

# Assessment of the discovered and undiscovered oil and gas of Africa

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## Abstract

The study presents assessment of the hydrocarbon potential of almost all known sedimentary basins of the African continent and adjacent offshore coastal areas of the Mediterranean Sea and the Indian and Atlantic Oceans. The assessment is based on new data that became available following the well-known monograph of V.I. Vysotsky et al. (1994), which provided the last petroleum potential assessment published in the Russian literature. These data provide a more accurate evaluation of the regional initially-in-place and recoverable hydrocarbon resources, exploration maturity as of the beginning of 2015, the total number of discovered oil and gas fields, and field/resources distribution by basin type and offshore and onshore areas.

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*Keywords:* hydrocarbons; resources; reserves; oil and gas fields; Africa

## Introduction

Africa is one of the world's biggest petroleum producers that was responsible for 11–13% of global crude oil production and 5–7% of marketable gas production in 2000–2014. The history of petroleum exploration and production in Africa stretches over a period of decades, in some places it is even a century old. At present, Africa's oil and gas production at existing fields amounts to 18 billion tons (Gt) of crude oil and 3 trillion cubic meters (Tcm) of natural gas (BP World..., 2015; Index..., 2015; International Energy..., 2015), whereas unbiased estimation of the current status of Africa's hydrocarbon potential will provide clues for understanding its role in both short- and long-term global oil and gas supplies and is critical for determining the cooperation opportunities in the fields of science, technology, and economy between Russia and countries of the African region.

The last summary report presenting a hydrocarbon potential assessment for most regions around the world, including Africa, has been completed and published, more than 20 year ago, by researchers from VNIIZarubezhgeologiya and VNIGNI (Vysotsky et al., 1994). Since then, much new and interesting information (mostly web-based) has become available and include data on exploration and development activities in many African countries, as well as analytical results of the

U.S. Geological Survey (Brownfield et al., 2010; Charpentier et al., 2000; Schenk et al., 2012) and many national companies, geological surveys, international consulting services, and oil and gas companies. From this, a detailed analysis was made to provide a better understanding of the number, boundaries and size of petroleum basins and discovered fields, and to allow a more accurate evaluation of the region's initially-in-place and recoverable hydrocarbon resources, exploration maturity as of the beginning of 2015, the total number of discovered oil and gas fields, and field/resources distribution by basin type, offshore and onshore areas using Russian geology-based reserves classification methodology (Kontorovich, 1988; Maksimov et al., 1983).

## Petroleum zonation of the region

Within the African continent and adjacent offshore coastal areas of the Mediterranean Sea, Indian and Atlantic Oceans, about 60 sedimentary basins with known and yet-to-find hydrocarbon potential have been identified (Fig. 1), 28 of which have proven to contain commercial productivity and 32 are presently under exploration or awaiting exploration.

According to the nomenclature used in the map of world oil and gas potential (Vysotsky et al., 1994), all sedimentary basins identified in Africa are subdivided into continental (platform or associated with orogenic belts) and transitional (associated with passive continental margins and intraplate zones) basins.

