

## CÔTE D'IVOIRE

*By Bob Foster*

*Exploration Consultants Limited, Henley-on-Thames, UK*

Côte D'Ivoire (Ivory Coast) is an independent republic of almost 16 million people. One of the larger countries of West Africa with an area of some 322,000 km<sup>2</sup>, it borders the Gulf of Guinea and is bordered inland by Liberia (to the west), and Guinea, Niger, Burkina Faso and Ghana (to the east). The political and administrative capital is Yamoussoukro but the commercial capital and leading port is the city of Abidjan.

A narrow coastal strip is backed by a forest-covered coastal plain rising inland towards a mix of plains and low hills, with a small mountainous area around Man to the west. The highest point is Mount Nimba at 1,752 m elevation. Moving north, the land becomes savannah. The tropical climate is affected by distance from the sea: coastal areas have wet seasons from May to July, and from October to November. In the central areas the wet seasons are March to May and July to November; the shorter wet season in the north is from June to October. The official language is French and the former French colony, although gaining independence in 1958, still maintains close political and economic links with France. There are 60 native dialects, with Dioula the most widely spoken. The main ethnic groups are Baoule, Bete, Senoufou and Malinke. Major religions are Islam (63%), Christianity (12%) and indigenous beliefs (25%).

Côte D'Ivoire is a republic, with a multiparty presidential regime having been established in 1960. For more than three decades after independence under the leadership of its first president, Felix Houphouët-Boigny, Côte D'Ivoire was conspicuous for its religious and ethnic harmony, and economic progress in West Africa. However, the country's reputation for stability was shattered when General Robert Guei took power in a coup in December 1999. The first coup in the Côte D'Ivoire in 40-years of independence, it was followed by two

major military rebellions, disputed elections and violence. Presidential elections to restore democracy in October last year led to yet more violence and a popular uprising that brought Laurent Gbagbo to power. But the new president's triumph has been soured by political and ethnic fighting between his supporters and those of rival opposition leader, Alassane Ouattara, a Muslim from the northern part of the country. To date the Muslim-Christian split appears irreconcilable.

The main exports are cocoa, coffee, tropical hardwoods, petroleum, cotton, bananas, pineapples, palm oil, fish and rubber-sourced latex. Agricultural products are a key element of the country's economy. Consequently, the economy is highly sensitive to fluctuations in international prices for these products and to weather conditions. Despite attempts by the government to diversify the economy, it is still largely dependent on agriculture and related activities, which engage roughly 68% of the population. Oil also plays an important role, although in recent years the downstream activities have dominated through a major refinery and separate bitumen plant located in Abidjan. GDP in 1998 was US\$11 billion, of which agriculture contributed 25% and industry 22%, with manufacturing comprising the bulk (19%) of the latter figure.

Underlain almost completely by Archaean and early Proterozoic rocks, Côte D'Ivoire has considerable mineral potential, with important occurrences of gold, diamonds, iron, nickel, cobalt, copper and manganese, and bauxite having been identified. Like much of West Africa, however, it is gold that has been at the forefront of exploration since the introduction of a new favourable mining investment code in 1995.

The Ity mine is the country's major gold-producer, owned by Normandy Mining Ltd

(51%) and by the state mining company Sodemi (Société d'Etat pour le Developpement Minier de la Côte D'Ivoire with 49%). The low capital cost, high-grade open-pit, heap-leach operation commenced production in 1991. During 1999-2000, a total of 269,267 t of ore was stacked for treatment resulting in the production of 43,410 oz of gold. Nearby additional resource potential has been identified in a 14 km anomalous zone. Gold production is expected to increase to 65,000 oz/y following the completion of a crushing and agglomerating plant relocation and expansion project. A plant upgrade is planned for later this calendar year. Towards the end of 2001, Cogema, the French nuclear fuels producer, announced that it was to acquire a 51% interest in Ity Aufrom Normandy Mining. The sale price was US\$10.8 million, plus a net smelter return royalty of 2% on output between 13 t and 21 t of Augold, and 3% between 21 t and 35 t of Augold. The remaining 49% of Ity was to be held by Sodemi.

The other operating mine, Angovia, opened in July 1999, is owned by CMA, a wholly-owned subsidiary of France's BRGM. The reserve was originally computed at 2 Mt of ore averaging at 4 g/t Au, giving a mine life of about six years. The Afema mine situated in the southeast of the country has closed temporarily due to the current gold price. Sodemi (32%) and Eden Roc Mineral Corp. of Canada jointly own Afema, which produces approximately 935 kg of gold annually.

