

Appendix A

Situational analysis



1. Oil and Gas Value Chain Analysis

Africa is endowed with considerable oil and gas. Oil and gas supply chains can be complicated systems, requiring explicit identification of the resource and intended end user. Recognising critical components within the supply chain models for both oil and gas, provides context to understand the diversity of the system and potential issues that can affect the various stages of development, production and distribution.

African nations have been divided into five geographic regions, namely North, East, South, West, and Central Africa, which together constitute all 55 countries of the continent. Study countries were chosen for evaluation based on their contributions to the oil and gas industry, while still allowing for geographic diversity.

The breakdown of the oil and gas value chain defined in this study, is followed by analyses of the value chains in the focus countries.

1.1 Value Chain Breakdown

Through a competitive tender process, EPCM The main purpose of the breakdown, as depicted in Figure 1, is to ensure that the business focused on upstream, midstream and downstream remains distinct, with clear risk transfer at each stage

1.1.1 Upstream Sector

Upstream includes all oil and gas field facilities, up to the point where oil and gas are sold or transferred to a transport system.

The main drivers for success in the upstream sector are the ability to quantify and manage risk.

1.1.2 Midstream Sector

In the midstream sector of the oil industry, bulk crude oil transport, storage and refinery facilities are included. For gas, the midstream sector encompasses pipeline transport, as well as processing and liquefaction facilities (Liquefied Natural Gas and Gas to Liquids).

Midstream success is dependent on uptime, cost control and conversion efficiency.

1.1.3 Downstream Sector

The downstream sector encompasses all facilities that handle the refined/processed oil/gas from the midstream processing facilities to final sale or consumption.

The downstream sector's success is dependent on logistics, location and marketing.

1.2 Northern African Countries

1.2.1 Algeria

Algeria is a strategic energy player. It is the biggest natural gas producer in Africa, a pioneer and leader in Liquefied Natural Gas (LNG) exports, Europe's second-largest natural gas supplier after Russia and a key hydrocarbon provider to Southern Europe.

The country holds the world's 11th largest proved natural gas reserves and the third highest technically recoverable shale gas resources, as well as the third largest proved crude oil reserves in Africa (BP , 2021).



Figure 1 Value chain breakdown

1.2.1.1 Crude Oil Value Chain

Upstream Sector

Algeria has an estimated crude oil reserve of 12,2 billion barrels, all of which are located on-shore because there has been limited offshore exploration, with current production reported in excess of 1,33 million bpd (BP , 2021).

Midstream Sector

Algeria primarily uses three coastal oil export terminals located in Arzew, Skikda and Bejaia (Africa Energy Series, 2020).

Algeria's domestic pipeline network facilitates the transfer of oil from interior production fields to coastal infrastructure, with the most important pipelines carry crude oil from the Hassi Messaoud field to refineries and export terminals.

Algeria consumes nearly 366 000 bpd, with a refining throughput of 557 000 bpd from five refineries (Adrar, Algiers, Arzew, Hassi Messaoud and Skikda) with a combined nameplate capacity of 671 000 bpd (BP , 2021) (AFREC, 2022).

Construction of a new crude oil refinery, in the Sahara Desert at Hassi Massaoud, with a capacity of 100 000 bpd, is anticipated to be completed in 2025 (Forbes, 2020).

Downstream Sector

Refined petroleum products are transhipped from Arzew and Skikda terminals to hydrocarbon terminals at Algiers, Annaba, Oran, and Bejaia.

1.2.1.2 Natural Gas Value Chain

Upstream Sector

Algeria's natural gas reserves are estimated at 81,2 tcf and it produced 2 878 bcf in 2020 (BP , 2021). Algeria consumed 1 522 bcf and exported 530 bcf as LNG, primarily to Europe and the Asia Pacific region (BP , 2021). The country's pipeline exports were recorded at

406 bcf to Italy, 32 bcf to Spain, with the remainder earmarked for other European and African countries.

Midstream Sector

Algeria has three transcontinental export natural gas pipelines: two transport natural gas to Spain (Medgaz pipeline and GME pipeline) and one transports natural gas to Italy (Transmed

pipeline) (EIA, Country Analysis Brief, 2016). Capacity on the Medgaz pipeline to Spain is set to increase from 920 MMscfd to 1 060 MMscfd, following a recently completed expansion (S&P Global Platts, 2022). Gas export by Algeria to Spain through the Gaz-Maghreb-Europe (GME) pipeline, with a capacity of 353 bcf per annum, stopped in 2021 (Atakayar, 2021). The Transmed pipeline, supplying natural gas to Italy, averages 2 150 MMscfd, with a design capacity of 1 183 bcf per annum (S&P Global Platts, 2022).

The country plans to develop two additional transcontinental export pipelines, namely the GALSI pipeline, destined for Italy with a capacity of 238 bcf per annum, and the Trans-Saharan Gas Pipeline (TSGP), from Nigeria to Algeria via Niger, with a capacity of 1 059 bcf per annum. Both of the proposed pipelines' development plans remain uncertain (EIA, 2019).

The Arzew/Bethioua LNG terminal consists of 13 natural gas liquefaction trains, with a total capacity of 20,8 MTPA (2,98 bcf/d). Skikda LNG terminal consists of a single liquefaction train, with a capacity of 4,5 MTPA. The facility was shut down in June 2021, following failure of a gas turbine control mechanism and operations have not yet been restarted (S&P Global Platts, 2021).

Downstream Sector

Algeria's domestic natural gas market primarily involves the power generation (41%) and residential (26%) sectors, with the remainder consumed in other sectors such as the industrial and petrochemical sectors (Statista, 2021).

1.2.1.3 Transactions

Crude Oil

Crude oil export was reported at 438 700 bpd in 2020, earmarked for Europe, Eurasia, France and the United Kingdom (OPEC, n.d.).

Natural Gas

Algeria exports LNG (530 bcf) primarily to Europe and the Asia Pacific region, while natural gas pipeline exports are destined for Italy (406 bcf), Spain (321 bcf) and other European Union countries (14 bcf) (BP , 2021).

Refined Petroleum Products

Algeria exports refined petroleum products to the United States (US), South Korea, China, France and Brazil (Refined petroleum in Algeria, 2019). Petroleum exports in 2020 corresponded to 503 400 bpd, with domestic demand noted at 383 000 bpd (OPEC, n.d.).

Despite adequate refining capacity to satisfy domestic demand, the country imported refined petroleum products from Italy, Russia, France, US and Netherlands (Refined petroleum in Algeria, 2019).

1.2.1.4 Energy Outlook

In the country's energy balance, natural gas contributes 56% of primary energy production, 97% of electricity production, and 38,4% of total energy consumption (Kerriche & Moussi, 2021).

There are on-going initiatives to expand Algeria's renewable energy potential, but progress has been very slow. Thus, renewable energy sources are still far from being able to achieve a significant share of Algeria's future energy mix and heavy reliance on natural gas to generate electricity will continue, at least until the end of next decade.

There are recurrent calls from Algerian policy decisionmakers to prepare for a sustainable energy transition based on a larger share of clean energy sources in a diversified energy mix, with a projected increase in solar energy share from 2% to 15% as early as 2028.

1.2.2 Egypt

Egypt is Africa's largest non-Organization of the Petroleum Exporting Countries (OPEC) oil producer and the continent's third largest producer of dry natural gas. Furthermore, the country is an important transit point for oil destined for Europe and the US from the Persian Gulf. Egypt expects to invest USD 38 billion into strengthening its petrochemical industry over the next four years (International Trade Administration, 2021).

1.2.2.1 Crude Oil Value Chain

Upstream Sector

Currently, Egypt has 124 active exploration and production licenses and produces

616 000 barrels of oil daily, but has proven reserves of 3,1 billion barrels in the Gulf of Suez and the western desert region (Egypt Oil and Gas, 2022) (BP, 2021).

Egypt has one Floating Production Storage and Offloading (FPSO), Al Zaafarana, operating in Block BN1, with a storage capacity of 800 000 barrels (Offshore Magazine, 2021)

Midstream Sector

Egypt's operation of the Suez Canal and the Suez-Mediterranean (SUMED) Pipeline plays a critical role in worldwide energy markets. The pipeline connects the Gulf of Suez's Ain Sukhna port to Alexandria's offshore Sidi Kerir in the Mediterranean Sea. SUMED replaces the Suez Canal as a method of transferring oil from the Persian Gulf to the Mediterranean and has a daily capacity of 2,8 million barrels (EIA, 2019).

The country has a liquid storage terminal, Ain Sokhna III, located in Suez, with a capacity of just over 13,3 million bbl (165 000 m³) (Offshore

Technology, 2021). The terminal is accessible by pipeline, road and sea.

Sidi Kerir terminal is a tanker terminal at the north-end of Suez Mediterranean pipeline, with a storage capacity of 3,3 million m³ (Logistics Capacity Assessments, n.d.).

Having eight refineries with a nominal capacity of 797 000 bpd, Egypt has the largest refining capacity in Africa (BP, 2021) (AFREC, 2022). The country aims to upgrade existing refineries to increase their efficiency and production.

In April 2021, the Egyptian government and the state-owned Red Sea National Petrochemicals Company signed an agreement to build a petrochemicals complex in the Suez Canal Economic Zone at Ain Sukhna. The petrochemicals complex will be used to produce a variety of petrochemical products, including polyethylene, polyesters, and bunker fuel, and, when completed, will be the first and largest integrated facility in Africa.

Export terminals include Melliha, Ras-sider, El-hamra, Ras-Ghareb, Gabal-El-Zeit, Shukheir, Ras-Badran and Ras Firan.

Downstream Sector

In 2021, Egypt transported crude oil and petroleum products to different areas of consumption through its domestic pipeline network, which reached 6 165,5 kilometres with a capacity of 59,8 million tons, as well as by using its fleet of trucks with a capacity of

22,5 million tons, and by shipping 8,6 million tons and 0,1 million tons respectively by sea and rail.

Retail fuel stations and industrial customers receive petroleum products from the main and sub-storage terminals.

As of June 2021, there are 3 853 retail fuel stations throughout the country, along with 37 mobile stations for supplying heavy equipment with fuel on sites for new projects (under construction).

1.2.2.2 Natural Gas Value Chain

Upstream Sector

Egypt ranks the third-largest natural gas producer in Africa.

Eni was awarded five new exploration licenses in January 2022, located in the Eastern Mediterranean Sea, Western Desert and Gulf of Suez, focussed on exploring and producing gas to sustain the Egyptian domestic market and contribute to LNG export following the restart of the Damietta LNG plant (Eni, 2022).

Midstream Sector

Egypt has two transmission pipelines to trade natural gas to the international markets, namely the Arab Gas Pipeline (AGP) and the East Mediterranean Gas (EMG) pipeline.

The AGP is a 1 200 km, trans-regional gas export pipeline, capable of transporting up to 1 000 MMscfd natural gas from Egypt to Jordan, Syria and Lebanon (Hydrocarbons Technology, n.d.). It is anticipated that Egypt will export up to 70 MMscfd natural gas to Lebanon in 2022.

The EMG pipeline is a 90 km natural gas pipeline, with a design capacity of

1 000 MMscfd (anticipated operating capacity of 550 MMscfd) running from Israel to Egypt (BusinessWire, 2019).

The Damietta LNG plant is located near Alexandria and has a capacity of 5 MTPA. The facility has been idle since 2012 amid legal disputes, but production was resumed in 2021 (Offshore Energy, 2021).

The West Nile Delta onshore LNG terminal at Idku City has a daily processing capacity of

1,4 bcf and all the gas is fed into Egypt's national grid (Euro Pétrole, 2021). The Egyptian LNG export terminal in Beheira, has a capacity of 7,2 MTPA.

To be submitted is a proposal for a 310 km pipeline from Cyprus' offshore gas resources to Egypt. A proposed start date for this operation is 2026, with an expected capacity of 283 bcf per annum (Mordor Intelligence, n.d.).

Downstream Sector

As of 2021, the domestic market has a collective natural gas demand of 2 214 bcf per annum. The natural gas consumption sectors include the electricity sector, representing 61% of the domestic gas consumption, followed by the industrial and petroleum sectors, representing 22% and 11% of the domestic demand. The residential and compressed natural gas (CNG) sector, account for 5% and 1% of the market demand respectively (Egyptian Natural Gas Holding Company, n.d.).

The National Gas Grid is continually upgraded and maintained, making it one of the largest and longest in Africa and the Middle East (around 74 000 km with a capacity of about

250 MMscfd reported by the end of June 2021). Monitoring and control of the network are carried out through the use of the latest technological systems (SCADA).

In the last 18 months, there has been a significant increase in CNG stations. By the end of 2022, there are expected to be 1 000 CNG stations in Egypt, a fourfold increase.

1.2.2.3 Transactions

Crude Oil

Egypt exports crude oil to India, Italy, Netherlands, Spain, China and Greece (EIA, 2022). A change in Egypt's import/export status occurred in 2020/2021, with the country becoming a net importer of crude oil to meet its local fuel demands and service its new projects.

Natural Gas

0,45 bcf per day of natural gas is imported from Israel through the AGP to liquefy (The Africa Report, 2021).

In 2020, Egypt exported nearly 64 bcf LNG to Asia and Europe (BP, 2021).

Refined Petroleum Products

Refined petroleum products are exported to the US, Tunisia, South Korea and Italy (OEC, n.d.).

Egypt imports refined petroleum products from Saudi Arabia, Greece, Turkey and Russia (OEC, n.d.).

1.2.2.4 Energy Outlook

The country's primary energy supply consists of oil, gas and renewables (IRENA, 2021). Egypt's electricity generation mix is comprised of 77,4% natural gas, 1,4% wind, 1,9% solar and 12,7% oil, with the remainder being made up of other renewables (Our World in Data, n.d.).

The government's Integrated Sustainable Energy Strategy, ISES 2035, calls for increasing renewable energy use and boosting energy efficiency in the power sector to satisfy rising energy demand. Based on increasing solar and wind deployment, the government has set a target for renewables to account for 42% of the country's electricity mix by 2035 (IRENA, 2018).

Egypt will continue to rely significantly on fossil fuels until 2028, with gas and coal-fired power plants providing 85% of the country's electricity. The majority of this will be powered by the country's abundant natural gas resources, with combined cycle power plants estimated to contribute 75% of total power generation (Enterprise, 2022).

1.2.3 Libya

Oil and gas contribute significantly to the economic growth of Libya by providing a primary source of revenue.

1.2.3.1 Crude Oil Value Chain

Upstream Sector

On the continent, Libya is estimated to have the largest crude oil reserves, reported at

48,4 billion barrels, concentrated in the Sirte Basin Province. The country's oil production declined by 70,2% (-920 000 bpd) in 2020, achieving only 390 000 bpd, attributed to lack of storage capacity and intensification of the civil war (including blockade of major oil fields) (BP, 2021).

Midstream Sector

The oil pipeline industry in the country is well-developed, connecting oil reserves to other sections of the country, where it can be refined and exported.

Export terminals include Mellitah (30 000 bpd), Es-Sider (447 000 bpd), Brega (51 000 bpd), Ras Lanuf (220 000 bpd), Hariga (120 000 bpd) and Zueitina (200 000 bpd).

The country is currently home to five major refineries (Ras Lanuf, Zawiyah, Tobruk, Brega and Sarir) with a combined nameplate capacity of 380 000 bpd (Energy Capital & Power, 2021) (AFREC, 2022). Most of the refineries were offline in 2020 due to the blockade against oil exports. New refineries are being considered for construction in strategic locations across the country, including Tobruk (300 000 bpd) and Ubari (30 000 bpd).

Downstream Sector

The public domain contains no information.

1.2.3.2 Natural Gas Value Chain

Upstream Sector

Libya's natural gas reserves are estimated at 50,5 tcf, maintaining a production rate of nearly 470 bcf per annum (BP, 2021) (OPEC, n.d.).

Midstream Sector

The Western Libyan Gas Project (WLGP) is a gas processing project in Libya, primarily servicing export to Europe (Italy) via overland and under-sea (Greenstream; 530 MMscfd) pipelines. The project includes two plants situated in the Wafa region and the Mellitag region respectively, each with a capacity of 280 MMscfd (JGC Holdings Corporation, n.d.) (Offshore Technology, 2021).

The Libya Coastal Gas Pipeline represents the country's largest gas pipeline and is comprised of an eastern segment (Benghazi-Brega; 410 MMscfd), a central segment (Brega-Khoms; 370 MMscfd) and a western segment (Khoms-Mel-

litah; 600 MMscfd) (Mordor Intelligence, n.d.). The Brega-Khoms Intisar gas pipeline provides gas for two electricity generating plants, situated in Az Zuwatina and Ajdabya, with a capacity of 750 MW (IBP, 2018).

Libya's only LNG plant, situated at Marsa al-Brega, has not been operational since 2011, but historically exported to Spain, with a capacity of 3,2 MTPA (Bouaziz, Ashahab, Hussein, & Hope).

Downstream Sector

The Zawia Combined Cycle Gas Turbine (CCGT) Power Plant, with a capacity of 1 440 MW, is located in Zawiya, and the Benghazi North CCGT Power Plant, with a capacity of 915 MW, is situated in Benghazi.

1.2.3.3 Transactions

Crude Oil

Libya exported just over 347 000 bpd of crude oil, primarily to Europe and the US, in 2020 (OPEC, n.d.).

Natural Gas

Libya exported just over 148 bcf of natural gas via the Greenstream pipeline to Italy in 2020, with domestic consumption reported at 322 bcf (BP, 2021).

Refined Petroleum Products

65 800 bpd of refined petroleum products were exported in 2020. Libya primarily exports to Italy, South Korea, Spain, US and Germany (OPEC, n.d.) (OEC, n.d.).

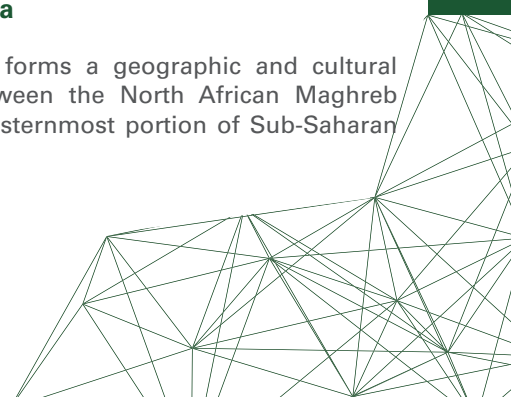
The country's domestic demand is satisfied through domestic refining, with an estimated market of 234 000 bpd.

1.2.3.4 Energy Outlook

Libya's greatest share of electricity (5 000 MW) is generated from fossil fuels (99,97%), with a current generation deficit of 2 500 MW. The country has ambitious development plans which include construction of CCGT power plants, to assist with increasing generation capacity of 6 000 MW before 2030. Libya's Renewable Energy Strategic Plan seeks to attain a renewable energy contribution of 10% by 2025 (Energy Capital & Power, 2020).

1.2.4 Mauritania

Mauritania forms a geographic and cultural bridge between the North African Maghreb and the westernmost portion of Sub-Saharan Africa.



34 Exploration and Production contracts have been signed and approved over the past eight years. To date, Mauritania has nine offshore discoveries, with blocks currently awarded to five operators. The country is set to become a major gas producer from 2023 after BP and partners in late 2018 decided to approve development of the Grand Tortue Ahmeyim (GTA) field. Further discoveries and exploration by Exxon, Shell and Total as well as BP hold out the prospect of more to come (MEES, 2021).

1.2.4.1 Crude Oil Value Chain

Upstream Sector

The West African Regional Atlas has estimated the country's oil reserves at 1 billion barrels, which places Mauritania just behind Nigeria in terms of total oil reserves. Currently (since the depletion of Chinguetti), there is no active oil production in Mauritania, although Ahmeyim (GTA) is expected to yield at least 42 million barrels.

Midstream Sector

At present, there are no crude oil or petroleum product pipeline networks in Mauritania.

The Nouadhibou refinery, built in 1978, ceased operation in 2001, since the refinery was not in good enough condition to process Chinguetti crude oil in 2006. The refinery is currently being dismantled.

Downstream Sector

Mauritania is a net importer of refined hydrocarbons, with fuel consumption reaching over one million tonnes in 2020. The contracted cargoes are transported by ship to the Société de Gestion des Installations Pétrolières' (GIP's) receiving and storage facilities in Nouadhibou and then partially transported by coastal shipping to Société Mauritanienne des Hydrocarbures' (SMH's) facilities in the Port of Nouakchott.

GIP's storage facilities, with a total capacity of 270 000 m³, are in urgent and substantial need of renovation and modernisation. Storage facilities in Nouakchott, owned by SMH and the Mauritanienne des Entreposages des Produits Pétroliers (MEPP), are in fairly good condition but require an increase in capacity.

SMH is already considering the extension of the public storage depot for liquid petroleum products in Nouakchott and is planning to build three new storage tanks with a total capacity of nearly 23 000 m³, while rehabilitating the existing infrastructure. Storage facilities owned by SMH and MEPP have a capacity of 60 000 m³ and 16 000 m³, respectively.

1.2.4.2 Natural Gas Value Chain

Upstream Sector

Mauritania does not currently produce gas, despite various significant discoveries and historic plans to exploit the plentiful gas sources, estimated at 73,9 tcf. Development of the first phase of the GTA field is currently underway with the objective of producing LNG by 2023 with a plateau of 2,5 MTPA.

Midstream Sector

There are currently no specific gas pipelines, processing plants or storage facilities in Mauritania.

Downstream Sector

LPG is currently the only finished gas product marketed in Mauritania. Nearly 76 000 tonnes of LPG were imported in 2020, used as fuel for cooking appliances in the residential and commercial sectors.

1.2.4.3 Transactions

Crude Oil

Mauritania no longer trades in crude oil, following depletion of the Chinguetti oil field.

Natural Gas

Mauritania doesn't currently trade in natural gas, but has future prospects due to large natural gas field discoveries and development plans.

Refined Petroleum Products

Mauritania is a net importer of refined petroleum products, primarily importing from the United Arab Emirates (UAE), Togo, Belgium, Sweden and Senegal (OEC, n.d.).

1.2.4.4 Energy Outlook

Mauritania's current energy mix consists predominantly of thermally generated power (66%), with hydroelectricity (17%) and renewable energy (solar and wind) accounting for the difference. According to the Strategy for Accelerated Growth and Shared Prosperity (SCAPP), Mauritania is anticipating increasing the renewable energy contribution up to 60% by 2030, and depending on the country's development pathway, could see natural gas demand rise in excess of 201 MMscfd.

1.3 Eastern African Countries

1.3.1 Sudan and South Sudan

Rich in oil, iron ore and other mineral resources, Sudan and South Sudan contains the third largest oil reserves in sub-Saharan Africa. A

landmark peace deal in October 2018, the resumption of production at several key oilfields, a recent onshore discovery and a soon-to-be reformed regulatory framework have significantly improved the investment climate, with particularly strong investment opportunities in exploration and infrastructure (Energy Capital & Power, 2020).