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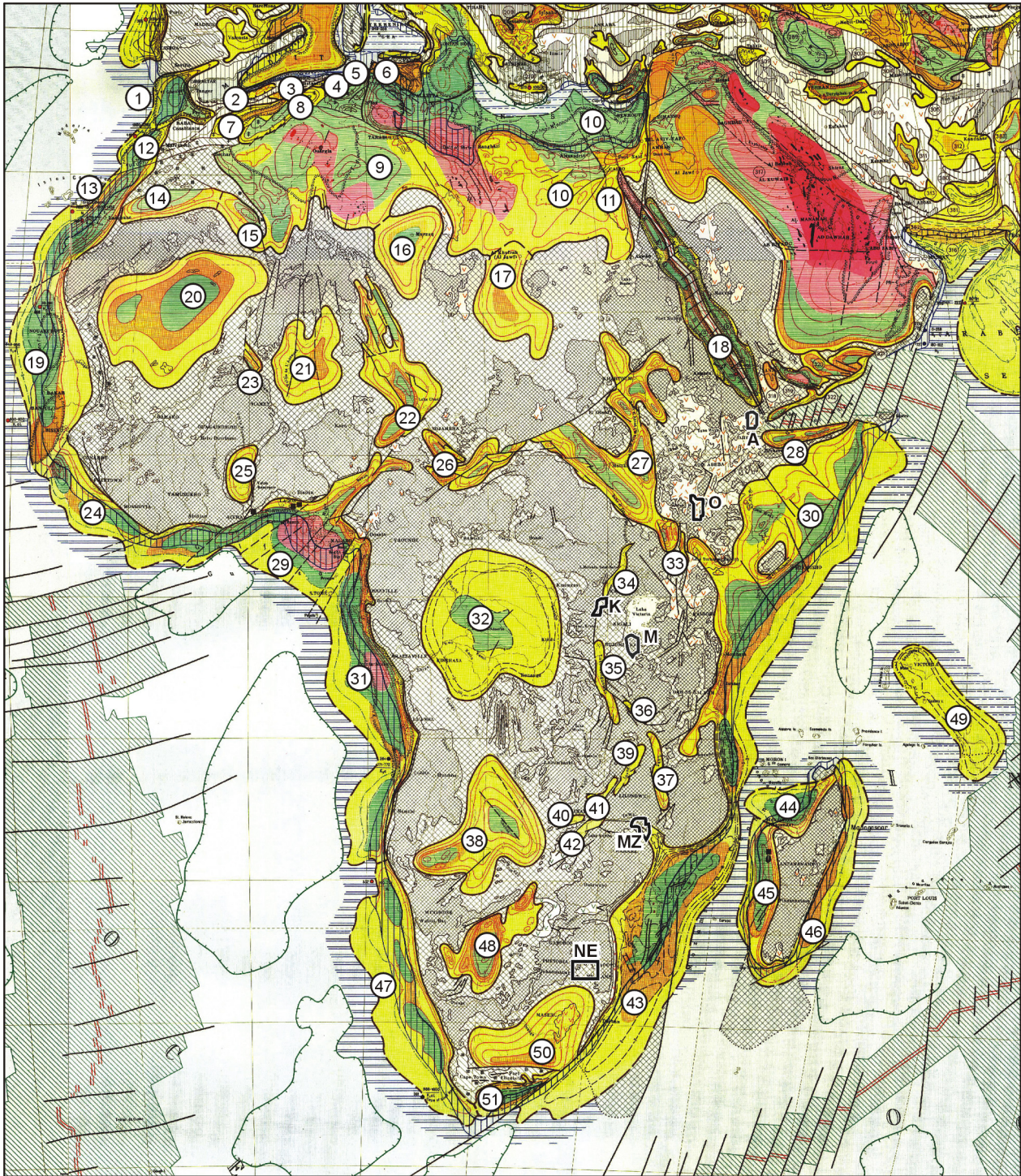


Fig. 1. Map of Africa's sedimentary basins with discovered and yet-to-find oil and gas fields, modified based on the geological map of Africa of Levey (2012) using data from Vysotsky et al. (1994) and data published in 1995–2015. The numbers denote the basins: 1, Andalusian-Pre-Rif; 2, Western Tell; 3, Southern Tell; 4, Eastern Tell; 5, Eastern Atlas; 6, Tunisia–Sicily; 7, Middle Atlas; 8, Central Atlas; 9, Algerian–Libyan; 10, Sahara–East Mediterranean; 11, Gulf of Suez depression of the Red Sea–Suez basin; 12, West Moroccan; 13, Aaiun; 14, Tindouf; 15, Reggane; 16, Murzuq; 17, Kufra; 18, Red Sea depression of the Red Sea–Suez basin; 19, Senegal; 20, Taoudeni; 21, Mali–Niger; 22, Chad; 23, Gao; 24, Leone–Liberian; 25, Volta; 26, Chari; 27, Upper Nile; 28, South Aden; 29, Gulf of Guinea; 30, East African; 31, Kwanza–Cameroon; 32, Congo; 33, Turkana; 34, Albert; 35, Tanganyika; 36, Rukwa; 37, Nyasa; 38, Okavango; 39, Luangwa; 40, Kafue; 41, Luano; 42, Kariba; 43, Mozambique; 44, Majunga; 45, Morondava; 46, Eastern Madagascar; 47, Namibia; 48, Kalahari; 49, Seyshelles; 50, Karoo; 51, South Cape; basins delineated after 1994: A, Afar; K, Kivu; M, Malagarasi; O, Omo; MZ, Middle Zambezi; NE, basins of the northeastern part of the RSA (Waterberg, Ohrigstad, Soutpansberg, Springbok, Tuli).

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