

Congo (Republic of Congo)

Total population (July 2000 estimate): 2,831,000

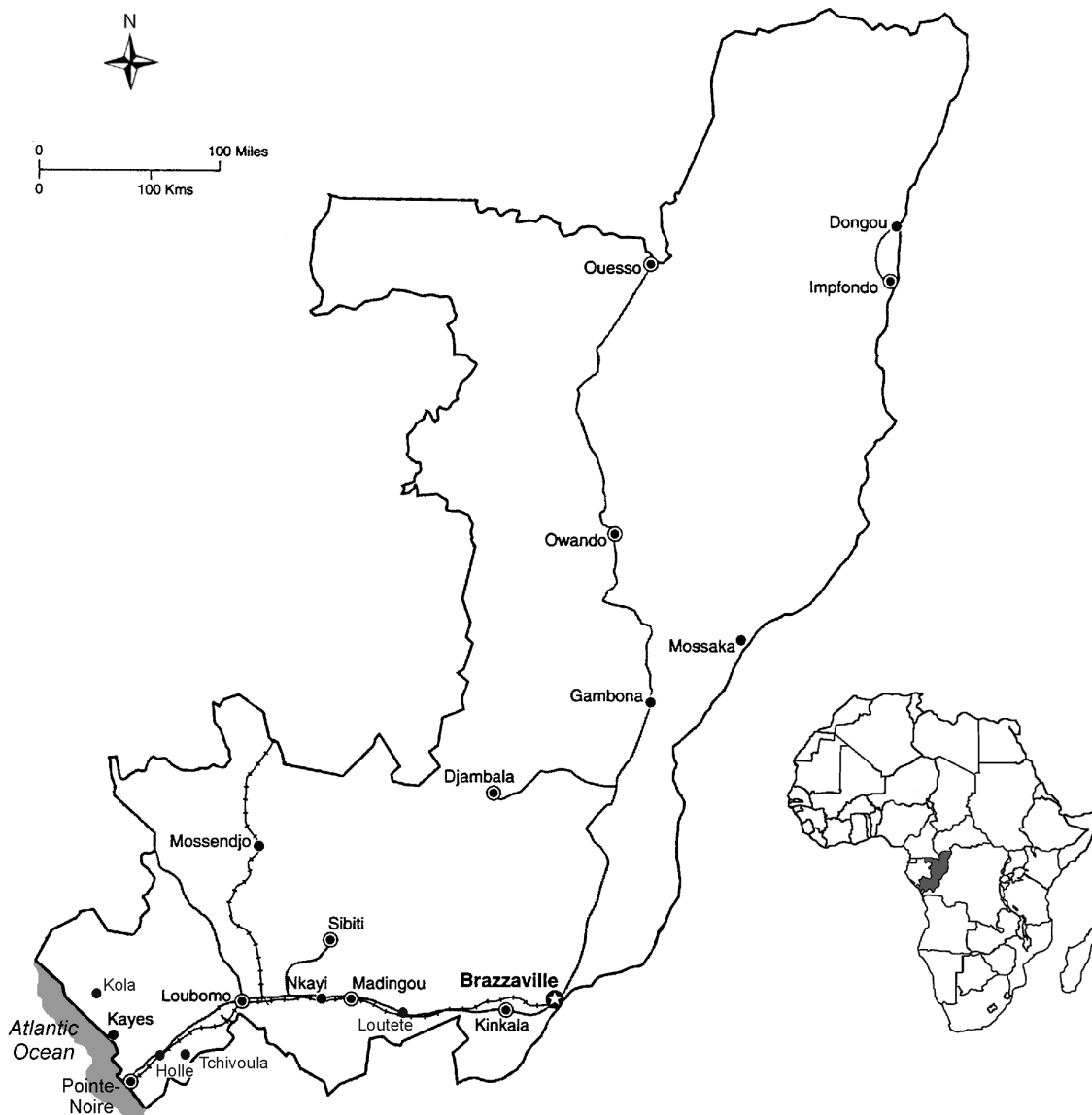
Area: 342,000 km²

Annual population growth rate (2000): 2.23%

Life expectancy at birth (1998): 48.9 years

People not expected to survive to age 40 (1998): 34.4% of total population

GDP per capita (1998): US \$995



The Republic of Congo (also called Congo-Brazzaville) lies on the equator at the west coast of Africa. The main geographical zones of the Republic of Congo (RC) are, from west to east: the low, treeless coastal plain, the Mayombe Range and Chailu Massif covered by rainforest, the vast depression of the Niari valley, and the Bateke plateau and northern parts of the country covered with equatorial rainforests.

The economy of the Republic of Congo with its capital Brazzaville is largely based on the export of crude oil and natural gas. The RC is sub-Saharan Africa's fourth-largest oil producer, pumping 265,000 barrels per day from its offshore deposits. Oil contributes more than 50% to the GDP. The natural gas reserves of the RC are 3.2 trillion cubic feet (TCF), the third-largest known gas resources in sub-Saharan Africa (after Nigeria and Cameroon). All of Congo's gas output is currently flared due to a lack of infrastructure.

Congo's agriculture is predominantly subsistence in nature. Food crops are cassava, plantains, maize, groundnuts and rice. Other crops are sugar cane, palm oil, citrus, pineapple and coffee. Agriculture contributes only 10% to the GDP but provides a livelihood for about 60% of the population.

Geological outline

Geologically, the Republic of Congo is characterized by Precambrian rocks in the central part of the country, which are overlain by continental Cretaceous and Tertiary sediments. Quaternary alluvial sediments cover the eastern part of the country. The coastal basin is made up of Cretaceous to Quaternary marine