particular to their infrastructure development efforts), if necessary in partnership with the private sector, while investing sufficiently itself in sector-building capacity; iv) the Government supports more formal and productive development of small and artisanal mining. In this scenario, no iron projects start in the short run, which could happen if, for example, projects in west Africa (Guinea, Liberia, etc.) progress in a faster way than anticipated and world growth does not justify the launching of new “greenfield” projects with too high infrastructure costs.

8) **Scenario B.** It takes all the assumptions of Scenario A and in addition assumes that an iron project of DMC type (Direct Shipping Ore, DSO) starts by 2015. By choosing this scenario, we do not affirm in any way that the DMC project has more chance of starting than other DSO projects in Congo (Mayoko-Moussoudji, Badondo, etc.). The principal additional assumption is that the capacities of existing infrastructures (CFCO Railroad, Port of Pointe Noire) can be enhanced, renovated or increased to haul iron ore.

9) **Scenario C.** It takes all the assumptions of Scenario B and supposes moreover that an iron project of “Zanaga type” starts by 2017. The principal additional assumption is that new infrastructure of gigantic size (new 350-km railroad or pipeline, new port at Pointe Noire and dedicated hydroelectric power stations) can make for a win-win public–private partnership, built in time to make this project viable. Here, again, we by no means assert that Zanaga has more chance of starting than any other major project in Congo. But for the purposes of our model, it is more illustrative to choose a project of Zanaga type with major infrastructures entirely completed in Congo.

10) In the absence of an advanced gold exploration project in Congo, we have not included a gold mine in our scenarios. This model will have to be updated periodically because an industrial gold project could develop in a faster way than anticipated and constitute a significant means of increasing the contribution of mining to the economy of Congo. Indeed, production of gold is less dependent on weak infrastructures, investments are far smaller and price has continued to climb since the 2008 economic crisis. It is not unlikely that a gold mine of average size will come into existence in the medium-term. At the regional scale it could look like the Bakoudou mine currently under development in
3. Potential contribution of the mining sector to diversification of the Congolese economy

11) These three scenarios indicate that the contribution of the industrial mining sector—through investments, export value, tax revenues, infrastructure and employment—would be significant. The following paragraphs demonstrate a significant contribution to diversification. They must, however, be reviewed with caution because they use assumptions and rough estimates to determine orders of magnitude. More thorough studies would make it possible to quantify the contribution to growth and reduction of poverty in certain areas. MPD affirms that Zanaga has the potential to increase GDP of Congo by approximately 20% to 30% and to contribute to the economic and social development of areas directly affected and in a broader extent the whole country.

12) Only Scenario C would trigger investments comparable (although lower) to oil investments planned in Congo, but even in Scenarios A and B, mining investments exceed non-oil investments. Mining investments could range between $1 and $8 billion between 2012 and 2017: at least, they would double non-oil foreign direct investments (FDIs), the total of which was only $1 billion between 2006 and 2010. That undoubtedly remains lower than the $15 billion of investments planned for development of oil fields (offshore and onshore) in Northern Moho (Total); M’Boundi (ENI); and Mengo, Kundji, Bindi (SNPC). It would still be necessary to add investments in exploration, which are far from negligible: $200 to $400 million were already invested in mining exploration and development between 2007 and 2011, which undoubtedly accounts for a large proportion of non-oil FDIs, ranging between $100 and $200 million per annum over the last few years.

Figures 7: Mining investments in Scenarios A, B and C.

58For an investment of about 16 billion FCFA in Gabon, Bakoudou is projected to generate 150 local employment opportunities and 8 billion in annual revenue for the Gabonese government). Such a mine will have an annual production of approximately 1500 kg of gold for about ten years.
59 The principal assumptions of Scenarios A, B and C are detailed in Annex 2; their sensitivity to commodity prices is obvious.
13) **Mining exports could reach $1 billion per annum by 2016, and in Scenario C up to $6 billion by 2025.** This could represent up to three times the non-oil exports planned for the years to come (estimated at approximately $2 billion per annum). They would not reach the level of oil exports, estimated at around $10 billion (barrel price variations will determine these orders of magnitude). However, even Scenario A would increase current export revenues by 35%.

*Figures 8: Values of mining exports in Scenarios A, B and C.*

14) **Tax revenues from the mining sector could change the order of magnitude of non-oil revenues.** Tax revenue from mining could exceed $130 million per annum by 2020 according to Scenario A, and $1 billion in 2025 according to Scenario C; this would increase non-oil revenue by 10% to 80%, respectively (using 2010 as a baseline). Entry into production of Zanaga-type project would thus represent a major turning point, multiplying mining tax revenue by a factor of six. There again, the State cannot expect revenues comparable with those generated by oil exploitation ($3.5 billion in 2010). But royalties and mining dividends, in addition to the corporate tax, which remains the most important, could gradually change the order of magnitude of non-oil revenues.