1.3.1.1 Crude Oil Value Chain

Upstream Sector

South Sudan's oil reserves are estimated at 3,5 billion barrels, with a production rate of 170 000 bpd, while it has been estimated that Sudan has approximately 1,5 billion barrels, with a production rate of 86 000 bpd (Energy Capital & Power, 2020) (PremiumTimes, 2020).

Steps have been taken to attract investment in exploration and development due to producing fields being at peak production and the countries' economic dependency on exporting crude oil.

Midstream Sector

Sudan has two transmission pipelines, namely Petrodar (DPOC; 500 000 bpd) and the Greater Nile Petroleum Operating Company (GNPOC; 450 000 bpd), destined for the Bashayer Marine Terminal in Port Sudan, with a storage capacity of 2,5 million bpd and an export/import facility with a handling capacity of 1,2 million bpd (EIA, 2019).

In South Sudan, the midstream sector depends on the Sudanese Government's infrastructure since all oil produced in the country is exported via a pipeline that runs from the North of South Sudan to the Bashayer Marine Terminal near the Port of Sudan on the Red Sea.

Sudan also has a 200 000 bpd pipeline that connects to the al-Fula oil field and extends to the Khartoum refinery (EIA, 2019).

Two South Sudanese crude oil transmission pipelines have been proposed, destined for Kenya/Uganda and Djibouti via Ethiopia (EIA, 2019), to reduce processing, transportation and associated tariffs through Khartoum. The option also exists for further transportation through the East African Crude Oil Pipeline (EACOP), extending from Uganda to Tanzania.

The Lamu Port South Sudan-Ethiopia Transport Corridor Project (LAPSSET), an infrastructure project that aims to connect the East African countries of Kenya, Ethiopia and South Sudan, is anticipated to be completed before 2024. The project includes the development of an oil pipeline between South Sudan and Ethiopia which will not only enable South Sudan to fully exploit and monetize its reserves, but will diversify options and open up a new infrastructure and energy front in the southeast of the country (Energy Capital & Power, 2021)

(African Development Bank, 2016).

South Sudan's Bentiu oil refinery commenced production early 2021, at a rate of 3 000 bpd, anticipated to increase to 10 000 bpd in the short-term (Oil Review Africa, 2021). Development of the Tangrial refinery, with a design capacity of 10 000 bpd, was suspended in 2019 due to security concerns. Sudan also has two proposed refineries (Akon refinery; 50 000 bpd) (Gameza refinery; 100 000 bpd) under consideration, seeking investment on a PPP basis.

Sudan has two operational refineries, namely Khartoum refinery (100 000 bpd) and El Obeid refinery (10 000 bpd). The Port of Sudan refinery, with a capacity of 47 000 bpd, needs refurbishment before processing can resume (Sentry, 2020) (AFREC, 2022).

Downstream Sector

All major private operators call to the Port of Malakal in South Sudan to offload fuel, which is discharged at a privately-owned depot with a storage capacity of 60 000 L diesel and 60 000 L petrol (African Development Bank, 2014). The lack of refined petroleum storage facilities require fuel to also be pumped directly from a barge to waiting tankers. In addition, fuel tankers from Kenya, Uganda and Ethiopia transport the vast majority of fuel to major supply depots around the country.

The Sudanese Petroleum Corporation constructed a strategic refined petroleum storage

(2,5 million bpd) at the Port of Sudan, for the storage of gas oil, gasoline, Jet A1, and LPG (Argus, 2021).

1.3.1.2 Natural Gas Value Chain

Upstream Sector

Neither Sudan nor South Sudan produces natural gas for commercial use or domestic consumption. Associated natural gas production from the oil fields is reinjected into the reservoirs to reduce pressure decline or flared as part of processing.

Natural gas reserves in Sudan and South Sudan are estimated at 3 tcf, with flared volumes hovering around 13,5 bcf per annum (EIA, 2019).

Midstream Sector

Neither South Sudan nor Sudan has midstream gas infrastructure (EIA, 2019).

Egypt and South Sudan are exploring potential infrastructure options for processing and distribution of flared natural gas (Sudan Tribune, 2019).

Downstream Sector

South Sudan and Sudan are both devoid of any domestic gas infrastructure or gas market (EIA, 2019).

1.3.1.3 Transactions

Crude Oil

Although petroleum exports have decreased in prominence since the secession of South Sudan in 2011, oil is still one of Sudan's primary generators of foreign currency.

Crude oil export is reported around 135 000 bpd, primarily to China, through the Bashayer Marine Terminal in Port Sudan.

South Sudan might start selling crude oil directly to its neighbours, after Ethiopia expressed its interest to buy oil from the country, in an effort to avoid the increased cost of importing from the Middle East (IHS Markit, 2019).

Natural Gas

Natural gas is not traded by Sudan or South Sudan.

Refined Petroleum Products

Although Sudan was historically an oil exporter until the secession of South Sudan, its current domestic production and distillation capacity is insufficient to meet the domestic demand. Therefore, it is importing a significant amount of oil products from the international market.

South Sudan relies on imported refined petroleum products from Kenya and other international markets, such as India and the UAE (OEC, n.d.). The country's current demand for petroleum products have been estimated at 20 000 bpd (Fortune of Africa, n.d.).

Sudan imports refined petroleum products primarily from the UAE, United Kingdom, Egypt, Turkey and Russia (OEC, n.d.).

1.3.1.4 Energy Outlook

Sudan has one of the largest power systems in Sub-Saharan Africa, with 3 500 MW of electricity generation capacity from hydro and thermal (primarily crude oil, diesel and Heavy Fuel Oil (HFO)) sources (ESMAP, 2019).

South Sudan, with mere 30 MW electricity generation capacity, is solely dependent on electricity generation from diesel and heavy fuel generators (United States Institute of Peace, 2018).

Both countries plan to increase the energy mix by utilizing other renewable sources of energy such as solar power.

1.3.2 Tanzania

Over the past 50 years, Tanzania has been exploring for natural gas, hoping to become an exporter in the future. The country has not produced crude oil, nor experienced a recent commercial oil discovery, requiring importation of refined oil products to meet domestic demand.

1.3.2.1 Crude Oil Value Chain

Upstream Sector

Tanzania has awarded 14 exploration and development licenses, geographically spread across five different areas. There has been no oil discovery to date, but oil discoveries in Uganda's Lake Albert region have prompted many oil exploration companies to begin looking at oil in Tanzania's Lake Rukwa basin via Lake Tanganyika in the western branch of the Rift Valley.

Midstream Sector

The Tazama Pipeline (Tanzania-Zambia Crude Oil Pipeline) extends 1 710 km from the Port of Dar-es-Salaam in Tanzania to the Indeni Petroleum Refinery in Zambia. The pipeline has a capacity of 2 million litres per day (22 000 bpd) with associated storage tank infrastructure (230 000 m³) available at the Port, supplied by a Single Buoy Mooring (SBM) system offshore. In May 2020 a proposed expansion of the pipeline to increase the capacity to approximately 1.1 billion litres per day, was published for investor soliciting (Construction Review Online, 2021).

Tanzania does not have any operational crude oil refineries.

Downstream Sector

The Port of Dar-es-Salaam, Mtwara and Tanga also serve as receiving terminals for petroleum products destined for neighbouring landlocked countries, such as Zambia, Uganda, the Democratic Republic of the Congo, Malawi, Rwanda and Burundi, with a combined storage capacity of nearly 1,3 million m³.

LPG is imported at the Port of Dar-es-Salaam, with smaller quantities received at the Port of Tanga, with a total storage capacity of 15 750 tonnes.

Downstream distribution occurs via road tankers, although the Tanga to Isaka, Kigoma and Mwanza railway has been revived.

1.3.2.2 Natural Gas Value Chain

Upstream Sector

Tanzania has 57,54 tcf of proven natural gas reserves, which is mostly undeveloped and 82% is located offshore. Production occurs at the Songo Songo field and Mnazi Bay field, at a reported rate of 120 MMscfd and 80 MMscfd, respectively.

Midstream Sector

Tanzania has four gas processing plants, with a combined capacity of 470 MMscfd, located at Songo Songo Island in Lindi region, Mnazi Bay and Madimba in Mtwara region. The gas processing plants are supplied from the offshore gas reserves via offshore and onshore pipeline networks. The gas processing facilities at Madimba and Mnazi is currently operating below 30% utilization capacity due to market demand.

The National Natural Gas Infrastructure Project (NNGIP) pipeline extends from Mnazi region to Dar-es-Salaam, 551 km long, with a capacity of 784 MMscfd.

Downstream Sector

Low-pressure downstream pipeline networks in excess of 50 km, 6 km and 17 km have been constructed in Dar-es-Salaam, Coast and Mtwara regions respectively.

Existing downstream markets include power generation, industry, transport, residential and commercial sectors, with an annual cumulative demand of nearly 8,5 bcf. The electricity sector is the largest consumer of natural gas, accounting for 80% of total current consumption.

1.3.2.3 Transactions

Crude Oil

Tanzania does not trade crude oil at this time.

Natural Gas

Tanzania doesn't export or import natural gas at this moment, with production volumes (nearly 60 bcf) servicing only the domestic market.

Refined Petroleum Products

Tanzania is a net importer of refined petroleum products, importing close to 6 billion litres per annum from UAE, India, Malaysia, China and Qatar, of which up to 43% is transit imports (via road tanker or ship) destined for Kenya, Rwanda, Madagascar and Burundi (OEC, n.d.). Diesel and gasoline account for nearly 90% of the liquid petroleum products being imported.

LPG annual imports reach nearly 200 000 metric tonnes, with increased market demand attributed to efforts done by the Government and

LPG marketing companies to create awareness by the public on the importance and convenience of using LPG instead of traditional fuels such as charcoal, firewood and kerosene.

1.3.2.4 Energy Outlook

Tanzania's main power resources include hydro, natural gas, liquid fuel, biomass and small amounts of coal, solar and wind. Despite the various energy sources available, many remain untapped. Tanzania's electricity generation comes mostly from natural gas (48%), followed by hydropower (31%), petrol (18%), solar (1%) and biofuels (1%) (EWURA, 2020) (Tanzania Invest, 2021).

Operational liquid fuel plants have the potential to be converted to dual fuel plants. The demand for electricity is estimated to grow at 10% per annum, with the country aiming to nearly double electrification rates to 75% by 2033 (International Trade Administration, 2021).

1.3.3 Uganda

Uganda's sizeable oil reserves, enabling regulation and proactive national oil company is positioning the country as a regional hydrocarbon leader.

1.3.3.1 Crude Oil Value Chain

Upstream Sector

Uganda's crude oil reserves have been estimated at 6,5 billion barrels, with 1,4 billion barrels deemed economically recoverable (Energy Capital & Power, 2022). Four Production Sharing Agreements (PSAs) in the Albertine Graben have been signed and applications for production licenses at 16 fields have been received by Government.

Uganda is set to produce its first oil as early as 2025 from fields located on the shores of Lake Albert, and production in the next five years is expected to jump to 230 000 bpd (World Oil, 2021).

Midstream Sector

There are no oil transmission pipelines in Uganda, but plans are in place for development of the 1 443 km EACOP, with an anticipated capacity of 230 000 bpd leading to the Tanzanian coast for export at the Port of Tanga (FinancialTimes, 2022).

Uganda does not have an operational crude oil refinery, but a project has been proposed for the construction of a 60 000 bpd crude oil refinery in Kabaale, Hoima District, as well as the associated 211 km refined products pipeline

from Hoima to Buloba, Kampala and a storage terminal at the pipeline terminus. The planned refinery is expected to produce LPG, diesel, petrol, kerosene, jet fuel and HFO, with the option of expanding capacity in the longer term based on market demand (Africa Investment Forum, n.d.).

Downstream Sector

A new fuel storage and transport system in Bugiri/Bukasa village started operations early 2022, to ease transportation of fuel from Kampala to Kisumu (and vice versa) via Lake Victoria (Bloomberg, 2021). The fuel storage (70 million litres) and transport system consist of 14 fuel storage tanks, 220 meter long jetties and ships, representing the largest fuel terminal in East and Central Africa (Construction Review Online, 2021).

1.3.3.2 Natural Gas Value Chain

Upstream Sector

Uganda discovered associated gas estimated at 0,17 tcf, with non-associated gas reserves estimated at 0,5 tcf, although there is no active natural gas production at the moment.

Midstream Sector

Uganda does not have any midstream natural gas infrastructure established. However, Tanzania and Uganda have signed an agreement for the construction of a natural gas pipeline, marking the first trans-border gas pipeline in East Africa (ESI Africa, 2018).

Downstream Sector

Uganda currently doesn't have any downstream natural gas infrastructure or domestic market.

Uganda anticipates using future gas discoveries for various purposes, including power generation, residential and commercial heating and cooking, fuel for vehicles, and feedstock or thermal energy for different petrochemical industries.

1.3.3.3 Transactions

Crude Oil

Uganda doesn't currently import or export crude oil.

Natural Gas

Uganda doesn't currently import or export natural gas.

Refined Petroleum Products

Uganda is a land-locked country, and currently a net importer of petroleum products. It imports 95% of the products through Kenya and 5% through Tanzania. Most products destined for Uganda through Kenya are delivered from Mombasa seaport to western Kenya terminals of Eldoret and Kisumu by pipeline and thereafter by road and rail to Uganda. Refined petroleum product demand averages around 5,4 million litres per day, with the majority being gasoline and diesel (S&P Global, 2020).

1.3.3.4 Energy Outlook

Uganda has implemented both short- and long-term measures to address the country's electricity supply needs, which include commissioning a number of thermal power plants. This is all aimed at increasing power supply leading to minimal load shedding during the evening peak.

Up to 2020, Uganda had about 1 300 MW of installed capacity, with hydro comprising approximately 1 000 MW (80% of total installed capacity), thermal and cogeneration 8% each and solar Photovoltaic (PV) 4% (United States Energy Association, 2021). A country so dependent on hydropower generation and susceptible to hydrological fluctuations and changing weather patterns should diversify its supplies. According to the Energy Mix Diversification Strategy document, Uganda's electricity capacity is ideally comprised of solar, wind and/or geothermal technologies, based on several factors including resource availability and the country's overall development plan. Uganda has geothermal potential, reported up to 450 MW, particularly in Eastern Uganda around Lake Albert (United States Energy Association, 2021).

1.4 Southern African Countries

1.4.1 Angola

In Africa, Angola is the third-largest oil producer, following Nigeria and Algeria, and contains the fourth-largest natural gas resources, although only a small part of it is considered commercially viable.

1.4.1.1 Crude Oil Value Chain

Upstream Sector

The oil industry in Angola is dominated by the upstream sector, with nearly 75% of exploration and production activities occurring offshore. The country has proven oil reserves estimated at 7,8 billion barrels and recorded oil production of 1,324 million bpd in 2020 (BP, 2021). The oil rich continental shelf of the Angolan coast is divided into 55 blocks which is expected to be auctioned before 2025, presenting great potential for further sector development (Flanders Investment & Trade, 2021).

With a design capacity of 157 000 bpd, 245 MMscfd and 1,8 million barrels, PSVM FPSO is moored in Block 31's north-eastern area and serves four oil fields (Energy Capital & Power, 2022).

The Greater Plutonio FPSO is an "all-electric" FPSO with a storage capacity of 1,77 million barrels, a processing capacity of 240 000 barrels per day, and gas handling capacity of

400 MMscfd. Nearly 160 km north-west of Luanda, the FPSO is moored in the Block 18 concession (Offshore Technology, 2021).

In Block 15/06 of the Angolan continental shelf, the FPSO Armada Olombendo has the capability of handling 80 000 bpd of crude oil and 120 MMscfd of gas. Its net storage capacity is 1,7 million barrels (Offshore Energy, 2016).

Midstream Sector

Zambia and Angola have signed a Memorandum of Understanding to build an oil pipeline between the two countries in Southern Africa, anticipated for completion within five years. The proposed 1 400 km Angola-Zambia Oil Pipeline (AZOP) pipeline will have a capacity of 100 000 bpd, transporting petrol, diesel and LPG (Construction Review Online, 2021).

A single oil refinery in Luanda, with an installed capacity of 65 000 bpd is operational, with a planned facility upgrade expected to reduce the market deficit by 20% (AFREC, 2022).

Angola has taken an aggressive approach to develop and enhance domestic refining capacity, with the aim of reducing refined product imports and establishing a sustainable oil sector. The country has launched several large-scale refineries in 2021, including the

100 000 bpd Soyo refinery and the 200 000 bpd Lobito refinery (Flanders Investment & Trade, 2021).

Downstream Sector

To date, the country's refining of crude oil and distribution of refined oil products remain well below domestic demand, despite being a leading oil producer in the region. Refined petroleum products are imported and stored primarily in the capital city, Luanda, and the port city, Lobito (Angola's ports and oil terminals, 1988).

A petroleum storage facility at the Oceanic terminal, with a capacity of 580 000 m³, is also under construction with the objective of improving fuel distribution (Energy Capital & Power, 2021).

1.4.1.2 Natural Gas Value Chain

Upstream Sector

The country's estimated gas reserves have been reported at 10,6 tcf, with the natural gas industry requiring significant investment to capture its full economic potential. Most of the proven deposits are located in the Lower Congo and Kwanza Basins' offshore areas, with the majority of Angola's exploration taking place at depths of more than 1 200 m.

Angola produces small quantities of marketed natural gas, but most of its production is flared as a by-product of oil operations or reinjected into oil fields to increase oil recovery. Dry natural gas production is reported at around 400 bcf (OPEC, 2021).

Angola's first non-associated natural gas project, sourced from the offshore fields of Quiluma and Maboqueiro, was recently announced by TotalEnergies. It is anticipated that production will begin in mid-2026 (World Oil, 2022).

Midstream Sector

Associated gas is delivered from oil offshore reserves to the Soyo processing and liquefaction facility through a 500 km pipeline network (Flanders Investment & Trade, 2021). The LNG plant has a capacity of 5,2 MTPA, primarily earmarked for global market export, but is not operating at full capacity due to lower levels of gas sourcing from offshore oil fields through pipelines built under the Congo River (International Trade Administration, 2021).

Downstream Sector

Angola doesn't have an existing domestic gas market; however, a 750 MW combined cycle power plant is planned to enter into commercial operation in 2024 (Power Technology, 2021).

1.4.1.3 Transactions

Crude Oil

Angola produced 1,324 million bpd in 2020, with the annual export volume estimated at around 1,220 million barrels (BP, 2021) (OPEC, 2021). China was Angola's major destination for oil crude exports accounting for 72% of the exported volume, followed by India and Thailand.

Natural Gas

Angola produced around 400 bcf of natural gas in 2020 (OPEC, 2021). Export shipments from the LNG plant in Soyo was destined for Brazil, China, South Korea and France.

Refined Petroleum Products

Despite being one of Africa's major oil producers, Angola remains reliant on imports to meet its domestic gasoline needs. The country produced 44 100 bpd of refined oil products, importing 134 300 bpd (OPEC, 2021) (Statista, 2021).

1.4.1.4 Energy Outlook

Angola's power sector is characterized by two main natural resources, namely petroleum gas (12%) and hydropower (56%) (US Aid, 2021).

Angola's ambition is to have natural gas supply 21% of the country's primary energy demand by 2025, whilst achieving 60% electrification (International Trade Administration, 2021). Future gas-to-power initiatives include the Soyo combined cycle 750 MW power plant (Energy Capital & Power, 2021).

1.4.2 Mozambique

With the recent discoveries of vast natural gas reserves, Mozambique could soon be the world's fourth largest natural gas exporter.

1.4.2.1 Crude Oil Value Chain

Upstream Sector

Mozambique does not produce any crude oil or have any refining capacity, and it relies on imports to satisfy all of its oil product demand.

The Inhassoro discovery represents the first commercial oil find within Mozambique, with an expected production rate up to 2 000 bpd. However, no commissioning date has been published (NES Fircroft, 2020).

Midstream Sector

Currently, there is no crude oil midstream infrastructure in place in Mozambique.

The Mozambique New Refinery project involves the construction of Mozambique's first refinery, to be supplied crude oil from the Rovuma Basin (NES Fircroft, 2020). The project is still in the feasibility phase.

Downstream Sector

At present, Mozambique is reliant on refined petroleum products importation.

The country holds four main oil terminals, Maputo, Beira, Nacala and Pemba, with a total refined product storage capacity in excess of

702 000 tonnes (Muhai, 2015).

1.4.2.2 Natural Gas Value Chain

Upstream Sector

Mozambique is a small producer of natural gas from its Panda and Temane fields, reported at 212 bcf per annum, but substantial natural gas reserves discovered in Area 1 and Area 4 of Mozambique's deepwater Rovuma Basin, which lies off the northern coast of the country. This could transform the country into a significant LNG exporter. The country has an estimated reserve of 193,3 tcf (Deloitte, 2018).

Offshore Area 4 Coral field development, estimated to hold 15 tcf, is expected to start-up in 2022 (NES Fircroft, 2020). The anticipated production rate is unknown.

Offshore Area 4 Mamba complex development is expected to produce 100 MMscfd, with start-up aimed for 2024 (NES Fircroft, 2020).

The Temane and Inhassoro PSA expansion, could realize gas production of 150 MMscfd. However, no commissioning date has been published (NES Fircroft, 2020).

Midstream Sector

The 865 km Republic of Mozambique Pipeline Company (ROMPCO) pipeline is a free access transmission pipeline, connecting Mozambique's Panda and Tamane gas fields to South Africa. This transmission infrastructure presents a corridor opportunity for anyone who has secured natural gas in Mozambique and is willing to pay transport charges, with an uncommitted capacity of nearly 15 bcf per annum reported in 2017 (ROMPCO, 2017).

Mozambique has several facilities planned to be commissioned in the short-term. The Rovuma LNG export plant, to be situated on the Afungi Peninsula, will have a capacity of 15,2 MTPA, with production expected as early as 2024 (NES Fircroft, 2020). Mozambique LNG is an onshore LNG facility being developed, with a capacity of 12,88 MTPA (NES Fircroft, 2020). The Coral Floating Liquefied Natural Gas (FLNG) project is expected to have a capacity of 3,4 MTPA, with an operational lifespan of 25 years (NES Fircroft, 2020).

A 2 450 km pipeline from Mozambique (Cabo Delgado) to South Africa (Richards Bay) is in the feasibility stage, but the pipeline is anticipated to supply gas to South Africa mainly for use in power generation (NES Fircroft, 2020).

A Floating Storage Regasification Unit (FSRU) is also on the horizon, with the objective of delivering regasified LNG to a Powership (current in operation but reliant upon heavy fuel oil) producing electricity for Mozambique's domestic electricity network (NES Fircroft, 2020).

The Afungi Gas-to-Liquids (GTL) project, with a capacity of 38 000 bpd, serves as a downstream development that will enhance Mozambique's ability to generate liquid fuel exports to regional and global players. A Final Investment Decision (FID) was expected in 2021, with an anticipated four-year construction period (NES Fircroft, 2020). The investment decision has not been disclosed further.