sediments, including phosphatic sequences and evaporites. The coastal basin borders the Precambrian Mayombe Range to the east. The Neoproterozoic West Congolian Supergroup occurs in the Nyanga syncline with feldspathic sediments overlain by dolomites, cherts and dolomitic limestones with stromatolites. Alvarez and Maurin (1991) and Alvarez (1995) provide a detailed sedimentological analysis of the Neoproterozoic rocks of the Comba trough.

AGROMINERALS

Phosphates

The Republic of Congo has considerable resources of sedimentary phosphates. These phosphate deposits, Upper Cretaceous - Lower Eocene (Ypresian) in age, form a string of outcrops extending over 50 km along the coast (Giresse 1980).

Sedimentary phosphates are exposed 50-80 km east to northeast of Pointe Noire within a 750 m wide belt of the Upper Cretaceous (Maastrichtian) Holle Series and younger sediments (Giresse 1980). These phosphate beds continue into the Cabinda enclave of Angola, and into Gabon. The phosphate deposits were discovered during exploration for oil. In total, the phosphate rock sequence of this area contains 15 million tonnes of phosphate ore at 21-25% P_2O_5 . The phosphate deposit of Kola, in the northwestern extension of the Holle Series, contains 0.3 million tonnes at 21% P_2O_5 (McClellan and Notholt 1986). The most researched phosphate deposit is located in the Holle area at Bas Tchivoula, approximately 40 km east of Pointe Noire, with 5 million tonnes at 23% P_2O_5 . The phosphates are exposed at the surface in two facies, siliceous fossiliferous, and coprolitic-quartzose, representing open sea and deltaic facies respectively (Giresse 1980). Crystallographic investigations of the apatite (unit-cell a -value = 9.30 to 9.35 Å) show that the apatites are francolites (Giresse 1980). However, some aluminum phosphates reported at the top of the formation, weathering products of the underlying phosphates.