*Figures 9: Tax revenues from mining sector in Scenarios A, B and C.*
*Source: World Bank, 2011*
The potential of the sector in terms of employment is also substantial for the formal sector of Congo. Whereas the country suffers from a rate of unemployment between 16% and 25% in the age range 15 to 29 (68% of the population is under age 30), job creation is of utmost importance. The figure below shows that direct employment opportunities could reach 18,000 during the construction phase and 9,000 in the operation phase. It is true that some labor and executives will have to be imported, but the majority of employment opportunities could be for Congolese citizens if training programs are sufficient. In comparison with the 125,000 employment opportunities in the formal sector in 2007, and given the significant number of indirect and/or induced employment opportunities from the mining activity, the sector could increase formal employment opportunities by 10%. Even in Scenario A, the mining sector would generate a number of employment opportunities comparable (during the phase of operation) or superior (during the phase of construction) to the oil sector (which employed approximately 1,000 people in 2006). In Scenario C, the mining sector would become the first sector in terms of formal employment in Congo. The two biggest sectors in 2006, the manufacturing and the forest sectors, indeed represented between 6,000 and 7,000.


16) The mining sector in Congo, as in other countries producing bulk commodities, can also become a genuine catalyst for development of infrastructure. Substances

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60Data on employment are from the World Bank’s Study of Growth and Employment, published in December 2011.
currently receiving the most interest, iron and potash, would be produced in huge volumes and would require port, railway transport and energy infrastructure (see summary table below).

a) In terms of port infrastructure, according to the scenarios, the launch of mining projects of industrial scale would require and justify extension of the existing port of Pointe Noire and/or creation of a new deep-water port\textsuperscript{61}. A new port would have a boat loading wharf at the end of a 2 km long jetty, an area of maintenance and/or ore processing and water, as well as a port of service that could be used to facilitate development of special economic zones.

b) In terms of railway infrastructure, the most immediate impact would be use and restoration of the CFCO. For several iron projects in Chaillu, the proximity to the old ore railway line of Comilog constitutes a paramount advantage. Scenario B would mean restoration and increase in capacity of this line up to 5–10 million t/year. In Scenario C, a new railroad of several hundred km could be created. If such an option were retained (the “pipeline” alternative offers many advantages), it should be noted that a railway line of this capacity would be most likely dedicated solely to mining export\textsuperscript{62} and not multi-use, at least for a certain duration.

c) In terms of energy infrastructure, the electricity sector in 2011 had generating capacity of 595 MW, but with average available power of only about 458 MW\textsuperscript{63}. Scenario C would mean an additional need of about 500 MW, i.e. a doubling of capacity. The mining projects can thus contribute to ensuring profitability of existing installations and justify new investments in power stations (in Pointe Noire for the harbor zone, for example) or dams.

\textit{Table 10: Key infrastructures related to the mining sector in Scenarios A, B and C.}

\textit{Source: World Bank, 2011.}

<table>
<thead>
<tr>
<th>Railway</th>
<th>Port of Pointe Noire</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Unchanged</td>
<td>Rehabilitation</td>
</tr>
<tr>
<td>B</td>
<td>Renovation CFCO (5 mtpa)</td>
<td>+Extension</td>
</tr>
<tr>
<td>C</td>
<td>+Potential creation of a new 350-km line (up to 45 mtpa) or pipeline (30 mtpa)</td>
<td>+New port</td>
</tr>
</tbody>
</table>

17) \textit{Beyond infrastructure, downstream integration would maximize the value added to the territory.} Resource-rich countries such as Canada, the United States, Finland, Norway, Sweden and, to a certain extent, Australia—the economies of which were initially based on extraction of primary products—are currently characterized by exports

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\textsuperscript{61}Able to accommodated 20-m draught ships.

\textsuperscript{62}The daily needs for a project like Zanaga (MPD), if the railway option and capacity of 35 million t/year were retained, would represent according to the company: 8 to 10 trains with 128 wagons carrying 137 t each and 3 or 4 locomotives forming convoys of 1500 m. To meet this need, a park of 1258 ore wagons, 20 to 30 fuel tank cars, 25 containers and 32 to 48 locomotives would be required,

\textsuperscript{63}This availability ratio of 77% takes into account the works to be completed on the hydraulic and thermal groups and the average annual throughputs on various hydraulic sites.
of highly specialized manufactured goods. The highly knowledgeable African Mining Vision\textsuperscript{64} projects an increase in internal value from links with the industries directly and indirectly associated with large mining projects. Some countries recently have encouraged the establishment of iron and steel plants, allowing raw material to be processed and thus retaining a large part of value on the territory. In Congo, iron potential could theoretically feed a downstream production chain, just as potash potential could theoretically feed agriculture. There is a long way between an iron-ore mine to a steel plant. Many obstacles exist to this vertical integration, but the Government would gain from exploring such possibilities, which would ensure that raw materials are not solely intended to export.

4. Obstacles and challenges

18) The mining sector’s possible contribution will not be achieved without proactive support of the State in facing obstacles, minimizing risks and taking on multiple challenges. Positive economic impacts listed previously will be generated only at the end of prolonged efforts and investments. Without oversight and necessary monitoring, the sector might develop in isolation from the rest of the economy, in an “enclave,” with few advantages for the working population in general and local communities in particular. In addition, the macroeconomic positive impacts could, to a large extent, be overshadowed by negative impacts on environmental and social levels. Contribution of the mining sector to diversification must thus be prepared and optimized with an effort toward good governance in several key fields: infrastructure, employment, revenue management, transparency and social accountability.