Downstream Sector

Mozambique has operational gas-to-power plants, including the 170 MW CTRG power plant, the 100 MW Gigawatt power plant, the 100 MW CTM power plant, the 48 MW Karpower plant and the 11 MW Temaninho power plant (AEMP, 2021).

A proposal for a fertiliser plant by Yara was also being considered, with a proposed capacity of 1,3 million tonnes per annum. It has since been announced that Yara has abandoned plans to develop a fertiliser plant using Cabo Delgado gas (Club of Mozambique, 2020).

A 250 MW combined cycle power plant at Nacala District, utilizing gas from the Rovuma basin, is also expected to be operational in future, in addition to 150 MW power plants in Pemba, Nacala, Quelimane and Beira. A concession agreement between the Mozambican Government and GL Energy Mozambique was concluded in 2021 (Club of Mozambique, 2021).

The Temane Combined Cycle Gas Project, a 450 MW gas-fired power project located at Temane in Inhambane Province of Mozambique, is currently under construction and is expected to be commissioned in 2024 (African Development Bank Group, 2021).

1.4.2.3 Transactions

Crude Oil

Currently, Mozambique does not produce any crude oil or have any refining capacity, and it relies on imports to satisfy all refined petroleum product demand.

Natural Gas

Mozambique produces approximately 212 bcf annually, with nearly 90% earmarked for export via the ROMPCO pipeline to South Africa and the remainder to satisfy domestic demand (IGUA-SA, 2021).

Refined Petroleum Products

Mozambique is a net importer of refined petroleum products, recorded at just over 2 million tonnes in 2019, primarily consisting of diesel (61%), gasoline (15%), jet fuel (9%), LPG (7,6%) and kerosene (7,4%).

Mozambique imports refined petroleum products primarily from India, China, UAE, Qatar, and Malaysia.

1.4.2.4 Energy Outlook

Mozambique has the largest power generation potential in Southern Africa from untapped coal, hydro, gas, wind and solar resources. The country accounts for 2 700 MW of installed capacity, 79% from the hydropower plant Cahora Bassa, 16% gas, 4% HFO and 1% from solar power (African Development Bank Group, 2021).

Mozambique's demand is expected to grow at an average annual rate around 8% in the next decade and this means the necessity to add about 1 500 MW to the generation fleet by 2030 (African Development Bank Group, 2021).

From a climate change perspective, the current Master Plan for Mozambique still envisages 1 700 MW coal-fired capacity up until 2042. However, striving to achieve carbon emission abatement targets could see coal-fired generation being replaced.

1.4.3 South Africa

South Africa's oil and gas sector has recently made significant gas discoveries off its south-eastern coastline, which could serve as a catalyst to make the country a major player in Africa's energy market.

1.4.3.1 Crude Oil Value Chain

Upstream Sector

Oil is not currently produced in South Africa, and there are no oil reserves reported.

Midstream Sector

South Africa imports all crude oil feedstock through the SBM system offshore Durban, transported through a subsea and onshore pipeline network to refinery storage tanks.

South Africa has four crude oil refineries, with a combined nameplate capacity of 545 000 bpd (AFREC, 2022). An explosion at ENREF, South Africa's second largest crude oil refinery in December 2020 has halted operations with consideration being given towards converting the refinery into a petroleum products storage import facility. SAPREF, South Africa's biggest crude oil refinery, has announced suspension of operations from the end of March 2022, for an indefinite period. A fire in mid-2020 at CHEVREF, also halted operations but Astron Energy announced in February 2022 its intention to restart operations by year-end.

Downstream Sector

Due to high domestic demand and inadequate domestic refining capacity, South Africa



remains heavily depended on imported refined oil products, with 15 million m³ petroleum storage facilities operational. The New Multi-Product Pipeline (NMPP) serves as the existing available liquid (diesel, petrol and jet fuel) transfer pipeline from KwaZulu-Natal to Gauteng, with a capacity of 100 000 bpd.

The existing refined petroleum distribution network consists of 200 depots, 4 600 service stations and 100 000 direct customers, supplied primarily via road transport.

1.4.3.2 Natural Gas Value Chain

Upstream Sector

South Africa's gas potential has been revealed by major discoveries, including the Brulpadda and Luiperd fields, that, when developed, could widen options for greater regional energy trade. The country has several natural gas opportunities for local natural gas production, either from conventional (onshore/offshore) or unconventional (shale gas/coal bed methane) sources, currently estimated at approximately 60 tcf.

From the F.O., F.A., and E.M. fields in the Bredasdorp basin, South Africa produced up to 1,5 tcf, but has since depleted its reserves.

The country's only producing gas source, is the biogenic gas resource situated in the onshore Witwatersrand Basin. Current natural gas production is estimated at nearly 2 MMscfd, serving as fuel to a local bus fleet.

Midstream Sector

PetroSA has subsea transmission lines (dry gas and liquids), 110 km long, leading from the F.A. platform to the GTL refinery in Mossel Bay.

The 865 km ROMPCO pipeline is a free access transmission pipeline, connecting South Africa to Mozambique. This transmission infrastructure presents a corridor opportunity for anyone who has secured natural gas in Mozambique and is willing to pay transport charges, with an uncommitted pipeline capacity of nearly 15 bcf per annum reported in 2017 (ROMPCO, 2017).

The 573 km Lilly transmission pipeline owned by Transnet, extends from Gauteng up to KwaZulu Natal, with an annual capacity of 20 bcf.

Sasol Gas has 355 km distribution pipelines from Secunda that connects Pretoria, Johannesburg, and Sasolburg, as well as a distribution network that links off the Transnet gas transmission pipeline to customers in KwaZulu Natal. The distribution network has a capacity of 70 bcf.

South Africa currently has one purpose-built GTL refinery situated in Mossel Bay, with a design capacity of 45 000 bpd. The GTL refinery is currently not operational because of the depleted gas reserves.

The Sasol Secunda Coal-to-Liquids (CTL) facilities were adapted to accept natural gas as feedstock, with a capacity of 150 000 bpd.

Downstream Sector

South Africa's domestic market consumes around 175 bcf per annum, primarily used in industry, with smaller volumes serving the residential, commercial, and transport sectors, with domestic consumption limited by gas supply availability. Unrestricted domestic gas demand has been reported in excess of 335 bcf (IGUA-SA, 2021).

1.4.3.3 Transactions

Crude Oil

South Africa doesn't produce and/or export crude oil at the moment. South Africa imports crude oil for domestic refining primarily from Saudi Arabia, Nigeria and Angola, with limit volumes being sourced from Ghana and Togo. South Africa imports more than 420 000 bpd, and will become more dependent on imports in the future.

Natural Gas

South Africa remains primarily dependent on importation of natural gas through the ROMPCO pipeline from Mozambique. Annual import volumes have been recorded at approximately 175 bcf, with supply risk due to declining Pande and Temane gas fields (IGUA-SA, 2021).

An existing annual supply shortfall has been reported at around 160 bcf, with future demand projected to be driven largely by the petrochemical, power and industrial sectors (IGUA-SA, 2021).

Refined Petroleum Products

South Africa does produce petroleum products domestically using imported crude oil as feedstock. Unfortunately, domestic refining capacity has reduced, and South Africa is currently importing in excess of 321 000 bpd. India, the UAE, Oman, Saudi Arabia, Singapore, the Netherlands, the US and Italy have been some of the key suppliers of refined petroleum products into South Africa (S&P Global Platts, 2021).

The South African market for these products also serves as a gateway (or origin in certain instances) for these products into neighbouring countries, including Botswana, Namibia, Zambia, Zimbabwe, Mozambique, Democratic

Republic of the Congo, Lesotho and Swaziland. No export volumes per destination have been published.

1.4.3.4 Energy Outlook

In pursuit of adding generating capacity, lowering carbon emissions, enhancing energy security and supporting industrial development, South Africa has taken the first steps in a gas-to-power programme to be executed under the Integrated Resource Plan (IRP) 2019, aiming to increase the national energy mix natural gas contribution from 2,6% to 15,7% by 2030 (Ministry of Mineral Resources and Energy, 2019).

1.5 Western African Countries

1.5.1 Ghana

Ghana's oil and gas prospects are significant. Discoveries suggest oil and gas resources extend across the country's shoreline from Cape Three Points in the west to Keta in the east, with the Volta Basin also believed to hold oil and gas reserves.

1.5.1.1 Crude Oil Value Chain

Upstream Sector

Ghana's crude oil production output in 2021 was 176 000 barrels per day, with estimated reserves of 700 million barrels (AGM, 2014) (All Africa, 2021).

FPSO Kwame Nkrumah operates in the Jubilee oil fields off the coast of Ghana, with a processing capacity of 120 000 bpd (African Development Bank, 2009).

Midstream Sector

Ghana's Bulk Oil Storage and Transmission (BOST) company has three pipeline systems, which includes a multi-product pipeline (with reverse flow mechanism), used to transfer refined products between ocean vessels into the Accra Plains Depot located in the south-eastern part of Ghana, the Tema-Akosombo Pipeline (TAPP) system and the Buipe and Bolgatanga Pipeline (B2P3) system used for primary transportation to inland depots. B2P3 have been abandoned in favour of non-traditional modes of transport (Energy News Africa, 2019). TAPP is currently being upgraded to allow for an annual capacity of 2 billion litres per annum, expected to be commissioned in 2022 (GhanaWeb, 2021).

Ghana has a single crude oil refinery, Tema Oil Refinery (TOR), situated in Tema, with a capacity of 45 000 bpd and a total (crude oil and refined petroleum product) storage capacity of 2,6 million barrels (AFREC, 2022). Ghana imports refined petroleum products, to meet the domestic demand of 65 000 bpd (TOR, 2022).

A proposed Petroleum Hub in western Ghana, Bonyere, is envisioned to include four

150 000 bpd refineries and two petrochemical plants, for completion by 2030 (Energy Voice, 2021).

Downstream Sector

Ghana has a refined petroleum storage capacity of 310 000 tonnes and 415 000 m³, concentrated around the Greater-Accra region (BOST, n.d.).

1.5.1.2 Natural Gas Value Chain

Upstream Sector

Ghana's gas reserves are estimated at approximately 2 tcf, with domestic gas supply primarily located in three fields: Jubilee, Sankofa, and Tweneboa-Enyenra-Ntomme (TEN) (IAEA, 2018).

Ghana's domestic natural gas production is currently 280 MMscfd, for use in power generation and industrial processes (S&P Global Platts, 2021). The newly contracted supply of LNG for Tema in 2020 and Takoradi in 2022 will increase total supply to 823 MMscfd by 2023 (Energy for Growth, 2021).

Midstream Sector

Tema LNG, the first offshore LNG receiving terminal in sub-Saharan Africa, has a scalable capacity of 3,4 MTPA, with an initial production capacity of 1,75 MTPA (Hydrocarbons Technology, n.d.). The facility has entered into a 17-year contract to supply 225 MMscfd from the Tema terminal (World Oil, 2022).

Ghana has a gas processing plant, located at Atuabo, with a design capacity of 150 MMscfd, currently operating at 120 MMscfd. The gas processing plant is supplied through a 58 km subsea pipeline from Jubilee and TEN gas, and has a truck-loading gantry for LPG in Anokyi (Ghana Gas, n.d.).

A bidirectional pipeline, Ghana-Cote d'Ivoire Gas Pipeline, with a capacity of 150 MMscfd was proposed in 2019, to allow for natural gas trade between the two countries (Upstream Online, 2019). No further developments have been reported to date.

The 678 km West African Gas Pipeline (WAGP), with a capacity of 800 MMscfd, links into the existing Escravos-Lagos pipeline (56 km) at the Nigeria Gas Company's Itoki Natural Gas Export Terminal and proceeds to a beachhead in Lagos, whereafter the pipeline extends to Ghana, with lateral gas delivery from the main line extending to Benin, Togo and Ghana (WAGPCO, n.d.).

Downstream Sector

Ghana's domestic distribution network (traditional pipeline network) supplies gas to the Karpowership at Sekondi Naval Base, Twyford Ceramics in Aboadze and WangKang Ceramics in Eshiem (Ghana Gas, n.d.).

1.5.1.3 Transactions

Crude Oil

Ghana exports all crude oil produced, reported at 176 000 bpd in 2021, with all the crude oil being consumed at TOR sourced from the international market (Abudu & Sai, 2020).

Natural Gas

Ghana imports approximately 560 MMscfd, in addition to domestic production recorded at 280 MMscfd (Abudu & Sai, 2020). Gas importation occurs primarily from Nigeria, through the WAGP.

Refined Petroleum Products

Ghana consumed around 65 000 bpd of petroleum products (TOR, 2022). Domestic demand for refined petroleum products is met both through domestic production and imported products. Ghana imports refined petroleum products primarily from Spain, Burkina Faso, Netherlands, UAE, and Finland.

Ghana also exports smaller volumes of refined products to nearby countries, such as Burkina Faso, US, Malta, Spain, and Togo.

1.5.1.4 Energy Outlook

Ghana's electricity supply mix is comprised of thermal (59,9%), hydro (39,9%) and solar (0,2%). Half of the ten thermal power generation facilities are dual-fuel, with the remainder split between natural gas (20%) and heavy-fuel oil (30%) (Energy for Growth Hub, 2020).

The Government of Ghana and the Volta River Authority (main power generation authority) have made it a key objective to switch fuel supply from oil-based power generation to a cleaner and cheaper natural gas-based power generation for all ten power plants to stabilize energy supply and transform the energy landscape for Ghana.

1.5.2 Nigeria

Nigeria is the largest oil producer in Africa and holds the largest natural gas reserves on the

continent. With adequate investment in gas exploration, Nigeria could also become the gas powerhouse of Africa.

1.5.2.1 Crude Oil Value Chain

Upstream Sector

Nigeria has the 10th largest oil reserve in the world, estimated at 36,9 billion barrels (Rui, et al., 2018). The 2020 daily production rate was recorded at nearly 1,8 million barrels, however production remains hindered by theft, pipeline sabotage and failure (BP, 2021) (Nigerian Energy Support Programme (NESP), 2015) (Nigerian National Petroleum Corporation, 2021).

The ABO FPSO has a storage capacity of 930 000 barrels, a processing capacity of

45 000 bpd and a gas handling capacity of 48,4 MMscfd (Lepic, 2022). The FPSO has operated at the Abo field offshore Nigeria since 2003.

The Agbami FPSO has a storage capacity of 2,2 million barrels, a processing capacity of 250 000 bpd and a gas handling capacity of 450 MMscfd (KBR, n.d.). The FPSO is scheduled to be on location for 20-years, with the contractual timeline expected to expire in 2028.

The Akpo FPSO was commissioned in mid-2005, and boasts a storage capacity of 2 million barrels, a processing capacity of 185 000 bpd and a gas handling capacity of 15 MMscfd (Bernard, 2010).

The Armada Perkasa FPSO, with a storage capacity of 360 000 barrels and a processing capacity of 35 000 bpd, was re-deployed offshore Nigeria, following a sales agreement in 2019 (Almeida, FPSO Armada Perkasa Extended Offshore Nigeria, 2013).

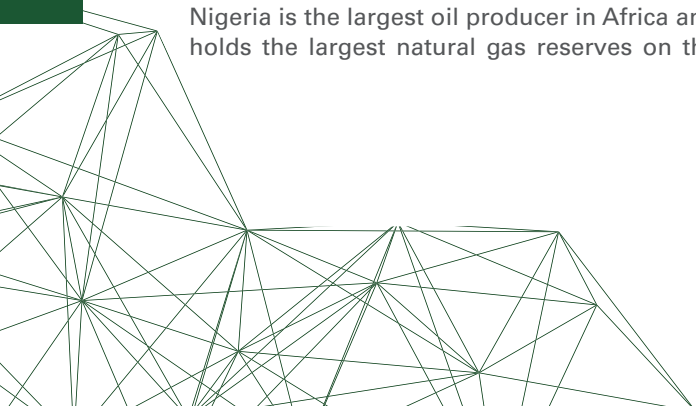
The Bonga FPSO has a capacity of 2 million barrels, with a crude oil processing and gas handling capacity of 225 000 bpd and 150 MMscfd, respectively (Akpan, 2020).

Following major discoveries in the Egina field area, a decision was taken to deploy another FPSO, namely Egina, with a total storage capacity of 2,3 million barrels and a processing capacity of 200 000 bpd (NOV, 2020).

Mystra FPSO, with a storage capacity in excess of 1 million barrels, and a production capacity of 46 000 bpd, has been reported to have structural and fatigue issues (Terpstra, Schouten, & Ursini, 2004) (Upstream Energy Explored, 2018).

The Sea Eagle FPSO, with a storage capacity of 1,4 million barrels, a processing capacity of 170 000 bpd and a gas handling capacity of 100 MMscfd, delivers gas to the Nigeria LNG facility at Bonny Island (Offshore, 2003).

The Sendje Berge FPSO has a total storage capacity of 2 million barrels, an oil processing



capacity of 60 000 bpd and a gas handling capacity of 55 MMscfd (Almeida, Sendje Berge FPSO Gains Extension Offshore Nigeria, 2014). A one-year extension with Addax Petroleum Exploration in Nigeria has been concluded with the firm period extended to the fourth quarter of 2022 (RigZone, 2021).

Usan FPSO, has a storage capacity of 2 million barrels, a processing capacity of 180 000 bpd and a gas handling capacity of 5 MMscfd (Ezeah, 2012).

Midstream Sector

The country has six petroleum terminals, namely the Forcados Terminal (13 million barrels of crude oil), the Bonny Terminal (12 million barrels of crude oil), the Qua Iboe Terminal (4,5 million barrels of crude oil), the Escravos Terminal (3,6 million barrels of crude oil), the Brass Terminal in Brass (3,6 million barrels of crude oil) and the Pennington Terminal (storage capacity unknown) (International Business Publications, 2011).

Nigeria has a refining capacity of 440 000 bpd (AFREC, 2022).

Downstream Sector

The Nigerian National Petroleum Corporation (NNPC) owns and operates a 5 001 km multi-product pipeline network, linking refineries with distribution networks.

1.5.2.2 Natural Gas Value Chain

Upstream Sector

Globally, Nigeria has the 10th largest natural gas reserve, estimated at 193,3 tcf (BP, 2021). Due to the lack of infrastructure, around 75% of the associated gas is either re-injected into the well or flared (54 bcf/d), with production averaging 2,53 tcf in nearly two decades (Rui, et al., 2018) (Vanguard, 2021). Nigeria holds more non-associated gas in its reserves than associated gas (from oil fields), yet the latter accounts for more than half of the total gas produced every year (Nigerian Energy Support Programme (NESP), 2015) (PWC, 2020).

Midstream Sector

Current export through LNG and the WAGP has been reported collectively as 3 200 MMscfd (Vanguard, 2021).

The 678 km WAGP, with a capacity of 800 MMscfd, links into the existing Escravos-Lagos pipeline (56 km) at the Nigeria Gas Company's Itoki Natural Gas Export Terminal and proceeds to a beachhead in Lagos, whereafter the pipeline extends to Ghana, with lateral gas delivery from the main line extending to Benin, Togo and Ghana (WAGPCO, n.d.).

Nigeria Liquefied Natural Gas (NLNG) is a major player in global LNG business, producing LNG and Natural Gas Liquids (NGLs) for export. NLNG has a total capacity of 22 MTPA LNG and 5 MPTA NGLs, from its six-train plant complex. In 2019, FID was taken on a 7th train, increasing the facility's capacity to 30 MTPA to enhance competitiveness in the global market (Nigeria Liquefied Natural Gas Limited, n.d.).

Accugas has a 200 MMscfd onshore processing facility, supplied from Uquo, connecting to a 260 km transmission pipeline. The facility and pipeline network have significant spare capacity and are strategically located in Southeast Nigeria (Savannah Energy, n.d.).

The Escravos Gas-to-Liquids (EGTL) facility began production mid-2014 and has a capacity to process 325 MMscfd into 33 000 bpd, principally synthetic low-sulphur diesel (Oil & Gas Journal, 2020).

Downstream Sector

In spite of the country's abundance, natural gas utilisation within the domestic market is limited and of the volumes consumed in-country, the majority is consumed within the power sector alone. The remainder is used as feedstock for gas-based industries (petrochemicals and fertiliser production), industrial heating and as fuel for natural gas vehicles. LPG derived from gas processing is also used for cooking and power generation.

Gaslink Nigeria Limited (GNL), in conjunction with the Nigerian Gas Marketing Company (NGMC), operate a domestic gas distribution pipeline network, spanning over 160 km, with a capacity of 130 MMscfd (Axxela, n.d.).

The current domestic gas supply has been reported at nearly 8 000 MMscfd to the power generation sector and 770 MMscfd to industries (Vanguard, 2021).

1.5.2.3 Transactions

Crude Oil

Nigeria's main export partners are the US, India, Brazil, Spain, France and the Netherlands (Frynas, 2000).

Nigeria is one of the top exporters of crude oil globally, but underutilization of its oil refineries (a capacity of around 30%) results in 85% of its refined petroleum products being imported (Nigerian Energy Support Programme (NESP), 2015).

Nigeria exported in excess of 1,8 million barrels of crude oil in 2020 (OPEC, n.d.).

Natural Gas

Nigeria produced around 1,76 tcf of marketed natural gas in 2020, exporting approximately 1,26 tcf, with the remainder servicing the domestic market (OPEC, n.d.).

No natural gas was imported during the assessment period.

Refined Petroleum Products

Despite boasting a refining capacity of 460 000 bpd, Nigeria only produced 900 bpd of refined petroleum products in 2020 (OPEC, n.d.). The country has a domestic petroleum demand of 465 800 bpd, primarily gasoline and diesel, and is dependent on the international market to meet its domestic requirements (OPEC, n.d.).

Petroleum products are imported mainly from Belgium, United Kingdom, Norway and Benin.

1.5.2.4 Energy Outlook

Currently, 80% of Nigeria's power generation comes from gas, with the remainder from oil, with Nigeria having the largest oil-fired back-up generators on the continent. Natural gas is set to remain the primary source of power, although there is a shift towards solar PV, as the country starts exploiting its large solar potential (IEA, 2019).

1.5.3 Senegal

Senegal appears to be on the verge of becoming a significant producer of hydrocarbons, with a number of significant oil and gas discoveries.

1.5.3.1 Crude Oil Value Chain

Upstream Sector

Rystad Energy reported Senegal's estimated oil resources at over 1 billion barrels, spread across numerous fields. Despite the reported oil reserves, Senegal currently imports crude oil for in-country refining, predominantly from Nigeria.

The Sangomar oil field is estimated to yield up to 500 million barrels of oil over the life of the field, with 231 million barrels anticipated during the first phase of exploitation. Production from Phase 1 is expected to commence in 2023, peaking in 2025 at a production rate of nearly 97 000 bpd (Offshore Technology, 2021). An FPSO, with a daily capacity of 100 000 barrels, is expected to be permanently moored at the Sangomar field as early as 2023.