Other phosphate deposits in the Republic of Congo are located offshore. In the early 1970s researchers from the Bureau de Recherches Géologiques et Minières (BRGM) reported unconsolidated phosphatic sediments of Miocene and Holocene age in offshore deposits near Pointe Noire (Barusseau *et al.* 1988). These deposits are probably reworked unconsolidated sediments and occur in shallow water at a depth of

about 40 m, less than 20 km from the coast. In 1982, the United Nations Revolving Fund for Natural Resources Exploration (UNRFNRE), through contractors, carried out detailed offshore investigations in an area between Point Noire and the border to the Cabinda enclave. The investigations included seismic profiling and dredge sampling, and outlined an area of about 81 km² with near-surface unconsolidated enrichments of phosphorite pellets and calcareous shells. The probable reserves are reported as 7 million tonnes of phosphorites and 25.5 million tonnes of calcareous shells (UNRFNRE 1984).

Samples from the mixed phosphorite/shell deposit (10.5% P₂O₅) were tested agronomically at the Research Station of Loudima in Congo, but no results are available. Large samples of phosphate pellets and calcareous shells were also evaluated by the Agronomy Department of the Mississippi State University (Pettry 1985) to assess their mineralogy and agronomic effectiveness.

Mineralogical and chemical studies of the screened samples show that the phosphate minerals are francolite. The unit-cell *a*-value of a phosphate sample provided by the International Fertilizer Development Center (IFDC) was 9.3247 Å, and has confirmed francolitic composition. Baresseau *et al.* (1988) report *a*-values from these offshore phosphorites from 9.155 to 9.347 Å. The total P₂O₅ content of the 'pure' phosphorites was 30.06-31.07% (Pettry 1985). Finely ground phosphorites were evaluated in a greenhouse study using an ultisol with a pH of 5 and high P-fixing capacities from Mississippi State as test soil and wheat as the test crop. The greenhouse study showed that plant uptake P-levels for the 0.25, 1, and 3 tons per acre applications of finely ground phosphorite (less than 60 mesh) exhibited increased yields of 20, 113, and 165% respectively above the control (Pettry 1985).

McClellan and Notholt (1986) mentioned phosphate nodules (28-35% P₂O₅) in the Neoproterozoic Schisto-Calcaire in the middle Niari Valley, near Comba, 110 km west of Brazzaville. Alvarez (1995) noted authigenic apatites in lagoonal sediments of the Neoproterozoic West Congolian Supergroup. So far, however, the grade, extent and volume of these occurrences are not known. This phosphate occurrence, though of unknown extent and quality, is extremely important as it represents the only known phosphate occurrence in the Schisto-Calcaire of the Neoproterozoic West Congolian Supergroup in West Africa.

Potash

The Republic of Congo is one of the few countries in sub-Saharan Africa with extensive potash resources. The Lower Cretaceous potash deposit of Holle in the coastal region of Congo was mined in the 1970s (de Ruiter 1979). The potash deposit at Holle occurs at depths of 400-700 m below sea level. The potassium-salts in the Holle potash deposit are rich in carnallite and sylvite. Production of sylvite (KCl) reached 450,000 tonnes per year in the 1970s but was halted when the mine flooded in 1977 (de Ruiter 1979; Kronsten 1996). De Ruiter (1979) describes layers of 1.9 m and 3 m thickness with K₂O contents of 18 and 38% respectively and mineable reserves of 17 million and 26 million tonnes K₂O respectively.

Limestone/dolomite

Abundant limestones and dolomites are found in the Neoproterozoic Schisto-Calcaire of the West Congolian Supergroup in the west of the country. The oolitic limestone at the base of the Schisto-Calcaire is up to 30 m thick with very large reserves. A limestone quarry near the town of Loutete provides limestone material for the local cement industry. At another site, at Mandingu, west of Loutete the quarried limestone is used for quicklime production. The lime kiln has an annual capacity of 30,000 tonnes (Gwosdz 1996). Other carbonate horizons of the Schisto-Calcaire are dolomitic in composition. There are also widespread Cretaceous - Tertiary marine sediments in the coastal area of Congo, some of which are limestones. Shell samples from dredging operations offshore, discussed in the section on phosphates, contained limestone shells with CaCO₃-equivalent contents of 81-89%, which is comparable to commercial agricultural liming material (Pettry 1985).