19) In the area of infrastructure, the Government must facilitate construction and negotiate conditions of access. With an aim to maximize the multiplier effect of the sector, the Government will often—especially in countries like Congo where demands on infrastructure are immense\textsuperscript{65}—promote development of mining-related infrastructures, provided they have a cross-sector or multi-purpose dimension. However, investors may actually prefer infrastructures that are strictly dedicated to mining operations, and for this reason, new infrastructure that they themselves build. They will want to ensure, for example, that a planned port extension is ready at the start of production, guaranteeing control of all the chains of evacuation of the ore on which sales depend directly, or to demonstrate to potential financiers that risk on large components of the project have been internalized. The Government itself may also prefer to delegate responsibility for their infrastructure to mining operators because launching of a mine is too difficult to forecast with certainty, and the State (even if it was itself a joint shareholder) may be wary about engaging public funds in major works that serve only a few direct beneficiaries. In all the cases, construction, operation, financing and control of mining, infrastructure will be the subject of intense negotiation between investors and each ministry concerned.

20) In the area of employment, the Government should optimize links between mining and the rest of the national private sector. The mining sector is not known to generate

\textsuperscript{64}\url{http://www.africaminingvision.org}.

\textsuperscript{65}The country endowed itself in 2004 with a National Plan of Transport requiring an effort of about 100 billion FCFA per annum on average, and proposing 350 infrastructure projects over 10 to 15 years, of which nearly 125 were planned to be launched in the first triennial phase (294 billion FCFA). These projects do not take into account mining projects, which have their own needs.
a great number of direct employment opportunities. Indeed, industrial mines, contrary to small and artisanal mines, are more intensive in capital than in labor. By contrast, indirect employment opportunities can potentially be important, in particular if the Government encourages them in a proactive way. In the particular case of Congo, which has a small formal sector, employment generated by the mine would be significant even beyond the phase of construction. But the sector multiplier effect on employment will depend partly on incentives the Government implements to make the most of the opportunities generated by each mining project. As an example, the development of SMEs in the area of Pointe Noire is skewed by the oil market, which dictates competition and price standards that are difficult for the mining sector to absorb. To avoid the development of mines in an “enclave,” which international experience shows is a risk, it is of primary importance to optimize it in at least two dimensions:

a) **Local or national recruitment and vocational training:** the Mining Code, as well as mining agreements signed to date, affirms the principle of preference to the employment of nationals (or residents). However, this preference is only applied at equal qualifications and experience. It is thus worthless if it is not accompanied by proactive measures in training and an increased awareness of the needs and opportunities of the sector on the national as well as local level. The Government must anticipate the offer of employment generated by the sector, which is likely to resort increasingly to foreign labor or expatriate executives if nationals lack adequate skills. Training structures for technical and professional education listed in the primary sector relate mostly to agriculture and livestock sub-sectors, with none concerning the mining sector. The University of Brazzaville annually trains geologists (general practitioners), the majority of whom are recruited by oil companies on the condition that their future employers give them further training appropriate to their position.

b) **Local or national procurement of goods and services:** the Mining Code, as well as mining agreements signed to date, also affirms the principle of preference for use of local products and services, which promotes local and national employment. However this preference only applies with the contingency that available products and services are competitive with those on the international market with regard to price, quality, guarantees and delivery times. There again, such a “privilege” is only meaningful when oversight measures and proactive initiatives are in place to reinforce SMEs’ capacities and to develop local supply chains. Mining companies sometimes subject themselves voluntarily to these requirements in order to maintain good relationships with communities that host them. The figure below illustrates opportunities generally offered by the mining sector in various development phases. Employment opportunities in the Congolese mining sector, as well as procurement of goods and services, require evaluation through a specific study to determine the profiles and

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66This amounts to a kind of localized “Dutch syndrome.”
67As with other sectors of the Congolese economy, it accounts for difficulties in recruitment experienced by the companies in Congo. This concerns, in particular, companies working in the fields of extraction, construction, hotel and restaurant, according to a study by the Support Project for the Socio-economic Reintegration of Disadvantaged Groups (workshop held March 17, 2010).
68S. Cheickna, Diawara, et al. (March, 2010), Burkina Faso: Mining Sector and Business Development; Kaiser and C. S. Diawara (2009), Mali: Supporting Local Procurement by the Mining Industry, FIAS.
required skills, products and constraints related to them and the incentives necessary to seize them.

**Figures 11: Goods and services procurement opportunities.**
*Source: S. Cheickna, Diawara, et al., Burkina Faso, 2010.*

21) **With regard to tax revenues, there are two objectives, which vary according to the type of mining projects.** The first objective is to develop a close partnership between tax authorities and large mining projects in order to monitor and anticipate their tax payments, which will be considerable over time. Success will occur by means of two simultaneous actions: coordination between the administrative bodies concerned, and their capacity building and transparency. The Extractive Industry Transparency Initiative (EITI; see box below) was the essential governance tool used over the last few years to reinforce tax transparency. The second objective is to face the dilemma of revenue sharing between the Central government and decentralized authorities. Congo did not create a mechanism for redistribution of sector revenues at the decentralized level, but the Government will have to face increasing expectations of the population with respect to mining sector spin-offs. Development of large mining projects is a true shock for neighboring populations, the majority of them being poor and rural. The city of Pointe Noire (first port of the country) undoubtedly is more accustomed to industrial activities thanks to oil, but residents of other areas probably are not aware of the realities of extractive industry. Some will see an opportunity for employment as well for business, while others will perceive a threat to the environment or local inflation. Generally, a feeling of frustration or impatience dominates. Indeed, the mines appear like islands of wealth in an ocean of poverty. The populations feel “disinherited” and naturally wish to claim their share of the benefit. The question of revenue sharing at the local level will thus undoubtedly be the subject of many discussions, if not complaints.