Midstream Sector

There is one oil refinery in Senegal, called Societe Africaine de Raffinage (SAR), owned by the Senegal Government, Total and Shell. A seaport connects the Port of Dakar to SAR for the import of crude oil. The refinery has a capacity of 25 000 bpd, which does not meet the local demand, requiring importation of over 8 300 bpd of refined petroleum products annually (Logistics Capacity Assessment, 2021) (AFREC, 2022). The Government aims to increase the refining capacity up to 3 MTPA, to fully satisfy the domestic market, while fuelling national economic growth up to 5% (Energy Capital & Power, 2019). Storage facilities allow for storage of 500 000 m³ liquid products, 18 350 tonnes butane and 200 000 m³ crude oil (Ministry of Petroleum and Energy, n.d.).

Downstream Sector

A terminal at the Port of Bargny, situated in the hydrocarbon zone, is envisioned to receive, store and distribute gasoline, Jet A1, gasoil, fuel oil and bitumen to Senegal and external markets, with a total storage capacity of 2,5 million tonnes. The terminal is anticipated to begin operations in mid-2022 (Construction Review Online, 2021).

There are also plans to install bidirectional offshore/onshore transmission pipelines at the Mineral Port of Bargny, which is currently in the feasibility phase.

1.5.3.2 Natural Gas Value Chain

Upstream Sector

Gas reserves in excess of 40 tcf have been discovered in Senegal (Energy Capital & Power, 2021). The country has a 50% share in the estimated 15 tcf of recoverable gas reserves in the cross-border GTA field, in addition to around 25 tcf in Yakaar-Teranga (Davis & Mihalyi, 2021). The Sangomar block is estimated to hold 1,3 tcf associated and non-associated gas resources (The Oxford Institute for Energy Studies, 2020).

Both Sangomar and GTA Phase 1 production are anticipated to commence in 2023, while BP anticipates an FID on Yakaar-Teranga gas in 2022, with 150 MMscfd output expected in 2024 (S&P Global, 2021).

Midstream Sector

There are currently no specific gas pipelines, processing plants or storage facilities in Senegal.

Phase 1 of the GTA project will see the development of a 2,5 MTPA FLNG facility, putting Senegal on the map for global LNG exports by 2023.

Downstream Sector

LPG is currently marketed in Senegal, with nearly 98% of the country's LPG consumption from the domestic and commercial sectors, either imported or produced at the SAR facility.

The Government of Senegal is actively developing Senegal's first major domestic onshore gas pipeline, extending 144 km and transporting up to 88 bcf gas per annum from the Yakaar-Teranga gas processing plant, to be built by BP, to gas power plants and other large commercial and industrial operations near the pipeline route (U.S. Trade and Development Agency, 2021).

1.5.3.3 Transactions

Crude Oil

Currently, Senegal does not produce or export crude oil, importing crude oil from Nigeria for local refining. Trade volumes cannot be accessed in the public domain.

Natural Gas

Currently, Senegal does not trade in natural gas.

Refined Petroleum Products

Senegal imports refined petroleum products, primarily from Russia, Belgium, the Netherlands, and the United Kingdom, to meet domestic demand not met by its crude oil refinery. Trade volumes cannot be accessed in the public domain.

1.5.3.4 Energy Outlook

Senegal's current electricity mix is comprised of solar PV (29,5%), HFO dual-fuel power plants (41,5%), hydroelectricity (3%) and coal power (26%) (Itoua & Atteib, 2021).

The Senegalese government plans to increase the contribution of natural gas in the country's electricity generation mix. The government adopted a goal of achieving universal access and reduce emissions from electricity generation, with domestic gas-to-power expected to be a major contributor to achieving these objectives. The domestic supply scheme calls for conversion of a number of existing power plants into dual-fuel power plants and commissioning of new combined-cycle power plants (Davis & Mihalyi, 2021)

1.6 Central African Countries

1.6.1 Chad

Chad's hydrocarbon potential has yet to be fully assessed, but oil and gas are regarded as the best prospect industry sector for the country.

1.6.1.1 Crude Oil Value Chain

Upstream Sector

Chad ranks as the tenth-largest oil reserve holder among African countries, with 1,5 billion barrels of proven reserves (BP, 2021). The country's crude oil production rate was reported at 126 000 bpd, with nearly 90% earmarked for export (BP, 2021).

Midstream Sector

The Chad-Cameroon oil pipeline is an oil pipeline in Central Africa that runs from Doba Basin, Chad, through Cameroon to Kome Kribe-1 floating storage and offloading facility. The pipeline has a length of nearly 1 100 km and a design capacity of 225 000 bpd (Mordor Intelligence, n.d.).

Niger-Chad oil pipeline, with a design capacity of 60 000 bpd, is a proposed oil pipeline in Central Africa, originally scheduled for completion in 2019, but little progress has been achieved due to economic viability concerns (Mordor Intelligence, n.d.).

The 300 km Ronier-Djermaya oil pipeline, with a design capacity of 20 000 bpd, extends from the Ronier, Mimosa, and Koudalwa oil oilfields in the Bongor Basin to the Djermaya oil refinery (Wood Mackenzie, 2021) (AFREC, 2022).

With a capacity of 20 000 bpd, Chad's refinery supplies domestic demand and exports surplus petroleum within the region (Reuters, 2012). Occasionally, operations have been temporarily suspended due to price disputes and operational issues.

Downstream Sector

The domestic refined petroleum market is reported at around 15 000 bpd (International Trade Administration, 2020).

1.6.1.2 Natural Gas Value Chain

Upstream Sector

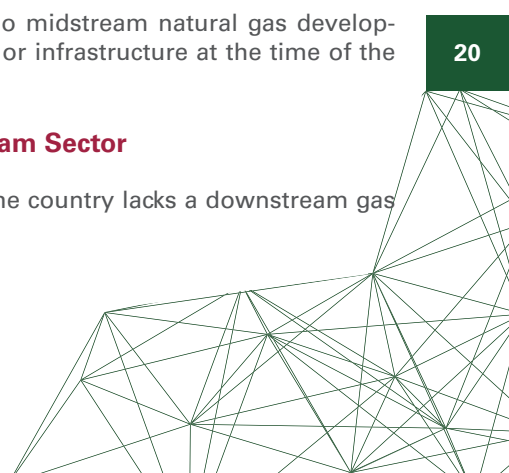
Natural gas reserves and production in Chad is considered meagre, with associated gas being flared.

Midstream Sector

Chad had no midstream natural gas development plans or infrastructure at the time of the report.

Downstream Sector

Currently, the country lacks a downstream gas market.



1.6.1.3 Transactions

Crude Oil

Crude oil export occurs via the Chad-Cameroon oil pipeline, with a geographically diverse customer base, exporting to countries including Taiwan, Italy, France, the UAE, the UK, India, the US and Japan.

Natural Gas

Natural gas is not a commodity traded by Chad.

Refined Petroleum Products

Almost all of the refined petroleum products produced serve the domestic market, with surplus exported by truck to neighbouring countries like the Republic of the Congo.

1.6.1.4 Energy Outlook

The majority of Chad's electricity generation is fuelled by fossil fuel (diesel and HFO), with a negligible renewable energy contribution, despite vast solar and wind resource potential.

The country's ability to achieve increased energy access and poverty reduction is constrained by significant challenges in the power sector. As a result, Chad's government is working to expand its electricity supply and encourage investment in the energy sector to stimulate the economy.

The 42 MW Djermaya Solar project is expected to be commissioned in 2023, improving access to cleaner energy (US Aid, 2022).

1.6.2 Republic of the Congo

Republic of Congo has the second largest crude oil reserves in Central and Southern Africa.

1.6.2.1 Crude Oil Value Chain

Upstream Sector

Republic of Congo is estimated to hold 2.9 billion barrels proven reserves, with a production rate of 307 000 bpd recorded in 2020 (BP, 2021).

Midstream Sector

In Republic of Congo, crude oil is transported to the Coraf refinery by road tankers because there is no midstream infrastructure for crude oil.

While Coraf, Republic of Congo's first refinery, has a capacity of 1 million tonnes per annum

(21 000 bpd), it processes only 600 000 tonnes, while the country's demand is estimated at

1.2 million tonnes (Energy Capital & Power, 2021) (AFREC, 2022). The refinery is scheduled for a facility upgrade in 2022 (EIA, 2021).

The country launched the construction of a new oil refinery, with a capacity of 110 000 bpd, near the Port of Pointe-Noire, in 2021 (Energy Capital & Power, 2021).

Downstream Sector

The 720 km Matadi-Kinshasa refined petroleum products (petrol, diesel and Jet A1) pipeline, with a capacity of 18 300 bpd, links the Port of Matadi with Kinshasa.

SEP (Service des Entreprises Pétrolières Congolaises) imports approximately 450 000 m³ fuel (mainly diesel) annually, with a total storage capacity in excess of 230 000 m³ (Global Logistics, 2009).

A refined petroleum products pipeline, spanning over 1 200 km from the economic capital Pointe-Noire in the south to Ouessou in the north, is expected to commence operation in 2027 (Offshore Technology, 2021).

1.6.2.2 Natural Gas Value Chain

Upstream Sector

Republic of Congo is estimated to hold nearly 10 tcf of proved natural gas reserves, with production recorded at 14 bcf for 2020 (EIA, 2021) (OPEC, n.d.). A significant amount of natural gas is flared as a by-product of oil production or is re-injected into oil fields to aid crude oil recovery.

Midstream Sector

A pipeline network from the M'Boundi and Marine XII fields supply gas to the Centrale Électrique du Djéno (CED) and Centrale Électrique du Congo (CEC), gas-fired power plants (Descalzi, 2020).

Downstream Sector

Two natural gas-fired power plants, namely 484 MW CED and 170 MW CEC, service Pointe-Noire (EIA, 2021).

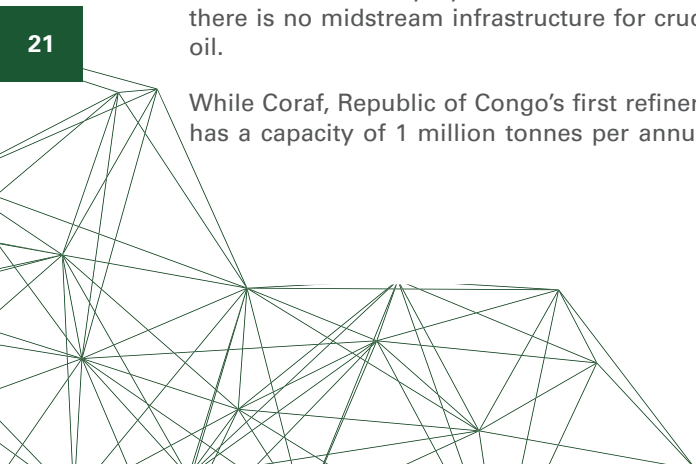
1.6.2.3 Transactions

Crude Oil

Republic of Congo exports in excess of 240 000 bpd, earmarked for China, India, US, Spain and Malaysia (OPEC, n.d.).

Natural Gas

Natural gas is currently not a trade commodity, with no importation or exportation of natural



gas recorded (OPEC, n.d.).

Refined Petroleum Products

Republic of Congo imports refined petroleum products from Togo, Cote d'Ivoire, France, Rwanda and the UAE.

1.6.2.4 Energy Outlook

Natural gas accounts for nearly 59% of the country's total primary energy, with petroleum liquids and renewables accounting for the difference. Republic of Congo's Gas Master Plan identified gas-to-power to continue being the main energy source for the country's power consumption in the short-to-medium term (Energy Capital & Power, 2022).

1.6.3 Equatorial Guinea

Equatorial Guinea is a producer and exporter of crude oil and natural gas. Oil and gas exports are central to the country's growth and is expected to continue driving the economy going forward, as the country diversifies along the oil and gas value chain.

1.6.3.1 Crude Oil Value Chain

Upstream Sector

It is estimated that Equatorial Guinea holds 1,1 billion barrels, with a 2020 production rate of 161 000 bpd (BP, 2021).

FPSO Aseng does not only service the Aseng field, but functions as a liquids hub for Alen and other nearby fields, with a processing capacity of 120 000 bpd and a total storage capacity of 1,6 million barrels of oil and condensate (Offshore Energy, 2011).

FPSO Ceiba, servicing the Ceiba field and Okume Complex, has a processing capacity of 160 000 bpd and a total storage capacity of 2 million barrels (A Barrel Full, n.d.) (Offshore Energy, 2021).

FPSO Serpentina, servicing the Zafiro oil field, has a processing capacity of 110 000 bpd and a total storage capacity of 1,5 million barrels (Ministry of Mines, Industry and Energy Equatorial Guinea, 2016).

Midstream Sector

Luba Oil Terminal Equatorial Guinea (LOTEG) Freeport has a storage capacity of 20 000 m³ and plans to expand fuel storage services to the mainland and neighbouring countries (Energy Capital & Power, 2021).

Progress on the Bioko Oil Terminal, expected to be a major West African transit hub for crude oil and refined petroleum products, with a total storage capacity of 1,2 million m³, has been slow, with no published development plans (S&P Global, 2019).

The country plans to build its first state-owned modular refinery, with a refining capacity of 5 000 bpd fed from the Alba and Alén fields (Ibekachikwu, 2020). The project is currently in feasibility phase (Construction Review Online, 2021).

Downstream Sector

Equatorial Guinea doesn't have any refining capacity and is a net importer of refined petroleum products to satisfy domestic demand (4 600 bpd) (OPEC, n.d.).

1.6.3.2 Natural Gas Value Chain

Upstream Sector

Equatorial Guinea is estimated to hold nearly 1,4 tcf, with a production rate of up to 213 bcf recorded in 2020, mainly earmarked for export as LNG (OPEC, n.d.).

Midstream Sector

Natural gas produced is either exported as LNG or gathered for domestic utilization.

The country has one onshore LNG plant, Equatorial Guinea Liquefied Natural Gas (EG LNG), located on Bioko Island and supplied from the Alba field. The facility has a capacity of 3.7 MTPA (Argus Media, 2021).

The Methanol plant at Punta Europa (AMPCO), consumed nearly 125 MMscfd, producing 19 000 bpd of methanol. A project aimed at converting methanol to gasoline and derivatives, to further monetise domestic gas produced is being explored (Oil Review Africa, 2020).

A Floating LNG facility, Fortuna LNG, has been proposed for Block EG-27, with a capacity of 2,2 MTPA (Energy Voice, 2021). Unfortunately, revival of the development remains uncertain.

In 2021, the country revealed plans to build a 70 km subsea gas pipeline, with a capacity of 950 MMscfd linking the Alen platform with the Punta Europa petrochemical hub (Construction Review Online, 2021).

The Gas Mega Hub development in Equatorial Guinea, which aims to pool stranded gas across the Gulf of Guinea and could open up economical avenues to monetize offshore gas in Cameroon and Nigeria, is undergoing evaluation, with the first phase successfully completed (ESI Africa, 2021).

Downstream Sector

Despite large export volumes, domestic use of natural gas in Equatorial Guinea has increased, primarily in the industrial and power genera-



tion sectors, in excess of 190 MMscfd (OPEC, n.d.).

In Punta Europa, a 154MW Malabo Turbogas thermal plant consumes about 14 MMscfd, supplying electricity to Bioka Island. Smaller thermal plants include the 24 MW Bata power plant and a 38 MW dual-fuel plant (Offshore Energy, 2018).

1.6.3.3 Transactions

Crude Oil

Crude oil export occurs via ship to earmarked countries in Asia and Europe (mainly India, Spain, South Korea and China). Equatorial Guinea exports around 114 500 bpd (OPEC, n.d.).

Natural Gas

Natural gas export, from the EG LNG facility via ship in excess of 142 bcf, is earmarked for the Asia-Pacific and Middle East regions (OPEC, n.d.).

Refined Petroleum Products

Equatorial Guinea is a net importer of refined petroleum products, with an estimated domestic market of 4 600 bpd (OPEC, n.d.). Petroleum products are imported from Cote d'Ivoire, Spain, UAE, US and Belgium (OEC, n.d.).

1.6.3.4 Energy Outlook

In Equatorial Guinea, 61% of electricity is generated from fossil fuels (primarily natural gas) and 38% from hydropower. The country has significant renewable energy potential, with solar and wind energy potential remaining largely unused.

The country has been able to meet domestic energy demand with self-produced power to date and as a result, is exploring the option of exporting excess electricity to neighbouring gas-deficient countries like Cameroon and Gabon, having already created a framework for an integrated and operational regional power market.

1.6.4 Gabon

Gabon is a mature oil producer in West Africa, and its government derives a significant amount of its revenue from crude oil production. Revenue from petroleum and other liquids represents about 45% of Gross Domestic Product (GDP), and petroleum and other liquids exports accounted for nearly 74% of total

export revenue in 2019 (Administration, US Energy Information, 2022).

1.6.4.1 Oil Value Chain

Upstream Sector

Gabon is estimated to hold 2 billion barrels of crude oil reserves, with a production rate of 207 000 bpd recorded in 2020 (BP, 2021). Low oil prices and mature oil fields have caused Gabon's oil output to decline (Administration, US Energy Information, 2022).

The spread-moored FPSO Petroleo Nautapia has an oil production capacity of 25 000 bpd, gas compression capacity of 3 MMscfd and storage capacity in excess of 1 million barrels. The FPSO's contract extension period expires in the third quarter of 2022 (Offshore, 21).

BW Adolo FPSO is moored at Turture field with the production capacity of 40 000 bpd, gas handling capacity of 18 MMscfd and a total storage capacity of 1,35 million barrels (Technologh, n.d.).

Midstream Sector

The country has a number of pipelines including the Ezanga oil pipeline network which connects a number of oil wells to the two export terminals, Cape Lopez and Gamba. Cape Lopez and Gamba oil export terminals have storage capacities of 4 million barrels and 1,4 million barrels, respectively.

The Sogara Refinery is the only refinery in the country, with the country's oil refining capacity expected to remain stagnant (Intelligence, 2021). The aging refinery has a crude oil distillation capacity of 24 000 bpd (EIA, 2020) (AFREC, 2022).

Downstream Sector

A communal retail depot is located in Libreville, with a storage capacity of approximately

18 000 tonnes of diesel, 7 000 tonnes of petrol and up to 800 000 tonnes of LPG. Storage infrastructures are functional and able to keep up with demand, primarily due to an overall decrease in fuel-demanding activities.

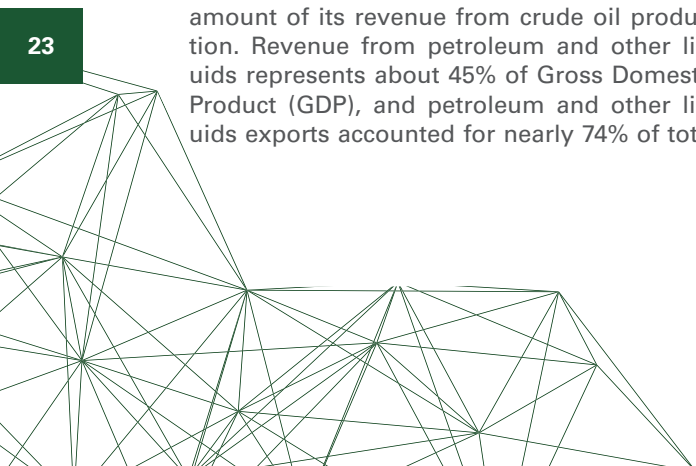
1.6.4.2 Natural Gas Value Chain

Upstream Sector

Gabon is estimated to hold in excess of 0,9 tcf natural gas reserves, with a production rate of nearly 18 bcf for 2020, most of which is associated with crude oil fields (OPEC, n.d.).

Midstream Sector

The only natural gas transmission infrastructure currently established in Gabon, is the privately owned 450 km pipeline (and com-



pression station) network of Perenco, linking the gas reserves to the power station in Libreville and Port Gentil.

A 15 000 tonnes per annum LPG plant in Batanga is expected to become operational by 2023 (Hawilti, 2021).

Downstream Sector

Gabon consumes all of the natural gas produced domestically. Most of the gas is reinjected into oil wells to enhance oil recovery or flared with only a small quantity, about 40 MMscfd, monetised for power generation in Libreville (75 MW) and Port Gentil (105 MW) (Hawilti, 2021).

Perenco runs a private gas retail station for 40 of its own vehicles in Port Gentil (Hawilti, 2021).

Gabon intends to primarily monetise flared gas to generate power, manufacture urea and produce methanol, along with LPG, CNG, and micro-LNG to provide fuel for remote industries (Hawilti, 2021).

Gabon Power Company has signed a concession agreement with Wärtsilä for the development of a new 120 MW gas-to-power project in Owendo (Hawilti, 2021).

1.6.4.3 Transactions

Crude Oil

Crude oil export occurs via ship to earmarked countries in Asia and Europe. China's share of Gabon's total crude oil exports increased significantly from 15% in 2015 to 74% in 2019, with other major export destinations including Singapore, South Korea, Australia, Malaysia, and Italy (Administration, US Energy Information, 2022).

Approximately 196 000 bpd was exported in 2020 (OPEC, n.d.).

Natural Gas

The country does not export the produced natural gas, with only a small quantity consumed domestically.

Refined Petroleum Products

Gabon exports refined petroleum products to the Netherlands, Belgium, Nigeria, Estonia, and Zimbabwe (OEC, 2022).

Gabon also imports refined petroleum products from France, Senegal, Belgium, UAE, and Portugal (OEC, 2022).

1.6.4.4 Energy Outlook

Nearly half of the electricity generated in Gabon stem from hydropower, with the remainder primarily attributed to non-renewables (fossil fuel) (IRENA, 2021).

Gabon's growing and urbanizing population and its industrial development are straining the country's power generation capacity. To meet the country's electricity demand, Gabon continues to invest in new hydroelectric power plants, with a new 34 MW hydropower plant on the Mbei River anticipated to be completed by 2023 (Administration, US Energy Information, 2022).

Wärtsilä and Gabon Power Company have signed a concession agreement for the development of a new 120 MW gas-to-power project in Owendo (Wärtsilä, 2021).

2. PESTLE Analysis

The PESTLE analysis examines several external factors that could influence direction, organization and content of the African oil and gas development strategy. The process allows an organization to plan strategically for any changes that may be necessary to its structure or to just get a sense of the various influences it must consider.

The PESTLE criteria are focused on potentialities and issues related to the political, economic, socio-cultural, technological, legal, and environmental considerations on the sustainable development of the oil and gas market in the African context.

Presented below are PESTLE analyses for each focus country by region.

2.1 Northern African Countries

2.1.1 Algeria

2.1.1.1 Political Factors

Algeria's economy is largely based on oil and gas revenues. However, military influence over Algerian politics has affected oil and gas deals with foreign investors. The previous administration was accused of mismanagement and corruption of revenues from oil, but newly elected President Abdelmadjid Tebboune promised to continue reforms.