The Australian junior gold mining and exploration company, Hargraves Resources NL (acquired by Durban Roodepoort Deep in 1999) is developing the Agbaou gold deposit located northwest of Abidjan. An initial resource of approximately 1 Moz of gold has been outlined in saprolitic and lateritic ores. Recently, Etruscan Resources has expressed an interest in the property, reportedly one of the largest gold deposits in West Africa. Ashanti Goldfields Co. was granted a three-year exploration permit on the Allangoua permit in the southeast close to the Ghanaian border. A rotary airblast (RAB) drilling

programme was undertaken, with the focus being on old artisanal workings. Previous RAB drilling on the Abradine prospect showed that the mineralisation occurs in discontinuous pods with limited tonnage potential. However, interest remains high, primarily due to the presence of the major Afema Shear Zone in Birimian greenstone-belt rocks.

Exploration by Randgold Resources Ltd at the Tongon Augold property on its Nielle permit has resulted in an increase in inferred resources of 1 Moz of contained Au to 2.9 Moz (or 34 Mt at 2.65 g/t Au). The property is now the subject of a prefeasibility study. The mineralised zone has been delineated to date over a 1.4 km strike length in one zone, and over 700 m in another. The original exploration programme was designed to assess the continuity and test the upside potential of mineralisation along two zones covering more than 4 km of strike length, believed to be extensions of the Syama gold belt from neighbouring Mali.

Golden Star Resources was actively exploring on the Tanda (Comoe) gold project during 2000. Golden Star had a 40% interest in the property in joint venture with North Ltd and Sodemi. Chinese investors reportedly expressed interest during 2001 in developing gold mining activities at Zeregbo in the central-western part of the country, and also showed interest in the country's manganese and tantalum resources. In the first half of 2001, Australian junior Equigold was to begin drilling on the Bonikro gold prospect, situated on the Oume permit.

Alluvial diamond mining has an official annual output of 20,000 ct, of which 75% is said to be gemstone quality. Sodemi's director general, Mr Jean Likane, estimated that actual production was probably four times that figure. The Côte D'Ivoire has historically produced approximately 165,000 ct/y. All of the alluvial mining is sourced from kimberlite fields at Tortiya, Seguela and Korhogo.

Golden Star Resources has several diamond exploration projects in Côte D'Ivoire. African

Mining and Petroleum Resources plc (AMPR - a re-incarnation of African Carnegie Diamonds plc, a subsidiary of Australian Carnegie Minerals NL) has a joint venture with Sodemi (25%) covering the 1,000 km<sup>2</sup> Bobi and Toubabakou diamond prospects. The area covers several kimberlitic dykes and sills. The initial target is a 6 km long stretch along the Legbo River as well as the Bobi dyke which could represent a potential source. The company was very encouraged with the diamond counts, the estimated diamond weight per tonne and the mineral chemistry of the indicator mineral chromite. Further mineral chemistry studies were undertaken to confirm the favourability of the mantle source rocks. Exploration in 2000 included trenching and sampling of the northwestern part of the dyke followed by diamond drilling but there does not appear to have been any activity since mid-2000. However, AMPR stated its intention of generating cash flow by purchasing diamonds from artisanal miners and then moving to production from the alluvial deposits.

The largest potential mining development under evaluation during 2001 was the Biankouma-Touba nickel deposit, a joint venture between Falconbridge Ltd and Sodemi, whereby Falconbridge has the option to earn an 85% interest. The project includes four deposits (Sipilou North, Fougouesso, Moyanga and Viyala), with an indicated resource of 126.4 Mt at 1.57% Ni and 0.11 % Co, and an inferred resource of 138.3 Mt at 1.39% Ni and 0.12% Co. Work during 2001

was focusing on hydrometallurgical testing. The third party originally involved in the joint venture, Trillion Resources, withdrew during 2000, and Falconbridge's option right consequently increased from 60% to 80%.

Necessary infrastructure to support this major venture would include a 500 km rail link between San Pedro on the coast and the project site at Sipilou, near Biankouma. The Canadian International Development Agency has reportedly awarded a grant of C\$600,000 to the government to cover the cost of a feasibility study for the railway to be undertaken by Canadian rail operator Canarail. It is anticipated that the same rail link could also be utilised to promote exploitation of the Mount Nimba iron-ore deposits on the border with Liberia and Guinea.

The vast iron-ore deposits at Mount Nimba and Mount Kalayo, in the western border area, estimated at 3,000 Mt, have so far attracted little attention owing to the grade of the deposits, estimated at 40% Fe. However, recent negotiations to develop a gas pipeline to service an iron-ore pelletising plant on site has been discussed with Normandy Mining, Sodemi and a Chinese investment group. There has also been talk of a rail link between Mount Nimba to the port of San Pedro.

Other commodities targeted for evaluation are bauxite resources of 1,200 Mt, manganese resources of at least 35 Mt and tantalite deposits.