**Box 3: Extractive Industries Transparency Initiative in Republic of Congo.**
*Source: EITI international and EITI Congo.*

EITI is a coalition of states, companies, civil society groups, investors and international organizations. It establishes an international standard of transparency for oil, gas and mining. Within this framework,
companies and governments communicate paid and collected amounts to independent auditors. Adherence to the initiative is facilitated by a process that allows participating countries to become “applicant countries” and then “compliant countries.”

Congo joined the initiative in June 2004. Decree 2006-626, enacted October 11, 2006, provided for the creation, attribution and composition of an executive committee for implementation of EITI. Decree 2006-627, also enacted October 11, 2006, provided for the creation, attribution and composition of a consultative committee to the executive committee for implementation of EITI. Since 2008, these committees have implemented the EITI Congo triennial action plan (2008–2010). The World Bank supported the launching phase of the initiative in Congo. The reports published to date relate mainly to the oil sector presented by the independent auditor.

Congo is today, like the other countries of central Africa, an “applicant country.” Whereas Congo did not reach the status of “compliance” in December 2010, it was judged by the EITI Council to have made “significant progress” in EITI implementation. On this basis, Congo preserved its status as candidate and has a new deadline of December 9, 2012 to implement the measures identified by EITI.

22) More generally, the success of the sector’s development depends on transparency and social accountability. Many authoritative voices throughout the world have blamed development of extractive industries over the last decades, emphasizing in particular the persistent poverty of countries in Africa that are rich in mining resources, and disenchanted of the populations who live close to extraction sites. The extractive industry is accused of not contributing enough to development of poor countries (even of impoverishing local populations and harming the environment). The tax system is considered to be too advantageous to the mining companies. Governments are suspected of governance issues and poor usage of revenues generated by the sector. More and more, local populations demand transparency, not only with regard to payments and tax revenues, but also for mining contracts themselves (the agreements in the case of Congo) and follow-up measures. Transparency and civil society participation in sector dialogue form the two pillars of social accountability. Government must prepare itself for this increasing request of the populations by making governmental bodies more accountable for national natural resources management.

5. Recommendations

23) To maximize the contribution of the mining sector and the synergies between this sector and the rest of the economy (without, however, calling into question its specificities), the following proposals can thus be made.

24) Regarding infrastructure:

a) The Government should set up an adequate framework for private–public partnerships. Construction, operation, financing and control of mining infrastructure will be the subject of sustained negotiations between investors and each ministry concerned. It is very important that the Government prepare itself by setting up an inter-ministerial dialogue framework and an appropriate partnership framework with the private sector. The recent creation in Congo of the High Council on Public–Private Dialogue is a decisive step in this direction.

b) The Government and the private sector should also raise discussion to a regional level. The CEMAC has conducted prospective planning works and identified the mining sector as a regional stake because of linked infrastructure. However, beyond the efforts of planning, which always rest on uncontrollable assumptions, it is regional dialogue (in particular with Cameroon and Gabon) that is necessary to
facilitate making decisions in real time. The Mbalam-Nabeba project will require an agreement between Congo and Cameroon concerning the sharing of revenues (royalties for iron are different on sides, respectively 2% and 2.5%) and the location of infrastructure and/or installations of processing unit.\(^{69}\)

25) **Regarding employment:**

a) To promote and oversee local economic development around the mines and to promote ties between the mine and the rest of the national private sector, the **Government could launch a study and work out guidelines for local purchases, local subcontracting and local employment.** More examples and experience feedback are now available.\(^{70}\)

b) **To stimulate vocational training, a study of disciplines ensuring training of geologists and technicians necessary to the sector should be completed.** This is already recommended in the Growth and employment study conducted by the World Bank and published in December 2011.

26) **Regarding revenue management:**

a) **The Government must build the capacity to monitor and collect taxes and charges specific to the mining sector.** It is necessary to improve the mining title management (cadaster) system to check payment of superficial royalties and entry into production of the capacities of control of exported ore volumes. It is necessary more generally that the administration of finances and customs be informed of tax and accounting specificities of mining companies.

b) **The Government, in consultation with operators and civil society, should study the possibility of mining revenue-sharing redistribution mechanisms in the mining zones.** Various options are available when a formula of distribution does not exist in the law: at the national level, mining funds are to be used as an instrument of this redistribution; at the local level, funds, trusts or community foundations can be set up, as in many other countries.\(^{71}\)

c) **Mining sector actors should be encouraged to take part in the EITI process.** It is clear that like oil revenues, payments generated by mining are not “material.” Before they become so, it would be very advantageous to increase awareness of objectives of transparency among operators. Several mining agreements refer explicitly to the EITI, either as a good practice or as a commitment.

27) Finally, in the field of social accountability, the Government should facilitate participation of civil society not only in the EITI process, but also in reviewing EIAs and having public consultations and surveys carried out as part of the license granting process. Guidelines for participation of local communities in the decision-making

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\(^{69}\)There are few examples of such trans-border mining productions. The example of Pascua Lama, on the border of Chile and Argentina, is an interesting precedent: it took approximately four years to reach an agreement on the system of taxation to be applied.