The country scored 33% on Transparency International's Corruption Perceptions Index in 2021, indicating a high perception of public corruption.

Although still considered a politically unstable country, political stability has improved slightly, recorded at -0,86 for 2020, based on the Global Economy's Political Stability Index.

Algeria signed a Trade and Investment Framework Agreement (TIFA) with the U.S. and

ratified an E.U. association agreement. The country is a member of the Arab Free Trade Zone, African Continental Free Trade Area (Af-CFTA) and OPEC.

Relations with Morocco have soured over Western Saharan sovereignty, with diplomatic ties severed at the end of August 2021. Algeria, Morocco's main supplier of gas, also announced in October 2021 the official closure of the Maghreb-Europe gas pipeline.

2.1.1.2 Economic Factors

Algeria's economy was classified as less economically resilient according to the African Development Bank's economic resilience index. The country's economy is undergoing a fragile recovery, supported by a rebound in hydrocarbon output, exports and prices.

In September 2021, an Action Plan was presented, which ambitions to foster the economy's transition towards a sustainable, private-led growth model, and restore macroeconomic equilibria. The Action plan reaffirmed the country's commitment to curb imports and boost nonhydrocarbon exports.

The annual GDP growth rate declined from 6,3% in 2020 to 3,4% in September 2021. Inflation increased from nearly 9,2% in 2020 to 9.3% in November 2021.

The country was classified as a lower middle-income country by the World Bank in 2020, with the cost of living 2,22 times less expensive than the global average, making the country a potentially attractive location for oil and gas investments.

2.1.1.3 Social Factors

The labour market in Algeria has improved in the last decade, with a Human Capital Index score of 0,53 according to the World Bank.

In 2020, the labour participation rate increased to nearly 45%, with unemployment levels remaining around 12,8%. Nevertheless, there are still several challenges related to the high levels of labour market segmentation.

Algeria has a population growth rate of 1,85%, with nearly 74% of its residents living in urban and city areas.

2.1.1.4 Technological Factors

Algeria has a mature mobile segment, 3G and 4G services, and is deploying a country-wide

fibre optic network. Wi-Fi, though still in its infancy in Algeria, is a highly-desired technology particularly among potential government and business end-users.

A Mediterranean optical fibre submarine communications cable system, SEA-ME-WE 4, is available to Algeria, with a capacity of 4,6Tbps.

2.1.1.5 Legal Factors

Law No. 05-07 covers all matters pertaining to oil and gas activities within Algeria and replaced Law No. 86-14. Under the law, all oil and gas resources in Algeria are owned by the State. Law No. 05-07 was superseded in December 2019 by Law No. 19-13. However, under the new law, contracts existing under the previous law (Law No. 05-07) remained in effect but cannot be extended or renewed.

Law No. 19-13 introduced a number of changes, including abolishment of taxes and duties for entities established for the benefit of the state and local authorities, exemption from social security tax for foreign workers in the refining and petrochemical fields and extension of the hydrocarbon exploration and exploitation contract to 30-years, with a maximum extension period of ten years. The new law also introduced local content development, with preference given to Algerian companies for the supply of goods and services produced in Algeria, reintroduces production sharing agreements and reduces the complexity of the previous petroleum framework by simplifying the structure of the fiscal terms. Foreign entities are required to continue paying surface tax, royalty, hydrocarbon revenue tax, and additional income tax.

2.1.1.6 Environmental Factors

As in most of North Africa, desertification is the major problem facing the environment of Algeria.

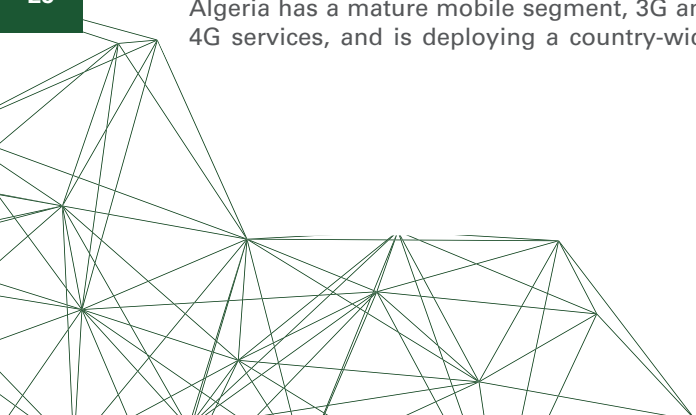
Law No. 01-19 prescribes the management, control and disposal of waste, while Law No. 03-10 dictates regulations for general environmental protection, aimed at implementing a national policy for environmental protection within the framework of sustainable development.

Law 02-02, on the protection and valorisation of the marine coastal zone, defines the framework for interventions on the coast, while Law 04-05 prescribes land use planning.

2.1.2 Egypt

2.1.2.1 Political Factors

Due to the period of political instability following the 2011 uprising, combined with the crude oil prices disruption crisis in 2014, and most recently the Covid-19 pandemic, which resulted in a global economic slowdown, crude oil



production and reserves have declined significantly in the country over the past six years.

Transparency International's Corruption Perceptions Index of 2021 scores Egypt at 33%, indicating a perception of a highly corrupt public service.

As of 2020, the country remains politically unstable (-1,21), according to the Global Economy's Political Stability Index.

Egypt has been a member of the Organisation of Arab Petroleum Exporting Countries since 1973, and the agreement on the loan and guarantee to the natural gas investments between Egypt and the International Bank for Reconstruction and Development (IBRD), in addition to around 115 bilateral investment treaties (BITs) and double taxation treaties (DTTs) signed with over 58 countries.

The country is a signatory to a number of international trade agreements, including the AfCFTA, the Free Trade Agreement (FTA) between the European Union (EU) and Egypt (Association Agreement), the FTA between Turkey and Egypt, the Agadir FTA, the Eastern and Southern Africa's Common Market (COMESA), the Area of Pan-Arab Free Trade (GAFTA) and the MERCOSUR-Egypt FTA.

Egypt succeeded in receding terrorism in the Sinai region, and yet Egypt and Ethiopia are at odds over the Ethiopian Dam on the Nile.

2.1.2.2 Economic Factors

Growth, foreign income sources, and government debt were adversely affected by Covid-19, but are now improving due to favourable base effects, recovering global conditions, and easing restrictions. The Egyptian economy was classified as less economically resilient according to the African Development Bank's economic resilience index.

According to the International Monetary Fund, Egypt was one of the few emerging market economies to grow (1,3%) in 2020, primarily due to government incentives and support to sectors impacted by the Covid-19 pandemic.

Egypt's inflation rate was reported 5,9% in 2021, but accelerated to 7,3% in January 2022, still remaining within the target range (5% - 9%) set by the central bank.

Egypt's credit rating stands at B according to Standard & Poor, while Moody reported B2, and Fitch affirmed B+.

Egypt was classified as a lower middle-income country by the World Bank in 2020, with the cost of living reported at 2,14 times less expensive than the world average.

2.1.2.3 Social Factors

The Egyptian people are facing intense challenges due to rapid population growth, deep and increasing poverty, widespread youth unemployment, a looming Nile water shortage, and threats to food security due to climate change.

According to World Bank data, Egypt's labour force participation rate continued to decrease to 41,5% in 2020, a downward trend that has been observed over the past decade which could indicate a potential future limitation on the number of resources available to service new oil and gas developments. Egypt's Human Capital Index score, according to the World Bank, was reported at 0,49.

Egypt's unemployment rate edged up to 7,5% in the fourth quarter of 2021, following a steep decline from 9,6% reported in 2020.

The highest concentration of habitation continues to be near the banks of the Nile River.

2.1.2.4 Technological Factors

Despite good growth between 2020 and 2021 and strong mobile usage, Egypt's Internet penetration remains below 60%.

The geographic position of Egypt allows for an efficient crossing from the Red Sea to the Mediterranean Sea for submarine cable systems. There are now six major cable landing stations for subsea cables crossing Egypt, with 17 submarine cable systems connecting Egypt, as well as Trans-Border Terrestrial Cables with Libya and Sudan.

Egypt has been adopting a robust strategy and strong course of action in transforming the existing government services and community ecosystem to an entirely digital and data driven ecosystem, to provide public services in a faster and simpler way.

All public services are to be provided to citizens digitally nationwide. Egyptian citizens, anywhere in the country, will be able to receive these services in a digital format. Several methods of online payment of service fees were made available.

2.1.2.5 Legal Factors

Article 32 of the Egyptian Constitution of 2014 provides that all natural resources are owned by the state, upon which is solely bestowed the right to control the exploitation and development of these.

The oil and gas sector is generally regulated according to a number of laws and regulations.



including the Mining and Quarries Law No. 66 of 1953, as amended by Law No. 86 of 1956 and its Executive Regulations issued by Ministerial Decree No. 758 of 1972 (referred to as the Fuel Materials Law); Law); other amendments were made on Law No. 198 of 2014, and issued by Law No. 145 for 2019, in addition to its Executive Regulations in 2020; the Gas Market Activities Law No. 196 of 2017 and its Executive Regulations issued by the Prime Ministerial Decree No. 239 of 2018; the 'Oil Pipelines Law' No. 4 of 1988 and its Executive Regulations issued by the Ministry of Petroleum Decree No. 292 of 1988; and the Environmental Law No. 4 of 1994 (Environmental Law) and its Executive Regulations issued by Prime Minister Decree No. 338 of 1995.

Regulations adopted by COMESA may also apply to companies carrying out oil and gas activities in Egypt.

2.1.2.6 Environmental Factors

Egypt is a signatory to several environmental conventions and protocols dedicated to the protection of the Mediterranean Sea against pollution and the management of hazardous waste. Most notably, Egypt acceded to the Mediterranean Action Plan (MAP) (Barcelona Convention) of 1975/1976, as well as the International Convention on Civil Liability for Oil Pollution Damage (Brussels Convention) of 1969, signed in 1989. Egypt has also been a member of the International Maritime Organization (IMO) since 1958.

On the domestic level, while there is no special law exclusively dedicated to upstream oil and gas activities, the Fuel Materials Law and its Executive Regulations, as well as the Egyptian Environmental Law, regulate several environmental-related matters with respect to oil and gas operations.

2.1.3 Libya

2.1.3.1 Political Factors

Libya is politically unstable, rated -2,48 by the Global Economy's Political Stability Index. Libya's political turmoil has entered a new phase, following the House of Representatives selection of Fathi Bashagha as a new rival Prime Minister on February 10, 2022, separating Libya into two opposing political administrations. If there is a greater collapse in stability or a return to war, parties may be tempted to shut down production once more to exert pressure on Tripoli, as eastern-based forces did for much of 2020 when nearly all exports were suspended for months.

In Transparency International's Corruption Perceptions Index for 2021, Libya scored 17%, indicating a prevailing perception of a highly corrupt public service.

Libya is a member of OPEC but has exemption from OPEC production quotas.

Libya has made a bid to be part of the World Trade Organization (WTO), and as part of its WTO accession bid, has implemented numerous trade liberalisation reforms, such as reducing the number of State importing monopolies, limiting the number of import bans, abolishing licences for most goods, and reducing subsidies.

Libya is a signatory of the Greater Arab Free Trade Area (GAFTA) and the Arab Maghreb Union (AMU), with ties to the Community of Sahel-Saharan States (CEN-SAD) and the Common Market for Eastern and Southern Africa (COMESA). It has bilateral trade agreements with Morocco and Jordan. Libya is the only Mediterranean country, with the exception of Syria, that has not yet concluded an FTA with the EU.

In recent years, the country has served as a major transit point for migrants to Europe, as well as a source of international tension as competing governments in the west and east fight for national dominance.

In spite of an October 2020 ceasefire agreement between warring factions, the political and security situation remain fragile and volatile.

2.1.3.2 Economic Factors

Libya's economy was classified as less economically resilient according to the African Development Bank's economic resilience index, with the economy almost entirely dependent on oil and gas exports.

The country's real GDP shrunk by more than 60% by 2020, being the sharpest decrease in North Africa, due to an intensification of the civil war and a decrease in oil prices that reduced income from already depressed oil production. Fitch forecast real GDP growth of 4,6% in 2022, as energy production increases further, Covid-19 headwinds subside, and presidential and parliamentary elections are held.

According to statements from the Governor of the Central Bank of Libya, Sadiq Al-Kabir, Libya must raise its oil production by 40% from current levels to meet its expenditures and revamp its economy.

Libya's inflation rate fell to 3,90 % in December 2021, with the country's interest rate projected to trend around 3% in 2022 according to econometric models.

Libya's credit rating stands at BB according to Standard & Poor and Fitch affirmed B.

Libya is classified as an upper-middle income country, with the cost of living 31,28 % lower than in the US.

2.1.3.3 Social Factors

The war economy has driven up costs, and there are widespread shortages of medicine and power outages. Civilians are also at risk of being caught up in the unpredictability of the combat, and militia kidnappings for ransom are widespread.

Libya's unemployment rate rose to 19,39% in 2020, up from 18,34% in 2019, primarily due to the Covid-19 pandemic. The public sector's high wages and substantial non-wage benefits have led to exaggerated income expectations, exacerbating the unemployment situation.

Oil revenues have allowed the government to rely on foreign workers to meet the labour market's skill requirements, despite a labour participation rate of approximately 52,8%. Libyan workers are viewed by private employers in Libya as unreliable and unmotivated, with a lack of both cognitive and non-cognitive skills.

2.1.3.4 Technological Factors

Libya's infrastructure has been severely damaged by the civil war sabotage and negligence.

United Nations sanctions on Libya, which lasted eleven years, have had a negative impact on the progress of information technology in Libya as many organisations were deprived from improving their capabilities and participation in the so-called information age. Nevertheless, the sector of information and communication infrastructure in Libya is steadily progressing.

The country has a 425 km repeaterless submarine cable system connecting Darnah in Libya with Chania in Greece, across the Mediterranean sea, with a capacity of 1,2Tbps.

2.1.3.5 Legal Factors

Petroleum Law No. 25 of 1955, is the prominent legal foothold in Libya. However, the law and concessions were significantly altered in 1961, 1965, and 1970, with terms and conditions being substantially altered in favour of the Government. The current Production Sharing Agreement (PSA) is EPSA IV, which was introduced in 2005.

Regulations adopted by COMESA may also apply to companies carrying out oil and gas activities in Libya.

2.1.3.6 Environmental Factors

Environmental protection had little impact in Libya in the past, despite the existence of a law on the subject (Law No. 7/82). This could be owing to the political issues that caused Libya to be isolated from the rest of the globe. The

opening of Libya's economy to the rest of the world prompted the government to prioritise environmental conservation, which resulted in the passage of a new environmental law in the Libyan congress in 2003, which addressed contemporary environmental challenges and raised environmental awareness. As a result of this awareness, the Libyan Environmental Law (Law No 15/03) was enacted.

2.1.4 Mauritania

2.1.4.1 Political Factors

The Mauritanian political system is hyper-presidentialism. The politicisation of identities and the military's involvement in politics are the main political issues within Mauritania. Political stability index data for 2020 indicate that the country remains politically unstable (-0.75).

Transparency International's Corruption Perceptions Index in 2021 found Mauritanian perceptions of public corruption to be high, noted at 28%.

Mauritania has been a member of the WTO since 1995 but scarcely participates in WTO activities, mostly making use of WTO technical assistance. The country does not actively participate in regional trade agreements, but re-signed the Economic Community of West African States (ECOWAS) trade agreement in 2017. AMU, which the country is a founding member of, is not practically operational. Mauritania has ratified the Pan Arab Free Trade Area, yet it has not yet taken any steps to grant trade preferences (tariff or otherwise) under this agreement. Although the country concluded various bilateral trade agreements, tariff concessions had not been applied. Nevertheless, Mauritania has benefited from the EU's "Everything but Arms" initiative, since 2008. Mauritania has also benefited from the U.S.'s African Growth and Opportunity Act (AGOA) and Generalised System of Preferences (GSP) for crude oil products.

Mauritania has bilateral trade agreements with Algeria, Gambia, Morocco, Tunisia, China, Kuwait, Qatar, Turkey and Sudan.

The country remains the exception to the waves of violence (and associated destabilisation) in the Sahel, with concerns that armed groups might be operating in proximity to Mauritanian borders.

2.1.4.2 Economic Factors

According to the World Bank, Mauritania is classified as a lower-middle income economy, and the African Development Bank considers it to be less resilient economically because of



its high dependence on the extractive sector (iron).

The decline of the global economy in 2020 caused by the Covid-19 pandemic caused Mauritanian real GDP to shrink by 3,6%, after having 5,9% growth in 2019. The real GDP is forecasted to grow 4,2% in 2022, thanks to private and public investments that have been reinvigorated and structural reforms.

Inflation was reported at 2,7% in 2020, lower than the targeted 4% forecasted by the monetary authorities, but was still higher than the 2,3% of 2019.

Development of the GTA offshore gas field during 2021/22, projected to begin production in 2023, will bolster the short-term economic outlook.

According to the debt sustainability analysis conducted by the International Monetary Fund, the risks of external and public debt distress are severe in Mauritania. Public external debt as a percentage of GDP is expected to rise to 68% in 2022, far above the 40% that is considered sustainable.

The medium-term outlook is broadly favourable, with growth projected to gradually recover to an average 4,1% during 2021 and 2023, maintaining a strong fiscal position.

The cost of living in Mauritania is low in comparison with other places in the world.

2.1.4.3 Social Factors

The country's labour participation rate was reported at around 44,5%, predominantly active in the Agricultural and Fishing industries. Recently, Mauritania's large oil and gas reserves have attracted significant foreign investment, however, nearly half of the population still lives impoverished.

Unemployment in Mauritania increased to 10,70% in 2020, from 10,10% in 2019, with the majority of the population poorly equipped to enter the workforce. Educational quality is reportedly low, with a literacy rate of 53,5% and a Human Capital Index score of only 0,38 according to the World Bank.

Approximately 60% of the 4,85 million people living in Mauritania reside in the vicinity of a major city.

2.1.4.4 Technological Factors

Although the country is slowly advancing in terms of technology, the infrastructure and

funds for advancement are not available.

The national optical fibre network project in Mauritania, part of the West African Regional Communication Infrastructure Program (WAR-CIP), was completed in 2021. Nouakchott also serves as the landing point for the cable system of the Africa Coast to Europe (ACE), further enhancing the international network connection between the two continents.

2.1.4.5 Legal Factors

The oil and gas sector in Mauritania is governed by a legal system surrounding the Petroleum Law of 1988.

The main legislation governing petroleum exploration and production activities include Law No. 2010-33, as amended by Law No. 2011-044 and Law No. 2015-016 (the 'Petroleum Code'). Due to the general nature of the Petroleum Code, most of the specific provisions governing petroleum exploration and production are included in PSAs.

The laws and model contracts enacted require changes, and this work is currently underway.

2.1.4.6 Environmental Factors

The National Strategy for the Environment for Sustainable Development started enacting the Environmental and Sustainable Development Policy in 2017.

In terms of prevention of underwater pollution risks, Mauritania is committed to the Pollution Maritime (POLMAR) Plan and adopted a law on the prevention and response to marine pollution in 2011, amended in July 2013, ensuring the transposition into its national law of international regulations in this area.

2.2 Eastern African Countries

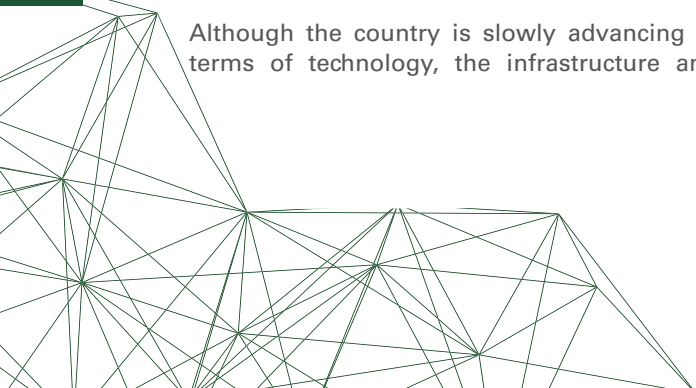
2.2.1 Sudan and South Sudan

2.2.1.1 Political Factors

South Sudan

Political instability (-2,1 according to the Global Economy's political stability index) in South Sudan has been a major problem to the oil industry in the country, resulting in a civil war that left at least 380 000 people killed and 4 million displaced.

South Sudan's perceptions of public corruption were noted at 11% in Transparency International's Corruption Perceptions Index for 2021. The country is currently struggling to establish strong institutions and combating corruptions. Corruption has discouraged some investors to invest in the oil industry and the Government is trying to reform some policies and establish new laws.



The political agreement between South Sudan and Sudan in 2012 stipulated the tariff agreement for crude oil from South Sudan to the Port of Sudan. However, South Sudan is currently looking for refinery investors to reduce cost charges by the Sudanese Government on export of petroleum products.

In addition to enjoying vibrant and long-lasting trade relations with its neighbours, South Sudan also has long-term economic ties with the Central African Republic (CAR), Ethiopia, Kenya, and Uganda. South Sudan has BITs signed with the UAE and Morocco, but none are in force.

Sudan

Civil wars have resulted in political instability (-1,76 according to Global Economy's political stability index) and hindered crude oil production in Sudan. 2021's military coup has also challenged political stability, leading to chaos and protests in the country which in one way or another, affect oil and gas operation activities.

In Transparency International's Corruption Perceptions Index for 2021, Sudan was noted to have a high level of perceptions of public corruption, reported at 20%.

Oil production in Sudan decreased noticeable following South Sudan's independence, since most of the large producing oil fields are situated in South Sudan. It has however, also accelerated exploration and development of other fields in an attempt to increase the Government's oil revenues.

Sudan is a member of Intergovernmental Authority on Development (IGAD) and COMESA. Apart from CAR, which is a member of the Economic Community of Central African States (ECCAS), all the other states bordering South Sudan are members of either COMESA or IGAD or both.

2.2.1.2 Economic Factors

South Sudan

South Sudan's oil sector accounts for 70% of GDP and more than 90% of public revenue, with the country considered less economically resilient by the African Development Bank.

The outbreak of the Covid-19 pandemic in 2020 derailed South Sudan's nascent economic recovery. As a result, real GDP declined by 3,6% in 2020, after expanding by 7,4% in 2019. In 2022, real GDP is anticipated to grow by 2.5% as a result of a peace dividend and a rebound in oil production and exports.

Inflation increased to 31,1% in 2020 due to supply shocks, coupled with the monetization of the government budget deficit and currency depreciation.

The United Nations has designated South Sudan as a least developed country, with the cost of living estimated at 1,85 times less expensive than the world average.

Sudan

Sudan's crude oil sector contributes to more 55% of the national GDP, with the country's economy considered the least economically resilient according to the African Development Bank's economic resilience index.

Real GDP shrunk by 8,4% in 2020, after shrinking by 2,5% in 2019, largely attributed to the Covid-19 pandemic's effect on commodity prices, trade and financial flows.

Inflation escalated to 124,9% in 2020, mainly due to currency depreciation and monetization of the fiscal deficit.