Agromineral potential

The Republic of Congo is endowed with a variety of agrominerals, including Cretaceous, Miocene and Holocene phosphates, as well as extensive potash and limestone/dolomite resources. The phosphorites of the Upper Cretaceous Holle Series near Bas Tchivoula should be assessed for their potential as direct application phosphate fertilizer using small-scale mining and appropriate processing technologies.

There is a strong need to investigate the stratigraphic and structural controls of Neoproterozoic phosphates of the Schisto-Calcaire and compare them to the Neoproterozoic phosphates of West Africa (Burkina Faso, Benin, Niger) and the Brazilian deposits of the Bambui Group (Dardenne *et al.* 1986). This could potentially lead to new discoveries of phosphates in the Republic of Congo and in other parts of the Neoproterozoic in neighbouring countries with similar rock sequences. The upper Cretaceous to Tertiary phosphorites of the Holle area should be studied on their potential as direct application phosphate fertilizer on local acid and phosphorus deficient soils. The potential of the limestone resources depends largely on the proximity of these resources to acid soils, on agronomic response, and on economic considerations.

References:

- Alvarez P 1995. Les facteurs de controle de la sédimentation du Supergroup Ouest-Congolien (Sud-Congo). Rampe carbonatée et activité biologique au Proterozoic Supérieur. Documents du BRGM 239, 231pp.
- Alvarez P and Maurin JC 1991. Evolution sédimentaire et tectonique du bassin proterozoïque supérieur de Comba (Congo): stratigraphie séquentielle du Supergroupe Ouest-Congolien et modèle d'amortissement sur décrochements dans le contexte de la tectogenèse panafricaine. *Precamb. Res.* 50:137-171.
- Barusseau JP, Giresse P and L Manongo 1988. Genesis of a Holocene phosphate placer deposit on the continental shelf of Congo. *J. Coastal Res.* 4:369-379.
- Dardenne MA, Trompette R, Magalhaes LF and LA Soares 1986. Proterozoic and Cambrian phosphorites - regional review: Brazil. In: Cook PJ and JH Shergold (eds.) *Phosphate deposits of the world*, Vol. 1: Proterozoic and Cambrian phosphorites, Cambridge University Press, Cambridge, UK: 116-131.
- De Ruiter PAC 1979. The Gabon and Congo Basins Salt Deposits. *Econ. Geol.* 74:419-431.
- Giresse P 1980. The Maastrichtian phosphate sequence of the Congo. *Soc. Econ. Paleont. Mineral, Spec. Publ.* 29:193-205.
- Giresse P and R Baloka 1996. Les phosphates meso-cénozoïques du bassin du Congo et leurs paléoenvironnements. *Bull. Soc. Geol. Fr.* 5:585-600.
- Gwosdz W 1996. Congo. In: Bosse H-R, Gwosdz W, Lorenz W, Markwich, Roth W and F Wolff (eds.) *Limestone and dolomite resources of Africa*. *Geol. Jb., D*, 114-117.
- Kronsten G 1996. Congo. *Mining Annual Review 1996*. Mining Journal Ltd. London, p.149.
- McClellan GH and AJG Notholt 1986. Phosphate deposits of sub-Saharan Africa. In: Mokwunye AU and PLG Vlek (eds.) *Management of nitrogen and phosphorus fertilizers in sub-Saharan Africa*. Martinus Nijhoff, Dordrecht, Netherlands:173-224.
- Petty DE 1985. Evaluation of shell/phosphorite deposits as soil liming and fertilizer materials. Rep. to UNRFRNRE. Agron. Dept. Mississippi Agric. For. Exper. Station, Mississippi State Univ./ UN, New York, 25pp.
- UNRFRNRE (United Nations Revolving Fund for Natural Resources Exploration) 1984. Exploration pour phosphates au large des côtes du Congo (Secteur de Pointe Noire). Internal report, UN, New York, 20pp.