\(^{70}\)See: Increasing Local Procurement by the Mining industry in West Africa, World Bank, November, 2011.

\(^{71}\)See: Sharing Mining Benefits in Developing Countries: The Experience with Mining Foundations, Trusts and Funds, World Bank, June 2011.
processes could also be worked out. Awareness, training, and knowledge-sharing campaigns should be supported in order to raise awareness about specificities of the mining sector, in particular in a country more familiar with oil exploitation.
CONCLUSION AND SUMMARY OF RECOMMENDATIONS

28) **The oil and mining industries, known collectively as the “extractive” industries, have similarities and distinctions that sometimes make comparison difficult.** Similarities between mining and oil development include dependence on geology, long-term investments, the important volume of initial investments, and low labor intensity. Important distinctions exist in the success rate of target indices. For oil, when a basin is identified, about 1 well out of every 10 proves to be rich. For mines, it is estimated that only 1 prospect out of every 1500 will become a mine. Some observers are also surprised to discover that mining companies do not compete to acquire research permits, and that production sharing cannot be applied to mining development because it is too expensive. International experience helps to clarify these differences between managing hydrocarbons, for which Congo is accustomed, and mining, for which the country must prepare.

29) **This review of the mining sector helped to characterize the issues of governance in four main areas.** These follow logical development of mining projects, discovery of mineralization indices in the management of socioeconomic and environmental impacts:

   a) **Promotion of geological heritage and mineral resources.** The mineral potential of the Republic of Congo is only partially known. New discoveries are only possible if exploration, led by private sector, turns to new areas and interpretations. Public investment in geological knowledge at the regional level is needed to encourage this momentum.

   b) **Facilitating entry into production.** There are now “windows of opportunity” for known deposits of potash, polymetals and iron. Several mines may emerge in years to come if the international market permits it, and if efforts of mining companies are effective and the Government accompanies them in a strategic manner.

   c) **Continuous improvement of the political, institutional, legal and regulatory framework.** The State is responsible for protecting and ensuring development of mining heritage in the interest of national development. This requires a clear sector-based political vision, a solid legal framework leading to a fair and effective development of the sector and some institutional capacity to enforce it.

   d) **Optimization of the sector’s contribution to diversification.** Mining projects may develop as “enclaves” that do not generate enough benefit for the population. The Government should proactively assist mining companies to maximize added value and the linkages and synergies that will catalyze genuine economic development locally and nationally.

30) **After this study, an action plan to improve the mining sector can be outlined.** The main recommendations detailed in previous chapters are grouped and summarized in the action plan below. Each activity is accompanied by a budget estimate and an order of priority. Obviously, advanced costs are only rough estimates based on recent experience in other countries, and some costs are recurrent ones. The time sequence is difficult to establish because all challenges are important and would ideally be dealt with in parallel. If trade-off needs to be made, the “average” or “low” priorities indicate that
corresponding activities might be theoretically launched in second or third place. For example, artisanal mining involves a large population and is experiencing renewed interest in gold because of high prices, but this is a permanent challenge that does not meet a need as acute as large-scale mining, which appears to benefit from a unique “window of opportunity.”

**Table 11: Action plan for mining sector management improvement.**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Activities</th>
<th>Priority</th>
<th>Cost (U.S. $, mil)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Promotion of mineral potential</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve knowledge of sub-soil</td>
<td>Campaign for airlifted geophysics</td>
<td>High</td>
<td>10</td>
</tr>
<tr>
<td>Improve management of geological information</td>
<td>Geological cartography</td>
<td>High</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Creation of a computed database (with training and associated equipment)</td>
<td>High</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Institutional strengthening</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimize institutional framework</td>
<td>Institutional assessment of main functions in sector-based management</td>
<td>High</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinforce institutional capacities (geological services aspects)</td>
<td>Support the creation of CRGM</td>
<td>High</td>
<td>0.2 (1st year)</td>
</tr>
<tr>
<td></td>
<td>Training program for agents of the Ministry of Mines and CRGM</td>
<td>High</td>
<td>0.2 (1st year)</td>
</tr>
<tr>
<td>Reinforce institutional capacities (negotiations and mining inspection aspects)</td>
<td>Support the Ministry of Mines and other involved ministries regarding negotiations on mining conventions</td>
<td>High</td>
<td>0.2 (1st year)</td>
</tr>
<tr>
<td></td>
<td>Training program for agents of the Ministry of Mines, trust institutions (BEEC) and decentralized services in mining inspection (monitoring of research and development activities, cadastral management, monitoring of operations)</td>
<td>High</td>
<td>0.2 (1st year)</td>
</tr>
<tr>
<td>Reinforce institutional capacities (cadastral, fiscal, environmental aspects)</td>
<td>Modernization of mining cadaster</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Training of administrative bodies in charge of collection, management and redistribution of mining tax revenues</td>
<td>Medium</td>
<td>0.1 (1st year)</td>
</tr>
<tr>
<td></td>
<td>Capacity building of decentralized authorities (communes, districts)</td>
<td>Medium</td>
<td>0.2 (1st year)</td>
</tr>
<tr>
<td></td>
<td>Technical assistance technique for the conception of mining fund</td>
<td>Low</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Training program for agents of the Ministries of Mines, Environment and Planning and Finances</td>
<td>High</td>
<td>0.2 (1st year)</td>
</tr>
<tr>
<td><strong>Improvement of political, legal and regulatory frameworks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarify political framework</td>
<td>Develop a sector-based policy document</td>
<td>High</td>
<td>0.1</td>
</tr>
<tr>
<td>Improve legal and regulatory framework</td>
<td>Revise some provisions of the mining code</td>
<td>High</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Review of the tax system (para-fiscality)</td>
<td>High</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Optimization of linkages and impacts