Sudan's economy is projected to remain in recession, with modest growth anticipated in 2022. According to the International Monetary Fund and World Bank's debt sustainability analysis, Sudan is in debt distress.

Sudan's recent removal from the States Sponsor of Terrorism List (SSTL) by the US, is however expected to stimulate financial flows, benefiting economic growth.

According to the United Nations, Sudan is categorised at a least developed country, with the cost of living reported at 1,85 times less expensive than the world average.

2.2.1.3 Social Factors

Because of tribalism and nepotism, South Sudanese and Sudanese are shifting their attitudes in favour of other sectors such as mining, agriculture, fishing, and entrepreneurship since employment opportunities in the oil industry are very limited.

The legacy of civil war combined with the cumulative effects of years of conflict, political instability and extreme poverty, eroded earlier gains in access to education.

South Sudan

South Sudan's population growth rate has been reported at a mere 1,2% in 2020, with unemployment estimated at 12,66%.

South Sudan's labour force participation rate was reported at 73,9% in 2020, which indicates adequate resources are available to service new oil and gas developments, although the World Bank's Human Capital Index was reportedly low, scoring 0,30.



South Sudan's population is among the youngest in the world, straining an already stretched education system, characterized by weak and under-resourced national systems.

Sudan

Sudan's population growth rate has been reported at nearly 2,4% in 2020, with subdued economic activity increasing poverty from 48,3% in 2019 to an estimated 56% in 2020.

Sudan's labour force participation rate decreased to 46,9% in 2020, with a low Human Capital Index (0,38) reported by the World Bank.

Education, healthcare and other services remain clustered in Khartoum's centre and are scarce in the surrounding areas. Formal schools are overcrowded, and government support has dwindled with the current economic crisis in Sudan.

2.2.1.4 Technological Factors

South Sudan

South Sudan has one of the lowest mobile penetration rates in Africa, with growth in the sector dependent on a resolution to the political crisis and a recovery of the country's economy.

The virtually untapped internet and broadband market also depends to a large extent on the country gaining access to international fibre optic cables and on a national backbone network being in place.

South Sudan's first direct international fibre link, a 200 km of optic fibre cable, linking Juba, the capital city, and Uganda through Nimule by the Liquid Intelligent Technologies company, was commissioned in February 2020. The optic fibre has been utilized by the mobile operators, carriers, enterprises and government organisations.

Sudan

Information and Communication Technology (ICT) growth in Sudan accelerated in past years and is comparable to regional averages. The country boasts one of the most liberalized ICT markets in Africa, with a strong multinational presence and is well endowed with fibre-optic connectivity to several subsea cables. Three subsea cables systems land in Port Sudan, in addition to terrestrial links to Egypt and Ethiopia and a 10 000 km domestic fibre backbone.

The emergence of competition in ICT gateways as a result of connectivity to subsea cables, has facilitated very attractive prices for ICT services

in Sudan, considered among the most attractive in Sub-Saharan Africa.

2.2.1.5 Legal Factors

South Sudan

South Sudan formulated and enacted the Petroleum Act, 2012, which guides all activities of oil and gas starting from exploration, development, production and exportation of petroleum products.

The country also enacted the Petroleum Revenue Management Act 2013, which established a formalized structure for distribution of petroleum revenues to immediate budgetary needs, savings and revenue stabilization, and direct transfers to petroleum producing states and affected communities.

Significant shortfall in enforcement of the Petroleum Act, 2012 and Petroleum Revenue Management Act, 2013, has been reported.

Sudan

The laws that governed petroleum industry in Sudan before 1998 included the Petroleum Resources Act of 1972 and the Petroleum Resources Regulations of 1973. The contracts and agreements concluded under these laws were concessions and these laws didn't allow the government to control and manage its petroleum resources to the best of its interests. In 1998, the new Petroleum Wealth Act of 1998 was formulated, and the act supersedes all previous associated legislation.

Regulations adopted by COMESA may also apply to companies carrying out oil and gas activities in Sudan.

2.2.1.6 Environmental Factors

Both governments currently plan to increase the utilization of renewable sources of energy such as the use of hydropower, wind power and solar power.

South Sudan

Even though the Environmental Protection Act of 2001 is no longer legally binding in South Sudan after gaining independence, it remains an important piece of legislation that is used to give guidelines in ensuring environmental conservation in the country.

The Draft Environment Protection Bill, 2015 is another critical piece of legislation, stipulating the requirement for Environmental Audits.

Sudan

Sudan is considered as one of the first African countries that have formulated legislation pertaining to environmental and natural resources.



The Environmental Protection Act 2001 is the first legislation pertaining to environmental management in Sudan. There are two major problems connected with the Environmental Protection Act 2001, namely confusion over the responsibilities and mandates of different institutions and sectors involved in environmental management, and lack of detailed regulations that guide the environmental requirements in different sectors.

The most detailed legislation on the preservation of the environment in oil and gas industry is supplied by the Regulations for Protection of the Environment in the Petroleum Industry (Amendment) 2005.

2.2.2 Tanzania

2.2.2.1 Political Factors

The country is still considered politically unstable country according to 2020's Global Economy's Political Stability Index, reported at -0,41. President Samia Suluhu Hassan was sworn in on March 19, 2021, as the United Republic of Tanzania's sixth, and first woman, president, and the new administration has maintained continuity of the political agenda while adjusting its policies and programs to reflect an evolving social and economic context.

The country scored 39% on Transparency International's Corruption Perceptions Index in 2021, indicating a high perception of public corruption.

Tanzania is the only country in East Africa that does not belong to COMESA. Instead, Tanzania is a member of the Southern Africa Development Community (SADC) and the East African Community and its Common Market, allowing for the free flow of goods within the EAC. While the EAC signed a TIFA with the U.S. in 2008.

Tanzania is also a member of SADC and is the beneficiary of trade arrangements such as AGOA and Everything But Arms (EBA). These arrangements allow Tanzanian goods duty-free access to U.S. and E.U. markets.

Tanzania has BITs with China (in force), Canada (in force), Oman (signed; not in force), Turkey (in force), Jordan (signed; not in force), Zimbabwe (signed; not in force), Italy (in force), Egypt (signed, not in force), United Kingdom (in force), Germany (in force), Korea (signed; not in force), Sweden (in force), Denmark (in force), Finland (in force), South Africa (signed, not in force) and Mauritius (in force).

An unwillingness to take decisions that imply long-term commitments and an increasing taste for state involvement in the petroleum sector have complicated deal-making between the state and investors. In addition, the inscribing of instability into legislation through the Natural Wealth and Resources Contracts (the Review and Renegotiation of Unconscionable

Terms Act 2017, which allows for the review of natural resources contracts) and the parallel use of ad hoc methods, such as an ongoing review of PSAs in the Attorney General's Office, are deterring necessary new investments.

2.2.2.2 Economic Factors

Tanzania's overall macroeconomic performance remains strong, with the country's economy considered economically resilient according to the African Development Bank's economic resilience index.

In 2020, the World Bank declared the rise of the Tanzanian economy from low-income to a lower middle-income country.

Inflation declined from over 4.2% in 2021 to 4% in January 2022. Growth had slowed to 2,1% in 2020 from 6,8% in 2019 because of Covid-19. However, as of September 2021 there was a rise as Tanzania averaged a 5,2% GDP growth per year, driven mainly by construction and manufacturing on the supply side and investments on the demand side.

The government's fiscal consolidation helped to reduce recurrent expenditures, but the adverse effect of Covid-19 on revenues increased the fiscal deficit to 2,3% of GDP in 2020, still lower than the government target of 5%.

The economic outlook is positive, with real GDP projected to grow 6% in 2023, due to improved performance of the tourism sector and the reopening of trade corridors.

Tanzania's credit rating stands at B2 according to Moody.

Cost of living in Tanzania is 1,26 times less expensive than the world average.

2.2.2.3 Social Factors

The number of Tanzanians living below the poverty line has increased as the pandemic caused weakness in sectors with high employment potential. Poverty and unemployment are expected to remain high due to depressed private sector activity, with the unemployment rate recorded at 9,5% in December 2020. In 2019, the labour force participation rate exceeded 80%, thereby increasing the country's potential for investment and development.

World Bank data shows that Tanzania's Human Capital Index score is low, at 0,39.

There are heavy population concentrations in the urban centres (including Dar es Salaam, Mwanza, Zanzibar, Morogoro, Tanga, Arusha, and Mbeya), in the foothills of Mount Kilimanjaro, and along the coast of Lake Malawi. How-

ever, the growing number of refugees (from neighbouring Rwanda, Burundi, and Uganda in particular) have added pressure on the economy and the local environment.

2.2.2.4 Technological Factors

Tanzania is one of the countries in Sub-Saharan Africa, which is characterised by massive deficit in science and technology.

Tanzania's ICT sector is the fastest growing sectors in Tanzania, boasting connection to several East African subsea fibre systems (2Africa, EASSy, Seacom, TEAMS), and has the second largest telecommunication market in East Africa, behind Kenya.

Currently, the government of Tanzania is constructing the National Fibre Optic Cable network, National ICT Broadband Backbone (NICTBB). The infrastructure will enhance usage of ICT applications for sustainable socio-economic development including implementation of e-government, e-learning, e-health, and e-commerce.

2.2.2.5 Legal Factors

The primary laws governing the oil and gas industry include the Petroleum Act 2015, the Energy and Water Utilities Regulatory Authority Act 2006, the Tanzania Extractive Industries (Transparency and Accountability) Act 2015, the Oil and Gas Revenues Act 2015, the Environmental Management Act 2004, the Tanzania Investment Act 1997, the Income Tax Act RE 2008, the Petroleum (General) Regulations 2011, the National Natural Gas Policy 2013, the Petroleum (Natural Gas Pricing) Regulations 2016; and the Petroleum (Local Content) Regulations 2017.

Regulations adopted by SADC may also apply to companies carrying out oil and gas activities in Tanzania.

2.2.2.6 Environmental Factors

Tanzania faces a similar dichotomy as Ethiopia in terms of environment. The capital Dar es Salaam is riddled with pollution and poor infrastructure while rural areas are being heavily deforested.

The Environmental Management Act provides for a legal and institutional framework for sustainable management of the environment, outlining principles for management, impact and risk assessments, prevention and control of pollution, waste management, environmental quality standards, public participation, compliance, and enforcement.

2.2.3 Uganda

2.2.3.1 Political Factors

Uganda has few formal trade barriers, though bureaucratic inefficiencies, high transport costs, and an influx of counterfeit consumer products increase costs for foreign businesses.

Uganda maintains a liberal trade and foreign exchange regime. Nonetheless, endemic corruption (27% corruption perception index according to Transparency International for 2021), financial mismanagement, a complex tax code with a large untaxed informal sector, and increasing political repression raise questions about the Government's commitment to fostering a stable and investor-friendly environment. Mid- to long-term political uncertainty also increases risks to foreign businesses and investors, with the Global Economy classifying Uganda as politically unstable (-0,78).

Uganda is eligible for AGOA and GSP trade benefits, although the country does not have a BIT or FTA with the U.S.

The country formally ratified the AfCFTA and is a member of the EAC, COMESA and the African Union Abuja agreement. As part of the EAC, Uganda, Kenya, Rwanda, Burundi, Tanzania, and South Sudan have created an East African Customs Union designed to promote free trade among the six nations.

2.2.3.2 Economic Factors

The Covid-19 pandemic and subsequent lockdowns to prevent the spread of the virus damaged Uganda's economy. The country's economy is however considered more economically resilient according to the African Development Bank's economic resilience index.

Real GDP declined by 0,5% in 2020, after growing 7,5% in 2019. Nevertheless, the central bank kept inflation at 3,8%, well under the 5% medium-term target. The financial sector has come under increasing pressure as a result of the decline in economic activity.

Uganda's credit rating stands at B according to Standard & Poor, while Moody reported Caa1, and Fitch affirmed B+.

Uganda is classified as a low-income country, with the cost of living reported at 1,58 times less expensive than the world average, affirming Uganda's potential attractiveness for oil and gas investment projects.

2.2.3.3 Social Factors

The workforce group in Uganda account for 46,49% of the population. Nearly half of the population fall within the workforce group, increasing the country's potential for investment and development.

The country scored low on the Human Capital Index, according to the World Bank, with 0,38 points.

The unemployment rate in Uganda was recorded as 2,44% in 2020, projected to trend around 2,30% in 2022 and 2,00% in 2023.

Population density is relatively high in comparison to other African nations, with most of the population concentrated in the central and southern parts of the country, particularly along the shores of Lake Victoria and Lake Albert near oil and associated gas reserves.

2.2.3.4 Technological Factors

Currently the country is facing challenges on required technology to handle oil and gas activities, including power, ICT and infrastructure.

Demand for ICT is high in Uganda. However, investors must grapple with a difficult regulatory environment, including taxes on imported internet-based services and applications.

Uganda's infrastructure needs remain substantial. The government is focused on building roads, especially roads to oil-producing areas, while still facing an eight-million-unit housing shortage according to the Uganda National Planning Authority.

2.2.3.5 Legal Factors

Relevant legislation governing petroleum exploration and production activities in Uganda include the Petroleum (Exploration, Development and Production) Act, 2013, and the Petroleum (Exploration and Production) (Conduct of Exploration) Regulations, S.I. 150-1.

Regulations adopted by COMESA may also apply to companies carrying out oil and gas activities in Uganda.

2.2.3.6 Environmental Factors

The National Environment, Act 9, enacted in 1995 later amended to National Environment Act, No. 5 of 2019, is the framework law on environment.

Other environmental laws and regulations related to oil and gas industry include National Environment (Waste Management) Regulations S.I. No. 49 of 2020, 153-2, Petroleum (Waste Management) Regulations S.I. No. 3 of 2019, National Environment (Noise Standards and Control) Regulations, National Environment (Wetlands, riverbanks and lake Shores Management) Regulations 153-5, National Environment (Standards for Discharge of Effluent into Water or Land) Regulations 2020, National Environment (Oil Spill Prevention, Preparedness and Response) Regulations, 2020, National Environment (Environmental and Social Assessment) Regulations S.I. No. 143 of 2020.

The goal of the National Climate Change Policy (NCCP) is to ensure a harmonised and coordinated approach towards a climate-resilient and low-carbon development path for sustainable development in Uganda.

2.3 Southern African Countries

2.3.1 Angola

2.3.1.1 Political Factors

Angola has become a leading example for the so-called resource curse, which refers to several other sociological, economic, and political problems that typically accompany a surge in natural resource-based prosperity.

Despite the conclusion of the civil war in 2002, the country remains politically unstable

(-0,52), according to the Global Economy's Political Stability Index.

According to Transparency International, Angola has a high perception of public corruption (29% in 2021). Excessive bureaucracy and inadequacy of transparency in public administration regulations and procedures were cited as some of the causes of corruption in Angola.

Domestic reforms by the authorities, such as Sonangol's "Regeneration Program" and the privatisation of numerous State-Owned Enterprises (SOEs), are supposed to minimise government involvement in the economy, reduce budgetary risks, enhance governance, minimise pricing distortions, and promote economic efficiency. The proposed reform of the largest SOE, Sonangol, the improved transparency of all SOE accounts, and the proper implementation of the SOE privatisation program are all anticipated to mitigate important fiscal risks in the economy under the IMF program.

Angola is a member of WTO and OPEC, and benefits from AGOA. At a regional level, Angola has signed (not ratified) AfCFTA, and is a member of ECCAS and SADC, but it is not party to the Southern African Customs Union (SACU).

Angola can make use of its excellent geographic location as a gateway to neighbouring nations, many of which are landlocked, as has been in pursuing customs agreements with its neighbouring countries (Namibia, Zambia, Republic of Congo and the DRC).

Public demonstrations against high unemployment (particularly young unemployment, which is above 50%), restricted economic possibilities, and suspension of municipal elections (formerly scheduled for 2020) have been recorded.

2.3.1.2 Economic Factors

According to the African Development Bank's economic resilience index, Angola is considered less economically resilient. The oil-driven economy of Angola has been in recession since 2016, causing its debt-to-GDP ratio to rise from 57,1 % in 2015 to 78,5% in 2021.

Angola's credit rating stands at CCC+ according to Standard & Poor, while Moody reported Caa+, and Fitch affirmed B- due to a significant improvement in the country's fiscal and external metrics, underpinned by a return to positive economic growth, sound fiscal management and higher oil prices.

Over the last two years, important changes have been implemented to encourage macroeconomic stability, private investment, and a more balanced economy, including a value-added tax, fiscal responsibility legislation, a liberalisation of the exchange rate system, and a private investment and privatisation law.

During its scheduled meeting on January 28th, 2022, the National Bank of Angola held its benchmark policy rate at 20 %, to maintain domestic recovery assistance in the face of continued inflationary pressures. In December 2021, the annual inflation rate rose for the ninth month in a row to 27,03%, the highest level since July 2017. Meanwhile, the economy grew by 0,8% year-on-year in the third quarter of 2021, the first growth since the fourth quarter of 2018, after nine quarters of decreases.

2.3.1.3 Social Factors

The unemployment rate in Angola increased to 31,60% in the second quarter of 2021, with widespread poverty (half the population lives in poverty), despite a labour force participation rate of 88,77%. Poverty and unequal economic distribution, expressed by the deplorable conditions in which millions of individuals live, are the major drivers of crime and inadequate safety in Angola.

World Bank data indicates that Angola's Human Capital Index score is low, 0,36.

The bulk of the population is concentrated in Luanda Province, in the Benguela-Lobito coastal area and on the highlands, especially in the Huila, Huambo, Bié, Kwanza Sul, Malanje and Uige provinces.

2.3.1.4 Technological Factors

Existing transport and logistics infrastructure in Angola remains a considerable impediment for businesses. Subsea fibre-optic cables form

the backbone of the global Internet, with Angola connected to SACS and West Africa Cable System (WACS).

2.3.1.5 Legal Factors

The Angolan regulatory framework for the exploration and production of oil and gas is essentially established in the Petroleum Activities Law, Law No 10/04, as amended by Law No 5/19 (Amendment of the Petroleum Activities Law).

Important sector regulations also include Law No 13/04, as amended by Law No 6/19 (Amendment of the Petroleum Activities tax Law), Law No 11/04 (Petroleum Customs Law), Law No 26/12 (Law on the Transportation and Storage of Crude Oil and Natural Gas).

Regulations adopted by ECCAS and SADC may also apply to companies carrying out oil and gas activities in Angola.

2.3.1.6 Environmental Factors

Angolan Decree No. 59/07 establishes the rules, criteria, and processes to be followed by the oil and gas industry to secure the necessary environmental permits.

2.3.2 Mozambique

2.3.2.1 Political Factors

Political stability in the country remains low (-1,16), according to the Global Economy's Political Stability Index.

A poor security situation is leading to greater instability in Mozambique, whilst corruption (26% according to Transparency International's Corruption Perceptions Index 2021), is endemic.

Mozambique has ratified the SADC Trade Protocol and has bilateral trade agreements with Malawi and Zimbabwe. The South African Government signed a bilateral investment treaty (1997) and a cross-border gas trade agreement (2001) with Mozambique.

In 2019, Mozambique and the US Department of Commerce entered into a bilateral memorandum of understanding to help facilitate trade and investment in the areas of energy, infrastructure, agriculture, and tourism among other industries.

The Islamist threat emerged in 2017, in the border province of Cabo Delgado. As in the form of the al-Shabaab ("youth") movement—it came about as a reaction to the LNG euphoria. The troubles in Cabo Delgado have given it an atmosphere like that of the Niger Delta. On April 24, 2021, Islamist rebels seized the city of Palma, Mozambique, forcing the French energy company TotalEnergies to suspend its biggest project. Mozambique's security situation has become so serious, with the spread of Islamist



insurgency and the failure of the security forces in dealing with it.

2.3.2.2 Economic Factors

The country's economy is considered less economically resilient according to the African Development Bank's economic resilience index.

Mozambique's strong economic performance was affected by the outbreak of the Covid-19 pandemic. GDP in the country reached 3,3% in 2021, exceeding pre-pandemic levels.

Mozambique's credit rating stands at CCC+ according to Standard & Poor, while Moody reported Caa2, and Fitch affirmed CCC.

The economy is expected to grow and accelerate in the medium-term as LNG projects start producing, with deterioration in the security situation in the Central and North presenting a major risk.

Mozambique is considered a low-income country, with the cost of living reported at 1,05 times more expensive than the world average.

2.3.2.3 Social Factors

Mozambique's population is growing at a rate of 2,93% every year, with the country facing several challenges with population growth, including ensuring access to health care and education, and minimising unemployment, which was recorded at around 3,8% in 2020.

The labour force participation rate was reported at 76,13% in 2020, indicating an adequate number of resources available to potentially service new oil and gas developments. However, Mozambique scored low on the Human Capital Index, according to the World Bank, with 0,36 points.

In Cabo Delgado province, the gas industry has forced hundreds of families from rural communities out of their homes and away from their farmland and fishing grounds (livelihood), in order to build the onshore support facilities of the Afungi LNG Park on the Afungi Peninsula for use by the Mozambique LNG, Coral LNG and Rovuma LNG projects.

2.3.2.4 Technological Factors

Mozambique has ensured technological development by investing in infrastructure and constructing natural gas pipelines and LNG facilities.

The country plans to digitise its economy, however, digital infrastructure is still a long way from achieving broadband universal access., with a low overall internet penetration rate of 21,2% in 2021.

Mozambique has several subsea fibre system connections, including EASSy, Seacom, PEACE and 2Africa.

2.3.2.5 Legal Factors

The Petroleum Law, Law No. 21/2014, establishes the general framework applicable to all oil and gas operations.

Other important sector regulations include the Investment Law, Law No. 3/93, the Petroleum Production Tax Law, Law No. 27/2014 amended by Law No 14/2017, the Petroleum Production Tax Regulation, Decree No. 32/2015, the Public Private Partnerships Law, Law No. 15/2011, the Petroleum Operations Regulations, Decree No. 34/2015 and the Mega-Projects Law, Law 15/2011.

Regulations adopted by SADC may also apply to companies carrying out oil and gas activities in Mozambique.

2.3.2.6 Environmental Factors

Legislation and policy making in the field of environment is of reasonable quality, however, implementation and monitoring are weak and uncoordinated.

The Environmental Regulation for Petroleum Operations, Decree No 56/2010, sets out the requirements to be complied with in order to perform oil and gas operations.

2.3.3 South Africa

2.3.3.1 Political Factors

The South African political environment is often clouded by mismanagement, political intolerance, popular protest and violence, which could slow down oil and natural gas development.

Political stability in the country remains low (-0,24), according to the Global Economy's Political Stability Index.

Transparency International's Corruption Perceptions Index 2021 exhibits a score of 44% for South Africa, reflecting a perception of highly corrupt public service.

South Africa has concluded FTAs with the EU and the European FreeTrade Association (EFTA) comprising Switzerland, Norway, Liechtenstein and Iceland, and has a preferential trade agreement (PTA) with MERCOSUR (comprising Brazil, Argentina, Paraguay and Uruguay) and India.

The new SACU agreement entered into force, with partners including Botswana, Lesotho, Namibia and Swaziland.

South Africa is in engagement with the People's Republic of China to implement the Partnership



for Growth and Development (PGD) that aims to promote value addition.

The country has also concluded a co-operative trade arrangement, namely the Trade, Investment and Development Co-operation Agreement (TIDCA), is a beneficiary of a number of non-reciprocal trade agreements, among them AGOA and the GSP, and is a member of BRICS.

Under the Copenhagen Accord, South Africa committed to reduce emissions below Business as Usual by 42% in 2025. The government is currently both promoting and supporting the development of the gas market in South Africa, with the IRP 2019, setting out a new direction in energy sector planning, which includes increased adoption of natural gas.

A national Gas Master Plan is under development, with the objective to provide the government with a blueprint for the development of infrastructure for future gas market developments.

2.3.3.2 Economic Factors

Covid-19 is continuing to have a major impact on South Africa's economy, due to external demand and domestic activity. Nevertheless, South Africa is considered one of the most resilient economies according to the African Development Bank's economic resilience index.

South Africa's annual real GDP decreased by 7,0% in 2020, following an increase of 0,2% in 2019, with an anticipated expansion of 4,9% to have been reported in 2021.

Standard & Poor's credit rating for South Africa stands at BB-. Moody's credit rating for South Africa has recently been upgraded to Ba2. Fitch's credit rating for South Africa was last reported at BB-. The credit rating decisions reflect the high and rising government debt, which was exacerbated by the economic shock triggered by the Covid-19 pandemic.

The Centre for Risk Analysis report noted a risk for further currency weakness, which means persistent high inflation combined with high unemployment and stagnant demand in a country's economy.

The annual inflation rate in South Africa rose to 5,9% in December 2021. This is in line with market expectations and moving close to the top of the South African Reserve Bank's target range of 3% to 6%. The projection for 2022 is to average at 4,6%.

The cost of living in South Africa is lower compared to the US, indicating relative affordability.

2.3.3.3 Social Factors

High and increasing unemployment, reported at 34,9% in 2021, with a labour force participation rate reported at 55,20% in 2021.

Human Capital Index score, as reported by the World Bank, for South Africa was 0,43.

Hostile labour relationships, service delivery protests and youth protesting for greater access to quality education could impact sector development if the social dynamics at play in South Africa is not understood.

2.3.3.4 Technological Factors

South Africa has one of the largest ICT markets in Africa, with technological leadership in the mobile software field, security software, as well as electronic banking services.

The SAT-3/WASC and the WACS are the most important international subsea cables connecting South Africa and West Africa to Europe. The WACS lands at the Yzerfontein CLS in Western Cape Town, the SAT-3/WASC lands at the Melkbosstrand CLS in Western Cape Town, South Africa, forming alternative gateways to South Africa, with a capacity of 120 Gbps.

An extension of the Equiano cable, with a design capacity of 150Tbps, connecting South Africa with Portugal, is expected to be completed in 2022.

2Africa is one of the largest subsea projects in the world, connecting 46 cable landing stations in 33 countries in Africa (including South Africa), Asia and Europe, with a cable length of 45 000 km. The cable system is expected to be commissioned in 2023/24, with a design capacity of 180Tbps.

2.3.3.5 Legal Factors

The Minerals and Petroleum Resource Development Act (28/2002) governs the acquisition, use and disposal of mineral rights and entrenches state power and control over the mineral and petroleum resources of the country. The Upstream Petroleum Resources Development Bill, currently under consideration, introduces a separation of the upstream petroleum exploration and production sector from the mining sector, which is regulated under the Minerals and Petroleum Resource Development Act (28/2002).

The sector is further governed by the Gas Act (48/2001), National Energy Regulator Act (40/2004), Petroleum Pipelines Act (60/2003), Central Energy Fund (CEF) Act (38/1977), National Energy Act (34/2008), Piped Gas Regulations (2007), Petroleum Products Act (120/1997) and Petroleum Pipelines Levies Act (28/2004).

Regulations adopted by SADC may also apply to companies carrying out oil and gas activities

in South Africa.

2.3.3.6 Environmental Factors

The National Environmental Management Act (107/1998) provides for co-operative environmental governance, while the Carbon Tax Act 2019 imposes a levy on any person who conducts any number of listed Carbon Dioxide producing activities (including several attributable to the extraction and processing of petroleum products).

2.4 Western African Countries

2.4.1 Ghana

2.4.1.1 Political Factors

Ghana's political landscape is one of the country's most recognizable distinguishing aspects in many respects, classified as politically stable (0,13) according to the Global Economy. In contrast to many of its neighbours, Ghana has experienced two decades of functional democracy, with free and open elections, and a lack of broader societal instability. This is not to suggest that Ghana has never experienced political upheaval or coups, but it has made great progress in recent decades in establishing a stable framework for democratic prosperity.

Corruption Perceptions Index 2021, published by Transparency International, scored Ghana 43%, showing a perception of a highly corrupt public service.

Strong connections with the U.K., the U.S., the E.U., China, India and South Africa have helped to boost investment and rapid economic growth.

Ghana is a member of the WTO and a signatory to the ACP-EU Partnership Agreement, which supplemented the Lomé Convention. In addition to being a prominent member of ECOWAS and a beneficiary of AGOA.

Ghana has prioritised infrastructure development to meet its national development goals, stipulated in its Infrastructure Plan, which aspires to produce sustainable, climate-resilient infrastructure across important sectors, linked with the Sustainable Development Goals and the Paris Agreement.

2.4.1.2 Economic Factors

Despite the consequences of Covid-19, Ghana's economy is robust (considered more economically resilient according to the African Development Bank's economic resilience index) and has an optimistic outlook, mostly due to sound economic control and budgetary discipline demonstrated via compliance to recently approved legislation (Budget Responsibility Act of 2018 (Act 982), Public Financial Management Act of 2016 (Act 921), and the Public Financial

Management Regulation of 2019).

Ghana's annual inflation rate quickened for the eighth consecutive month to 13,9% in January 2022, the highest rate since December 2016, exceeding the Bank of Ghana's target band of 6% - 10%.

The economy of Ghana advanced by 6,6% year-on-year in 2021. It was the fourth consecutive quarter of growth and at the fastest pace since the onset of the pandemic crisis in 2020.

Ghana's credit rating stands at B- according to Standard & Poor, while Moody reported Caa1, and Fitch affirmed B-.

Ghana is categorised as a low-income developing country, with the cost of living less expensive than the world average.

2.4.1.3 Social Factors

Ghana's labour force participation rate decreased to 66,2% in 2020, still indicating an adequate number of resources available to potentially service new oil and gas developments.

According to the World Bank, Ghana's Human Capital Index score was 0,45.

As elsewhere in Africa, unemployment is a major concern in Ghana, particularly due to the rising unemployment among youth. Unemployment in the country was recorded at 4,53% in 2020.

The highest concentration of habitation continues to be within the Accra-Kumasi-Takoradi triangle, primarily due to the economic productivity of the region.

2.4.1.4 Technological Factors

Presently, there are five subsea cables, with capacity up to 5,12Tbps, with the sector further supported by the ICT for Accelerated Development (ICT4AD) policy.

The internet penetration rate in Ghana reached 50% in 2021.

2.4.1.5 Legal Factors

Petroleum exploration and production activities in Ghana are regulated by a number of laws, including the Petroleum Commission Act, 1022 (Act 821), the Ghana National Petroleum Corporation Law, 1983 (PNDCL 64), the Petroleum (Exploration and Production) Law, 1984 (PNDCL 64), the Petroleum (Local Content and Local Participation) Regulations, 2013 (L.I. 2204), the Petroleum Revenue Management

Act, 2011 (Act 815), the Petroleum Revenue Management (Amendment) Act, 2015 (Act 893) and the Petroleum Income Tax Act, 1987 (PND-CL 188).

2.4.1.6 Environmental Factors

The environmental aspects of the oil and gas sector are regulated under the Environmental Assessment Regulations, 1999 (L.I. 1652).

Petroleum (Exploration and Production) (Health, Safety and Environment) Regulations (L.I. 2258) were passed in 2017 to prevent adverse effects of petroleum, provide minimum requirements, and provide high standards of health, safety and environment.

2.4.2 Nigeria

2.4.2.1 Political Factors

Nigeria is classified as politically unstable (-1.86) according to the Global Economy's Political Stability Index, and scored 24% on Transparency International's Corruption Perceptions Index 2021, indicating a perception of a highly corrupt public service. The allocations of contracts, appropriation of petroleum revenue and diversion of petroleum tax bonuses (amongst others) are all highly influenced by corruption in all levels of government.

Tariffs are the main trade policy instrument in Nigeria. In January 2015, Nigeria implemented the ECOWAS Common External Tariffs (CET) and ratified the AfCFTA in December 2020.

Nigeria is a member of WTO, OPEC and is eligible for preferential trade benefits under AGOA. The country has bilateral investment agreements in force with 15 countries, has double tax treaties with 13 countries and is a signatory to 21 investment-related instruments.

2.4.2.2 Economic Factors

The petroleum industry is the backbone of the Nigerian economy, though considered economically resilient according to the African Development Bank's economic resilience index.

The country's economy experienced its deepest recession in two decades in 2020, but the economy began growing again in 2021 as the government relaxed pandemic restrictions, oil prices recovered, and policies were implemented to counter the economic shock. Fitch has affirmed Nigeria at 'B', with a stable economic outlook.

In February 2021, the oil and gas sector contributed 9% to the country's GDP. Although

Nigeria is trying to diversify and move towards a greener economy, oil will continue to remain the main fuel source for the current future.

Nigeria's Central Bank has maintained its monetary policy rate at 11,5% since January 2022 to aid the recovery process following the shock of the Covid-19 pandemic. Furthermore, as of December 2021, Nigeria's annual inflation rate was 15,63%.

Nigeria's credit rating stands at B- according to Standard & Poor, while Moody reported B2, and Fitch affirmed B.

The country is categorised as a low-income developing country, with the cost of living 1,05 times less expensive than the world average.

2.4.2.3 Social Factors

The influence of non-indigenous companies in the oil and gas sector in Nigeria has meant that many jobs that could have gone to native people (labour force participation rate of 53,4%) were given to foreign people instead, resulting in an unemployment rate of 33,3%.

Human Capital Index for Nigeria, as reported by the World Bank, is 0,36.

Nigeria is the country with the highest population in Africa. Lagos, Kano, Ibadan, Benin City, and Port Harcourt have the highest population concentration.

2.4.2.4 Technological Factors

Nigeria's ICT sector has attracted significant FDI in the past few years and is regarded as Africa's largest ICT market.

The country has landing stations for several subsea cables, including 2Africa, ACE, NCSCS, GLO-1 and MainOne.

2.4.2.5 Legal Factors

The Petroleum Ordinance promulgated in 1889 was the first law, however the first concrete petroleum legislation is the Petroleum Act of 1969. There have been some amendments to the Petroleum Act of 1969 and enactments of new petroleum laws to govern different aspects of Nigeria's petroleum industry, including the enactment of the Petroleum Industry Act in August 2021.

Other legislation impacting, governing, and regulating the oil and gas sector include, amongst others, the Petroleum Profits Tax Act, the Deep Offshore and Inland Basin Production Sharing Contracts Act, and the Oil Pipelines Act.

2.4.2.6 Environmental Factors

Nigeria is aiming to achieve net-zero carbon emissions by 2060.

Gas flaring was banned by the Government of Nigeria in 1984, but the Government has struggled to maintain much order in this regard and gas flaring is still a problem that persists to this day. Gas flaring is the second most destructive environmental pollutant in the Niger Delta after oil spillage. There is a drive to achieve Zero Routine Flaring by 2030, but weak implementation and lack of intent is hindering this goal.

Existing environmental policies regulating the oil and gas sector include the Environmental Impact Assessment Act, the Associated Gas Re-Injection Act and the National Oil Spills Detection and Response Agency Act.

2.4.3 Senegal

2.4.3.1 Political Factors

Senegal is regarded as being democratic, but was classified as politically unstable (-0,02) according to the Global Economy's Political Stability Index for 2020. There is however corruption, particularly surrounding embezzlement, misuse of public funds, bribery, and petty corruption, scoring 43% on Transparency International's Corruption Perceptions Index 2021.

Senegal is a member of Extractive Industries Transparency Initiative (EITI), ECOWAS, West African Economic and Monetary Union (WAEMU), the Cotonou Convention and WTO. Senegal is also currently eligible for benefits under the AGOA, set to expire in 2025. On May 30, 2020, AfCFTA officially entered into force with Senegal as member state.

2.4.3.2 Economic Factors

The economy of Senegal is driven by mining, construction, tourism, fishing and agriculture. Despite diversification, the country's economy is considered less economically resilient according to the African Development Bank's economic resilience index.

In 2020, real GDP growth stood at 0,87%, down from 4,4% in 2019. A short-term increase in the GDP as a result of increased exploration and production in the hydrocarbon sector is expected from 2022, but the medium-term effect (to 2040) is expected to be low, as the oil and gas fields are expected to reach their production life by that time.

The interest rate for 2022 is 4%, down from 4,5% in 2020, while the annual inflation rate increased to 3,8% in December 2021.

Senegal's credit rating stands at B+ according to Standard & Poor, while Moody reported Ba3.

Senegal's cost of living is 1,19 times more expensive than the world average; despite being classified as a lower-middle income country.

2.4.3.3 Social Factors

Senegal's national unemployment rate increased from 16,70% in 2020 to 22,60% in the first quarter of 2021. The labour participation rate has been reported at approximately 44,27% in 2020, coupled with low a Human Capital Index score of 42, as reported by the World Bank.

The population of Senegal tends to increase by around 2,7% each year, with urban population accounting for nearly half of the population.

2.4.3.4 Technological Factors

Senegal's digital technology has rapidly expanded over the past decade, with increased access to cell phone services and mobile internet coverage, as well as investments and business incubators to provide access to these services.

A 720 km Senegal Horn of Africa Regional Express (SHARE) submarine cable system, connecting Dakar in Senegal and Praia in Cape VerdeCabo Verde, with a total capacity of 16 Tbps, is expected to be ready for service in 2022, with onward connectivity to Europe and South America possible via international cables landing in Cape VerdeCabo Verde. Future branching units to other West African countries have also been suggested.

Senegal is also connected to the ACE submarine cable, with a design capacity of 20 Tbps, connecting 19 countries in total.

2.4.3.5 Legal Factors

The main legislation governing petroleum activities is Law No. 98-05, as amended by Law No. 2012-32 and Implementation Decree No. 98-810. Petroleum Code 2019, Law No. 2019-03, was enacted, superseding Law No. 98-05, to reflect the rapid growth of the local industry in light of promising offshore exploration.

Due to the general nature of the Petroleum Code, most of the specific provisions governing petroleum exploration and production are included in petroleum contracts.

Uniform Acts adopted by the Organisation for the Harmonisation of Business Law in Africa (OHADA), of which Senegal is a Member State, apply to companies carrying out oil and gas activities in Senegal, especially the OHADA Companies Act.

Oil and gas activities are subject to exchange control regulations applicable within WAEMU and ECOWAS.

Senegal also conforms to the requirements laid out by EITI.

2.4.3.6 Environmental Factors

Articles describing Senegal's environmental protection laws in the Petroleum Code of 2019 include Articles 20, 22, 23, 28, 34, 39 and 51.

In 2021, the Senegal Parliament adopted a bill that was submitted by the Ministry of Petroleum Energy, reforming the electricity sector, with a regulatory framework currently being drafted for the oil and gas downstream sector.

2.5 Central African Countries

2.5.1 Chad

2.5.1.1 Political Factors

Chad is in a period of political instability, scoring -1,26 according to Global Economy's 2020 political stability index. Instability from neighbouring countries and Boko Haram (ISIS-West Africa) terrorist activities, especially in proximity to the Lake Chad Basin, also threaten Chad's security.

Chad's business and investment climate remains challenging. Private sector development is hindered by poor transport infrastructure, lack of skilled labour, minimal and unreliable electricity supply, weak contract enforcement, corruption (20% Transparency International's Corruption Perceptions Index 2021), and high tax burdens on private enterprises. Frequent border closures with neighbouring countries, exacerbated by Covid-19 restrictions, complicate international trade. Despite these challenges, the success of several foreign investments into Chad illustrates the business opportunities for experienced, dedicated, and patient investors, often operating with trusted local partners to navigate the challenges of operating in Chad.

Chad has signed BITs with Benin, Burkina Faso, China, Egypt, Germany (in force), Guinea, Italy (in force), Lebanon, Mali, Mauritius, Morocco, Qatar, and Switzerland (in force), and Turkey.

Besides the African Union and the United Nations, Chad is a principal member of several principal regional organisations, including CEN-SAD, ECCAS, and the Central African Economic and Monetary Community (CEMAC). Along with these organisations, Chad also belongs to several other organisations, including WTO, and has been declared compliant with EITI since 2014.

The country does not have an FTA but is eligible for tariff exemptions under AGOA.

2.5.1.2 Economic Factors

Chad's macroeconomic developments have been adversely impacted by a series of adverse and long-lasting shocks, which include the Covid-19 pandemic, oil price volatility and a significant deterioration in the output of the oil sector, security attacks, climate change and food insecurity.

The country's economy is also considered less economically resilient according to the African Development Bank's economic resilience index.

The real GDP in 2021 is estimated to have contracted by 1,1%, driven by a reduction in oil production. The Chadian economy is projected to remain weak over the near term, before gradually rebounding in 2024, to 3,6% provided adequate reforms are implemented. Meanwhile, average annual inflation was contained after soaring in 2020 to 4,5%.

The country is classified as a low-income country with the cost of living in Chad reported at 1,77 times less expensive than the world average.

2.5.1.3 Social Factors

Chad is one of the world's least developed countries and continues to be among the poorest nations in the world with levels of poverty well below average, even for sub-Saharan Africa.

Chad's population demonstrates a significant youth bulge, with a labour force participation rate of 68%. The country scored low on the Human Capital Index, according to the World Bank, with 0,30 points.

In December 2020, unemployment was 2,3%, up from 1,9% in 2019.

The population is unevenly distributed due to contrasts in climate and physical geography; the highest density is found in the southwest, particularly around Lake Chad and points south; the dry Saharan zone to the north is the least densely populated.

2.5.1.4 Technological Factors

Chad has experienced an improvement in development outcomes, such as the Government approved telecom infrastructure upgrade, the World Bank-funded Central African Backbone project and the Trans-Saharan Backbone project linking a fibre cable to Nigeria and Algeria.

In 2020, the Government of Chad eliminated an 18% excise duty tax on telecom services to reduce consumer costs and support mobile network penetration.

2.5.1.5 Legal Factors

The main legislation governing petroleum activities is Law no. 07-006 dated 2 May 2007 as amended by Ordinance no. 10-001 dated 30 September 2010 and its implementing Decree no. 10-796 PR/PM/MPE dated 30 September 2010.

Oil and gas activities are subject to Exchange Control Regulations applicable within CEMAC and other regulations adopted by ECCAS may also apply to companies carrying out oil and gas activities in Chad.

2.5.1.6 Environmental Factors

At this time, Chad has little capacity to assess and monitor environmental impacts. The National Plan for Sustainable Development dealt largely with desertification and ignored potential petroleum developments. The Ministry of Environment and Water had only recently been created, and the Environment Department was virtually devoid of staff and logistical support.

2.5.2 Republic of the Congo

2.5.2.1 Political Factors

Republic of Congo's attractiveness to investors is undermined by negative macroeconomic trends and weak governance.

Political stability in the country is low (-0,9), based on the Global Economy's Political Stability Index.

According to Transparency International's Corruption Perceptions Index 2021, the country scored 21%, indicating perceived high levels of public corruption.

Republic of Congo has bilateral trade agreements with over 50 countries and belongs to several international and regional trade organisations, including WTO, SADC, COMESA, ECCAS, OPEC, the Nile Basin Initiative (NBI), the Economic Community of the Great Lakes Countries (ECGLC) and OHADA. The country has also signed the AfCFTA.

2.5.2.2 Economic Factors

In 2021, the Congolese economy contracted by 3,5%, increasing extreme poverty from 51,9% of the population in 2020 to 53,9% in 2021. The GDP is expected to grow at a rate of 3,5% in 2022 and 3,8% on average between 2023 and 2024.

There was no change in headline inflation in 2021, which remained at 2%.

Although Republic of Congo continues to be in debt distress, recent debt restructuring agreements, higher oil prices, and improved debt management have helped to restore the sustainability of public debt, which decreased

from 113% of GDP at the end of 2020 to 98% at the end of 2021.

The country's credit rating stands at CCC+ according to Standard & Poor, while Moody reported Caa2 with a stable outlook.

The cost of living is reported at 1,7 times less expensive compared to the world average.

2.5.2.3 Social Factors

It is estimated that the country's population is growing at a rate of nearly 3% per year, which is not ideal given the current economic circumstances, which report an unemployment rate of nearly 23% by 2020.

Poverty in the country is high, remains widespread and pervasive, and is increasing due to impacts from Covid-19.

The labour force participation rate was reported in 2020, at 38,84%, with a high literacy, indicating significant domestic labour potential.

Human Capital Index score for Republic of Congo, according to the World Bank, was only 0,4.

While the country has been trending towards urbanisation in recent decades, more than 54% of the Congolese people still reside in small, tribal communities.

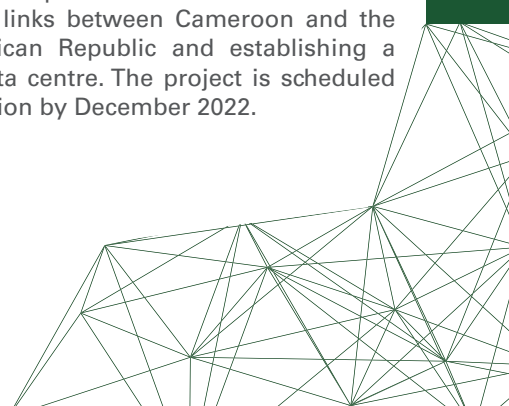
2.5.2.4 Technological Factors

The Republic of Congo does not have a widespread use of electronic commerce. A lack of reliable infrastructure and equipment has resulted in one of the lowest internet penetration rates on the continent. The situation has, however, improved with the completion of a fibre optic link connecting Pointe-Noire and Brazzaville to the West Africa Cable System.

Having connected its terrestrial fibre-optic network to Gabon's fibre-optic network, the Republic of Congo has completed the first phase of the fibre-optic backbone project in Central Africa.

With the advancement of regional digital integration, the Republic of Congo is expected to contribute to the development of information and communication technology, as well as the creation of jobs.

The Congo Component of the Central Africa Backbone Project is currently constructing 550 kilometres of optical fibre cable on the inter-connection links between Cameroon and the Central African Republic and establishing a national data centre. The project is scheduled for completion by December 2022.