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Priority</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finalization of mining regulation (land, tax, cadastral, environmental aspects, ASM)</td>
<td>High 0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review of the Convention regime</td>
<td>High 0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Optimize creation of jobs related to mining sector</strong></td>
<td>Guidelines on employment and local procurement</td>
<td>High 0.3</td>
<td></td>
</tr>
<tr>
<td>Support for national training supply in partnership with the private sector</td>
<td>Medium 0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study on ore transformation in Congo and added value</td>
<td>High 0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Facilitate development of mine-related infrastructure</strong></td>
<td>Reinforcing inter-ministerial coordination and public–private partnership framework for large mining projects</td>
<td>High 0.1</td>
<td></td>
</tr>
<tr>
<td>Regional dialogue and exchanges on development of trans-border mining and regional related infrastructure</td>
<td>High 0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting up of a management board to monitor sector-based statistics and revenue estimate</td>
<td>Medium 0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support for EITI (mine part), Kimberley Process, initiative for tracking and dialogue between stakeholders</td>
<td>Medium 0.2 (1st year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Support transparency and social accountability</strong></td>
<td>Guidelines on social responsibility for companies and on local communities’ participation</td>
<td>Medium 0.3</td>
<td></td>
</tr>
<tr>
<td>Mechanism study enabling transfer of tax revenues at the decentralized level</td>
<td>Medium 0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Optimize local impacts</strong></td>
<td>Guidelines on social responsibility for companies and on local communities’ participation</td>
<td>Medium 0.3</td>
<td></td>
</tr>
<tr>
<td>Mechanism study enabling transfer of tax revenues at the decentralized level</td>
<td>Medium 0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Improve formalization and practices of ASM</strong></td>
<td>Formalization campaign of ASM (sensitization, creation of cooperatives or associations, training)</td>
<td>Medium 0.3</td>
<td></td>
</tr>
<tr>
<td>Pilots to improve production practices (productivity, environmental responsibility)</td>
<td>Medium 0.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

31) **Some of these activities have already been initiated or converge with existing projects; others require additional efforts that require sector-based technical assistance.** In the Finance Act, the Government earmarked a budget of 105 billion FCFA (equivalent to $200 million) for the Ministry of Mines to cover this exceptional investment in geophysical and geological programs. This budget clearly shows that the Government is aware of the importance of promoting mineral potential. Government should guarantee a high quality of supervision in order to ensure proper return on this significant, long-term, public investment. In parallel, several existing projects converge with some of the recommendations identified: among others, the Support Project for Economic Diversification, which focuses on aspects of diversification, including special economic zones; the Extractive Industries Transparency Initiative (EITI); and the forestry and skills projects being set up. However, specific needs of the sector, including capacity building, legal and regulatory aspects and optimization of linkages and benefits would justify dedicated technical support.

32) **Finally, it is only in the long run that the mining sector will make a significant contribution to development of the national economy.** After extensive geological works are undertaken to achieve certification of the reserves, a company leading such work that manages to prove through a feasibility study that its operation can be profitable may decide to enter the development phase. Only then does construction begin, and it can
take several years, depending on the type of project and infrastructure at work. These two phases, in combination, can easily last 10 years. They are carried out without any profit to the operators. The positive cash flows generated by the first phase of production are used to repay advances from shareholders or banks. It is only later on that the operation generates profits, which in turn generate important tax revenues, though they are dependent on metal prices in that period. It is sometimes difficult for authorities, local communities and the public to remain patient and wait for benefits that are years down the road. International experience shows the responsibility of the Government, private sector and civil society in raising awareness about this unavoidable temporal horizon. Recommended activities in our action plan should enable the Government to prepare and anticipate mining development that contributes to diversification and sustainable development.
ANNEX 1: BRIEF DESCRIPTION OF THE GEOLOGY OF CONGO

The main geological units of the country are the following

1) The Massif of Chaillu in the western center of the country is a large Mesoarchaean granitic batholith spanning nearly 20,000 km$^2$ and containing volcano-sedimentary and iron narrow furrows (BIF) dated Meso- to Neoarchaean in Gabon.

2) The Massif of Ivindo in the north has a surface area greater than 25,000 km$^2$ and consists of nearly 80% of a Mesoarchaean granite and gneiss complex, punctuated by rare acid to basic intrusions and volcano-sedimentary fragments. It also contains Meso- to Neoarchaean volcano-sedimentary and BIFs, and migmatites and granitoids dated Neoarchaean in Gabon.

3) The Basin of Sembé-Ouesso, covering over 60,000 km$^2$, is composed of weak metamorphic sedimentary rocks, equivalent to Francevillian formations in Gabon (Paleoproterozoic era). From bottom to top, it is the schisto-quartzitic formation of Ouesso, the sandstone-pelitic formation of Sembé-Ouesso, crowned by the discordant Tillite of Dja. Some dolerite dykes and sills cut across the Paleoproterozoic formations and are dated Neoproterozoic (~ 980 Mach [Ma]) in Gabon.

4) The Chain of Mayombe is a section of the Pan-African chain of west Congo covering approximately 10,000 km$^2$, bordered by the Basin of Niari in the northeast and the Coastal Basin in the southwest. It contains mainly meta-sedimentary formations of Neoproterozoic origin (west Congolese group), but also some elements of mica and gneiss Paleoproterozoic basement. From west to east there are:
   a) A lower set, or formation of Bikossi, combining micaceous quartzites, mica schales and basic (dolerite) or acid (calco-alcaline microgranite) intrusions;
   b) A medium set, covering the formations of Loukoula and Mvouti, composed of sericite quartzites, quartz, graphitic or carbonaceous schales, and some acid (microgranite) or basic (dolerite) interflows;
   c) A higher set, or formation of Mossouva, composed of quartzites, quartzitic sandstones, variegated shales, bariolés and jaspers;
   d) A discordant terminal set, composed of lower Diamictite, related to sturtian glaciation and superimposed formation of Louila.

5) Deformed and metamorphosed allochtonous rocks of the chain of Mayombe are discharged or overthrust to the northeast over indigenous units of the Basin of Niari of the
Neoproterozoic period. The degree of metamorphism increases from the northeast (external domain of Niari) to the southwest (internal domain of Mayombe), in connection with an intensification of tectonic deformation.

6) The Niari Basin constitutes a broad asymmetrical synclinorium, and down through the Bouenza sandstone-pelitic formation and the upper Diamictite formation, related to Marino glaciation then topped by shale formations and capped by shale-sandstone Mpioka formations. The Bouenza formation, flush on the NE flank of the Niari basin is regarded as an equivalent to the Louila formation.

7) Overcoming the southeast region of the Basin of Niari, the Neoproterozoic formations of the west Congo group, the Series of Inkissi rests in angular unconformity on different terms of Mpioka. This series is brought closer to the deposits of the System of Karoo, being of Permian period.

8) The Coastal Sedimentary Basin is over 150 km long and 60 km wide. It has three main lithostratigraphic units, representing the three major geodynamic episodes that punctuate the Atlantic Margin. In the onshore domain, one recognizes from bottom to top:
   a) The Series of Contact, of the Cretaceous period, shows on the surface discontinuously in paleovalleys hacking the cristilline basement of Mayombe. It is characterized in the base by alluvial sandstone and conglomerate deposits, then by silt clays and dolomitic limestones, and finally by argilites and sandstones. Indices of bitumen are recognized.
   b) The Series of Holle, of the probable late Cretaceous period, mainly consists of phosphatic sandstone deposits.
   c) The Series of Cirques, of the Pliocene to Pleistocene period, forms an alluvial glaze that covers the entire Coastal Basin and overlies the Series of Holle.

9) The Inner Basin of the Congolese Basin occupies two-thirds of the surface area of the country and forms a large depression. It includes three major formations:
   a) The Series of Stanley Pool (equivalent to the Series of Lualaba-Lubilash) of Upper Jurassic to lower Cretaceous, overlies the Inkissi. It consists of fossiliferous mottled clays and sandstones. At the top, some oil shales in Ostracodes were found through drilling;
   b) The Series of Sandstones of Carnot, where the fluviolake upper set should be considered a part of the Mesocenozoic lithostratigraphy of the Congolese Cuvette;
   c) The Series of Batéké plateaux, of tertiary age, composed of very heterogeneous polymorphic sandstones;
   d) The recent formations of clay and sand. No important mineralization is known there. However, indices of diamond have been reported in the district of Béou near the Central African Republic, and gold and diamond terraces at the gates of Brazaville (Mbamou).

10) The complexes of Haute Sangha and of the Massif of Chaillu are overcome in Congo by discordant formations of medium Precambrian, composed of volcano-sedimentary rocks and intrusions of dolerites (Shales, limestones and quartzitic sandstones weakly metamorphosed in Nela and Sembe-Ouesso) assimilated with the Proerozoic series of francevillien (volcanic faisceau of Massima) further west.
11) The discordant higher Precambrian is represented by the filling of Niari syncline (super group of western Congo) composed of a series of glacial and periglacial tillites in the lower Congo (Niari), alternating with marly limestones of Nyanga, argilites and arkoses attributed to discordant schisto-chalkyseries of Louila/Bouenza, M’Pioka and Inkissi.

12) The most recent sedimentary cover corresponds to the filling of the Coastal Basin, subdivided into three sets. The salt layer of Loemé, in between a sandstone pre-salt layer and a carbonate post-salt layer, is characterized by cyclic sedimentation 650 m to 1000 m thick. It consists of black bituminous clays at the base, overlain by a thick salt layer, alternating anhydrite, halite, sylvinite and carnallite.
ANNEX 2: ASSUMPTIONS OF SCENARIOS A, B AND C

Reminder of scenarios

Three basic scenarios were selected to represent different possible paths of mining development in Republic of Congo in years to come. They are schematically listed in order of probability and are presented in the table below. Their respective assumptions and conclusions drawn are not predictions, but rather a simplified model based on information collected as part of this review.

| Scenario A | A mine of polymetals (Cu, Pn, Zn) of Boko Songho type (SOREMI) starts to produce in 2013; |
| A mine of potash of Mengo type (MPC) starts to produce in 2014; |
| Some efforts are made to better regulate and then increase artisanal production of gold and diamonds. |
| Scenario B | Scenario A |
| A mine of potash of Mengo type (MPC) starts to produce in 2014; |
| Some efforts are made to better regulate and then increase artisanal production of gold and diamonds. |
| Scenario C | Scenario B |
| A mine of polymetals (Cu, Pn, Zn) of Boko Songho type (SOREMI) starts to produce in 2013; |
| A mine of potash of Mengo type (MPC) starts to produce in 2014; |
| Some efforts are made to better regulate and then increase artisanal production of gold and diamonds. |

The scenarios are based on more advanced projects that can provide a sufficiently reliable base line: MPC, SOREMI and Congo Iron on one hand, and Zanaga, MDC on the other hand, that have reached, respectively, the stage of feasibility and pre feasibility. The scenarios do not represent an expert judgment on these projects. Finally, it should be noted that these scenarios do not account for possible developments in industrial minerals.

Key assumptions

**Scenario A.** It represents the basic scenario, probable considering the progress of current projects. It depends mainly on the following conditions: i) global demand justifies entry into production of mining projects in countries considered at risk; ii) companies such as MPC (Evergreen) and SOREMI secure funding for their projects, make the decision to invest and successfully launch production; iii) the Government facilitates their entry into production thanks to their efforts to develop infrastructure, as required in partnership with the private sector, while also investing sufficiently from its side in capacity building of sector management; and iv) the Government supports a more formal and productive development of small and artisanal mines. In this scenario, no iron project starts in the short term, which actually could happen if, for example, projects of west Africa (Guinea, Liberia, etc.) progress faster than anticipated and global growth does not justify the launch of new “greenfield” projects with significant infrastructure costs.

**Scenario B.** It reproduces Scenario A and all its assumptions, assuming further that an iron project of DMC type (directly exporting ore [DSO]) starts by 2015. With this choice of scenario, we do not affirm that the DMC project is more likely to start than other projects of DSO in Congo (Mayoko-Moussoudji, Badondo, etc.). The main additional assumption is that capacity of existing resources (CFCO Railway, Port of Pointe Noire) can be enhanced and renovated or increased to transport iron ore.

**Scenario C.** It reproduces Scenario B and all its assumptions, assuming further that an iron project of Zanaga type starts by 2017. The main additional assumption is that new infrastructure of gigantic size (new railway 350 km long, new port in Pointe Noire, dedicated hydroelectric station) may be subject to public–private partnership and built in time to ensure viability of the
Again, we do not affirm that Zanaga is more likely to start than any other major project in Congo. For the purposes of our model, it is more illustrative to choose a project of Zanaga type whose rail and port infrastructure are likely to be fully realized in Congo.

Given the absence of an advanced gold exploration project in Congo, we have not used any gold mine in our scenarios. This model should be updated periodically because an industrial gold project could grow faster and constitute important leverage to increase the contribution of solid mining to the economy of Congo. Indeed, gold production is less dependent on the weak infrastructure, investments are much lower and prices continue to climb since the economic crisis of 2008. It is not unlikely that a medium-size gold mine will be created in the medium term. Regionally, it may look like the mine of Bakoudou currently developed in Gabon.

**Model**

The share that the sector could represent in the GDP is difficult to assess without any comprehensive macroeconomic framework, but some estimates can be identified using an illustrative model.

Production is estimated as follows:

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>12 ktpa Copper</th>
<th>1.2 Mtpa KCl</th>
<th>100 kgpa Gold</th>
<th>110,000 ctspa diamonds</th>
<th>0 Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario B</td>
<td>12 ktpa Copper</td>
<td>1.2 Mtpa KCl</td>
<td>100 kgpa Gold</td>
<td>110,000 ctspa diamonds</td>
<td>5 Mtpa Iron DSO for 10 years and then 10 Mtpa</td>
</tr>
<tr>
<td>Scenario C</td>
<td>12 ktpa Copper</td>
<td>1.2 Mtpa KCl</td>
<td>100 kgpa Gold</td>
<td>110,000 ctspa diamonds</td>
<td>5 Mtpa Iron (55% DSO)</td>
</tr>
</tbody>
</table>

**Assumptions of prices and costs of production**

The main assumptions of prices and costs of production adopted to establish Scenarios A, B and C are listed below:

<table>
<thead>
<tr>
<th></th>
<th>Price $/t</th>
<th>Production cost $/t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>8000</td>
<td>2000</td>
</tr>
<tr>
<td>KCl Conc</td>
<td>500</td>
<td>200</td>
</tr>
<tr>
<td>Iron 55% DSO</td>
<td>75</td>
<td>20</td>
</tr>
<tr>
<td>Iron 67% DSO</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>Iron 65% Sinter</td>
<td>100</td>
<td>40</td>
</tr>
</tbody>
</table>
The considered tax revenues are:
- royalty of 3% upon entry into production;
- corporate tax of 30% from the seventh year of operation;
- dividends of 10% of after-tax profits from the eleventh year.

**Sensitivity to price**

The results of this summary model depend on a great sensitivity to prices: if prices of each commodity decreased by 10%, revenue in each scenario would decrease by 15% by 2025. To remain in Scenario A, if the price of potash dropped by 20% (at $400/t of KCl), revenues would drop by 30% by 2025 to $114 mil/year versus $162 mil/year in our basic assumption.