The country's physical infrastructure remains patchy, with only 49,5% of the country's population having access to electricity.

2.5.2.5 Legal Factors

The main laws governing the oil and gas sector in Republic of Congo include the new Hydrocarbon Code, Law No. 28-2016 of October 12, 2016 (which repealed and replaced the old hydrocarbon code, Law No. 24-94 of August 23, 1994, in its entirety), Law No. 1-98 of April 23, 1998, Law No. 4-98 of August 28, 1998 and Law No. 6-2001 of October 19, 2001 (modified on March 1, 2002).

Environmental and investment laws include Law No. 003/91 of April 23, Law No. 6-2003 of January 18, 2003 (as well as ECCAS No. 17/99/CEMAC-20-CM-03 of December 17, 1999), Law No. 2017-24 of June 9, 2017, and Law No. 10-2017 of March 9, 2017.

In line with its Francophone regional neighbours, Republic of Congo adheres to OHADA law, which means that companies working in the country are subject to a set of business-specific legislation that is common to all OHADA members.

Regulations adopted by ECCAS, COMESA, and SADC may also apply to companies carrying out oil and gas activities in the country.

2.5.2.6 Environmental Factors

In addition to the Hydrocarbon Code (Law No. 28-2016 of October 12, 2016), Law No. 003/91 of April 23, 1991, provides a framework for environmental protection.

2.5.3 Equatorial Guinea

2.5.3.1 Political Factors

A challenging and opaque business environment, with corruption, perceptions of a biased judiciary and a burdensome, inefficient bureaucracy seem to undermine the general investment climate in the country.

Transparency International's Corruption Perceptions Index 2021 gave Equatorial Guinea a score of 17%, indicating perceived high levels of public corruption. The country is also considered politically unstable (-0,19) based on the Global Economy's Political Stability Index.

Equatorial Guinea has a bilateral investment agreement with Spain that came into force in 2003. The government signed a cooperation

framework agreement with Cape Verde Cabo Verde in 2019, including double taxation avoidance and tax evasion, and reciprocal protection of investments in the two nations.

The country has bilateral taxation treaties with the UAE (signed), China (in force), Ethiopia (signed), France (in force), Morocco (signed), Russia (signed), South Africa (signed), Spain (in force) and Ukraine (signed).

Equatorial Guinea is also party to various other economic agreements, including Cotonou Agreement with the EU, African Union Treaty, Economic Community of Central African States Treaty, CEMAC Convention on Liberalisation, CEMAC Investment, AfCFTA and a preferential Trade Status with China, with which Equatorial Guinea is negotiating an FTA. The country is also a member of OPEC.

Decree No. 67/2017 of September 2017 created the "Single Window" business portal to promote investment and economic activity by significantly reducing the time needed to register a new company.

2.5.3.2 Economic Factors

Equatorial Guinea is one of the largest sub-Saharan oil producers, considered less economically resilient according to the African Development Bank's economic resilience index, with the economy severely affected during the Covid-19 pandemic. A drop in oil demand and prices, along with a slowdown in business activities due to disease containment, contributed to the country's growth problems. Inflation was 3% in 2020, up from 1,2% in 2019, the result of a pandemic-spawned decline in the terms of trade and a worsening monetary situation. Real GDP shrank 6,1% in 2020, compared with 5,6% in 2019.

The oil and gas downstream sectors are expected to grow significantly in the short-term, due to an increase in gas production and proposed new investment taking place in the country.

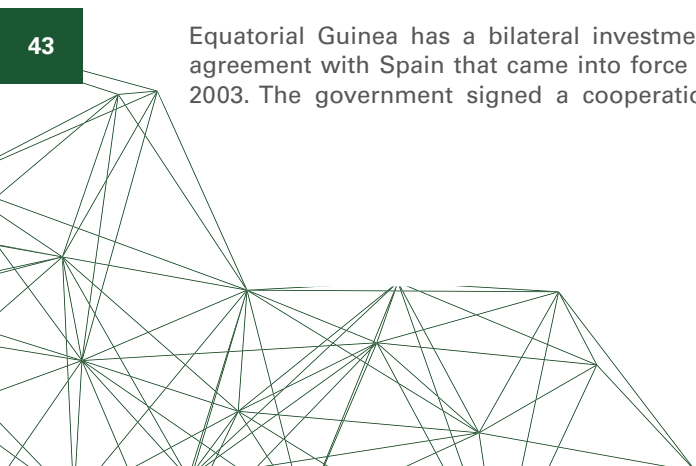
The African Development Bank has ranked Equatorial Guinea as moderately vulnerable on the economic vulnerability index.

Cost of living can affect the investment of the project in the country, as high cost of living will require high wages rates. The cost of living in Equatorial Guinea is 1,23 times more expensive than the world average.

The country was classified as a middle-income country by the African Development Bank in 2020.

2.5.3.3 Social Factors

Despite the country being the largest oil producer, the people of Equatorial Guinea to a large percent live in poverty, with a 9,2% unemployment rate and lack of crucial public



services.

Currently, 72,8% of the population of Equatorial Guinea is urban, with a population growth rate in excess of 3%.

The labour force participation rate in the country was reported at 63,5% in 2020, increasing the country's potential for investment and development.

2.5.3.4 Technological Factors

Equatorial Guinea has made significant advances on the country's Horizon 2020 social development plan, specifically in construction of infrastructure, electrification, and access to water, healthcare, and education.

The country is connected to the ACE submarine cable, with a design capacity of 20 Tbps, connecting 19 countries in total.

2.5.3.5 Legal Factors

The Hydrocarbon Law No 8 of 2006, is the main legislation governing the oil and gas sector.

Subsequent to the Hydrocarbon Law, the Petroleum Regulation No 4 of 2013, the Tax Law No 4 of 2004, the Local Content Regulation No 1 of 2014 and Decree 127 of 2004 applies.

Uniform Acts, in particular the OHADA Companies Act, apply to companies carrying out oil and gas activities in the country, with oil and gas activities subject to Exchange Control Regulations applicable within CEMAC.

Regulations adopted by ECCAS may also apply to companies carrying out oil and gas activities in Equatorial Guinea.

2.5.3.6 Environmental Factors

Gas flaring, except under very specific circumstances, is strictly prohibited and legislation stipulates Field Development and Production Plans must always be designed in such a way as to allow the use, conservation or commercial exploitation of associated gas (Article 149).

Changes observed globally are also observed in the climate of Equatorial Guinea and the country developed documents to address the effect of climate change for both adaptation and mitigation. These documents include the National Contributions Planned and Determined at the National Level 2015 (INDC), the National Adaptation Action Plan 2013 (PANA), and the National REDD+ Strategy (2018).

Equatorial Guinea Implement Law No.7/2003 which is considered the Environmental Regulatory Law. The legal framework of the country in environmental matters is currently conforming to the enforcement of other laws, among which the Mining Law stands out (Law No.9/2006)

and Hydrocarbons (No.8/2006) among others.

Decree No 173/2005, regulates the environmental protection provisions and regulations, and the sustainable use of natural resources.

In the regulatory framework, there are still legal gaps that allow activities that favours the increase of Greenhouse Gases or go against the policies of adaptation to the impacts of climate change.

2.5.4 Gabon

2.5.4.1 Political Factors

Gabon remains a well-established oil producing country benefitting from a strong presence of international oil companies.

Political stability index data for 2020 indicate that the country remains politically unstable (-0,08).

In the 2021 Corruption Perceptions Index released by Transparency International, public corruption was perceived as high in Gabon, with 31%.

Gabon is a member of OPEC and CEMAC. The country also has BITs with Belgium, Luxembourg, China, Egypt, France, Germany, Italy, Lebanon, Mali, Morocco, Portugal, South Africa, Spain, and Turkey.

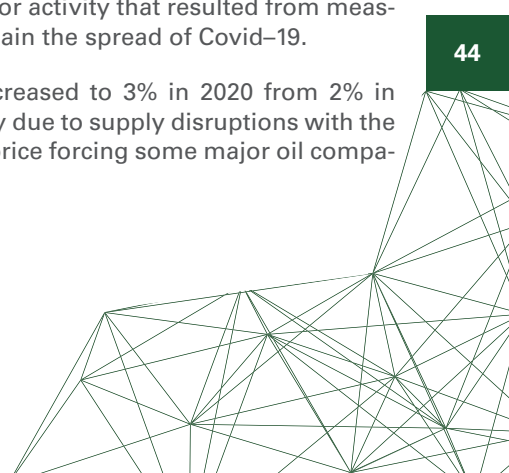
As a result of declining oil reserves, the government has been emphasising expanding the gas market in order to ensure oil and gas revenues have a positive impact on society.

2.5.4.2 Economic Factors

On average, Gabon's oil sector accounted for 80% of exports, 45% of GDP, and 60% of its fiscal revenue over the last five years, but the government has decided to diversify its economy as the country's oil reserves are declining. African Development Bank's economic resilience index also ranks the country as more economically resilient.

A global economic slowdown that was mainly caused by the Covid-19 pandemic severely affected the Gabonese economy. Real GDP contracted 2,7% in 2020, after growing 3,9% in 2019, reflecting a 21% drop in national oil production, a fall in oil prices and a slowdown in non-oil sector activity that resulted from measures to contain the spread of Covid-19.

Inflation increased to 3% in 2020 from 2% in 2019, largely due to supply disruptions with the drop in oil price forcing some major oil compa-



nies to close operations in Gabon. The inflation rate is expected to decrease to 2% by 2022 due to the Covid-19 control and oil price stabilisation in the world market, as well as reducing dependency on the oil and gas sector.

Gabon's credit rating stands at B according to Standard & Poor, while Moody reported Caa1, and Fitch affirmed B-.

Gabon has experienced sustained economic growth and has boasted an upper-middle-income country status, with the cost of living 1,63 times lower than the global average, making the country a potentially attractive location for oil and gas investments.

2.5.4.3 Social Factors

Exploration and discoveries of oil and gas offshore, as well as increased gas usage, especially in the power sector, will promote social upliftment nationwide. Despite this promising growth, a worrisome unemployment rate of 20,5% has persisted.

The labour force participation rate in the country was reported at 63,75% in 2020, increasing the country's potential for investment and development.

World Bank data shows that Gabon's Human Capital Index score is low, at 0,46.

Gabon has a population growth rate of 2,4%, with 90% of its residents living in urban and city areas.

2.5.4.4 Technological Factors

Research and innovation are promoted by the Gabonese Government in various sectors, especially the oil sector, in order to increase the utilisation of oil and gas resources. With the advent of technology and advancement in oil and gas development, the country has begun establishing initiatives to use gas for power generation and distribution for domestic and industrial purposes.

With the installation of the 22 km interconnected fibre optic network that links Cameroon with Gabon, technological advancements and innovations (public and private sector) have been accelerated, especially in the e-commerce sector.

The country also provides access to the ACE submarine fibre cable.

2.5.4.5 Legal Factors

The main legislation relating to petroleum activities in Gabon is the Hydrocarbon Law, Law No. 011/2014.

Additionally, Decree no. 673, regulates foreign direct investments in key economic sectors, including the oil and gas sector.

Due to the general nature of the 2014 Hydrocarbons Law, most of the specific provisions governing petroleum exploration and production are included in PSAs.

Uniform Acts, in particular the OHADA Companies Act, apply to companies carrying out oil and gas activities in Gabon and oil and gas activities are subject to Exchange Control Regulations applicable within CEMAC.

Regulations adopted by ECCAS may also apply to companies carrying out oil and gas activities in Gabon.

2.5.4.6 Environmental Factors

Gas flaring is one of the biggest sources of air pollution in oil production fields, but the Government has enacted measures to reduce it by converting the flaring gas into electricity or domestic fuel.

To ensure investors follow environmental protection regulations prescribed in Articles 125 and 126 of Law No. 002/2019, operators are required to submit gas flaring plans for production fields to the Ministry of Hydrocarbons and Environment.

3. SWOT Analysis

The purpose of the SWOT analysis is to:

- Identify opportunities and threats associated with oil and gas development in Africa as a result of the trends, situations, and events noted in the macro-environment
- Analyse and highlight strengths and weaknesses within the context of current and future macro-environmental conditions of the African oil and gas sector.

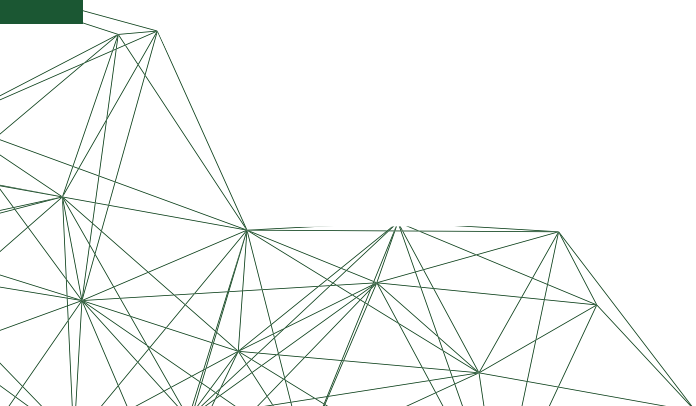
Presented below are SWOT analyses for each focus country by region.

3.1 Northern African Countries

3.1.1 Algeria

3.1.1.1 Strengths

- Abundant natural reserves (12,2 billion barrels crude oil, 2,3 tcf natural gas, 707 tcf shale gas)



- Established trade relationships and natural gas pipelines between Algeria and Europe
- Existing refining (657 000 bpd) and liquefaction (25,3 MTPA) capacity
- Presence of International operators (Eni, BP, Equinor, Sonatrach and China National Petroleum Corporation, etc.)
- Member of OPEC
- New hydrocarbon law that eases taxes, simplifies license procedures and shortens the timeframes for exploration and production agreements
- Access to the SEA-ME-WE 4 (Southeast Asia-Middle West-West Europe) Mediterranean optical fibre submarine communications cable system, with a capacity of 4,6 Tbps.

3.1.1.2 Weaknesses

- Acute political and social crisis triggered in 2019
- High corruption (33% corruption perception index according to transparency.org)
- Political instability (-0,86 political stability index according to globaleconomy.com)
- Less economically resilient (according to the African Development Bank's economic resilience index)
- High unemployment rate (12,8%)
- Net importer of refined petroleum products, despite adequate local crude oil supply
- Excessive weight (employment ratio) of the public compared to the private sector
- There are no special economic zones or foreign trade zones in Algeria, apart from the Exclusive Economic Zone located offshore.

3.1.1.3 Opportunities

- Restarting Skikda LNG terminal (4,5 MTPA)
- Construction of a transcontinental export gas pipeline destined for Italy (Europe)
- Construction of a transregional export gas pipeline from Nigeria to Algeria via Niger
- Access to a 100 000 bpd crude oil refinery at Hassi Massaoud, to be commissioned in 2025.

3.1.1.4 Threats

- Renewable energy as a threat to the oil and gas sector development (it is expected to increase from 2% to 15% by 2028)

- Recently severed diplomatic ties with Morocco over Western Saharan sovereignty.

3.1.2 Egypt

3.1.2.1 Strengths

- A significant number of reserves (3,1 billion barrels crude oil and 74,2 tcf natural gas)
- Large refining (795 000 bpd) and liquefaction (12,2 MTPA) capacity
- A member of several international petroleum investment organisations, including the Organisation of Arab Petroleum Exporting Countries.
- Several international trade agreements, including an FTA with Europe, Greater Arab FTA, COMESA, CEN-SAD, Agadir FTA, Egypt-EU Association Agreement, etc.
- Presence of International oil companies (BP, APEX International Energy, Chevron, ExxonMobil, etc.)
- Five exploration licences have been awarded to Eni in 2022, primarily focussing on gas
- Four special economic zones, with the Ain Sokhna zone allocated for heavy industry such as oil and gas operations
- Convenient geographic position, with proximity to the Red Sea and Mediterranean Sea, as well as the Suez Canal
- Only government share on oil and gas activities is PSAs, which are passed as an act of parliament
- Access to a resilient submarine cable system such as Hybrid African Ring Path (HARP) for network communications
- In addition to its LNG terminals at Damietta and Idku, Egypt developed a strategy to become a regional hub for oil and gas trade with the assistance of the extensive infrastructure (petroleum ports, pipelines, crude oil and petroleum storage capacity) distributed throughout the country.

3.1.2.2 Weaknesses

- High corruption (33% corruption perception index according to transparency.org)
- Political instability (-1,21 political stability index according to globaleconomy.com)
- Less economically resilient (according to the African Development Bank's economic resilience index)

- High unemployment rate (7,5%)
- Despite large crude oil reserves, Egypt imports oil and petroleum products to satisfy its local demand
- Decreasing labour force participation (41,5% in 2020).

3.1.2.3 Opportunities

- Access to the SUMED oil pipeline (1,2 million bpd surplus capacity)
- Access to the AGP (70,6 bcf per annum surplus capacity) transports gas to Jordan, Syria and Lebanon
- Construction of a gas pipeline (283 bcf capacity) from Cyprus offshore gas field to Egypt's Damietta Segas LNG terminal (5 MTPA capacity), which was restarted in 2021
- Access to EFLNG (7,2 MTPA) once preferential gas export to Lebanon via AGP has been established
- Access to products and services associated with the Ain Sokhna Special Economic Zone
- Exploiting the shortage of gas supply to Europe due to the recent Russian Ukrainian war, to export gas to Europe and use its liquefaction facilities.

3.1.2.4 Threats

- Increased drive towards renewable energy (42% of electricity mix by 2035)
- Declining crude oil production rate.

3.1.3 Libya

3.1.3.1 Strengths

- Largest crude oil reserve (48,4 billion barrels) and significant natural gas reserves (50,5 tcf)
- Very low external debt (5% of GDP)
- Member of OPEC, with exemption from production quotas
- Refining (380 000 bpd) and liquefaction (3,2 MTPA) capacity
- Strategic position in the Mediterranean, proximity to Europe
- Established gas pipeline (Greenstream; 530 MMscfd) connecting Libya to Europe (Italy)

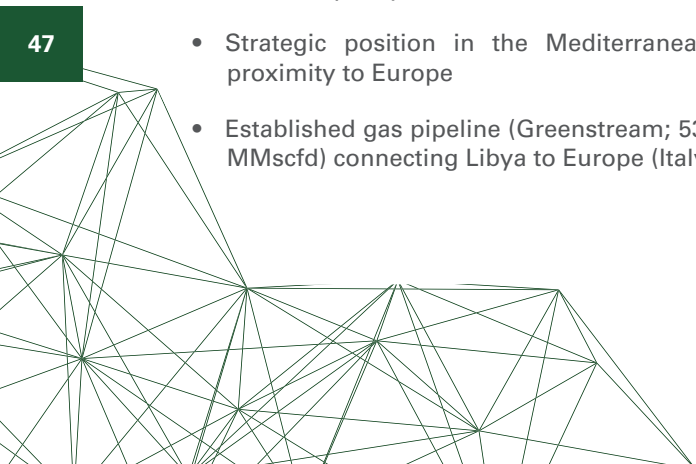
- Presence of International Oil Companies (TotalEnergies, Eni, BP, ConocoPhillips, etc.)
- Net exporter of refined petroleum products
- Bilateral trade agreement with Morocco and Jordan
- Member of GAFTA, COMESA, AMU, and CEN-SAD
- Wintershall Aktiengesellschaft signed two exploration and production agreements in 2019
- Oil and gas exploration and production contracts are negotiated directly with the National Oil Corporation
- Suez Canal Economic Zone, containing six seaports and two airports located along the canal.

3.1.3.2 Weaknesses

- High corruption (17% corruption perception index according to transparency.org)
- Political instability (-2,48 political stability index according to globaleconomy.com) and military conflicts
- Less economically resilient (according to the African Development Bank's economic resilience index)
- High unemployment rate (19,39%)
- Unattractive terms and conditions specified in the exploration and production sharing agreements, hindering investment in the high-risk Libyan market
- Armed militias controlling part of the oil sector eliminate.

3.1.3.3 Opportunities

- Access to the planned special economic zone in Wadi Al-Harir
- Access to the exiting European gas export pipelines (Greenstream)
- Restarting operation at Libya's LNG plant (3,2 MTPA), located at Marsa al-Breg
- Construction of gas-to-power generation facilities to meet the existing 2 500 MW generation deficit
- Access to new refineries (300 000 bpd Tobruk refinery and 30 000 bpd Ubari refinery)
- Access to products and services associated with the Suez Canal Economic Zone.



3.1.3.4 Threats

More favourable fiscal terms in the neighbouring countries that could attract more investors preferential to Libya.

3.1.4 Mauritania

3.1.4.1 Strengths

- Undeveloped oil (730 million barrels) and large gas reserves (73,9 tcf)
- Ideal geographic position, in proximity to Europe and able to service other Western African countries
- Presence of International Oil Companies (BP, TotalEnergies, Shell, New Fortress Energy, Capricorn Energy, etc.)
- Bilateral trade agreements with Algeria, Gambia, Morocco, Tunisia, China, Kuwait, Qatar, Turkey, and Sudan.
- Member of WTO, GATT, ECOWAS, AMU and Pan Arab Free Trade Area and benefits from the U.S's GSP for crude oil products
- Aligned with the UN Sustainable Development goals and has a published socio-economic strategy development plan (SCAPP)
- Active cross-border cooperation agreement for the development of the GTA field with Senegal
- Free zone established in Nouadhibou
- Part of the part of WARCIP
- Nouackchott serves as the landing point for the ACE cable system.

3.1.4.2 Weaknesses

- Limited state of infrastructure for the oil and gas sector
- High corruption (28% corruption perception index according to transparency.org)
- Political instability (-0,75 political stability index according to globaleconomy.com)
- High unemployment rate (10,7%)
- Sustainable energy supply issues
- Net importer of refined petroleum, with no domestic gas market.

3.1.4.3 Opportunities

- Establishing the port city that includes rehabilitation of the current oil storage capacity in Nouadhibou.
- Expansion of the public storage depot for liquid petroleum products in Nouakchott (under consideration by SMH)

- 19 offshore blocks remaining for negotiation, with the government open to unsolicited offers in this sector
- Development of a dedicated zone for the development of hydrocarbon in a Public-Private Partnership.
- Exploitation of onshore gas reserve shared with Mali.

3.1.4.4 Threats

- Increasing renewable energy contribution (60% of the energy mix by 2030)
- Signed Memorandum of Understanding for a 10 000 MW green hydrogen project
- Neighbouring country, Senegal, has an advance oil and gas sector, which might be favoured for trans-regional trade
- Continued terrorist violence (Al-Qaida) in neighbouring Mali.

3.2 Eastern African Countries

3.2.1 Sudan and South Sudan

3.2.1.1 Strengths

South Sudan

- Significant crude oil reserves (3,5 billion barrels)
- Production at a domestic refinery (3 000 bpd) commenced in 2021
- High labour force participation rate (73,9%)
- Presence of International Oil Companies (Dar Petroleum, Petronas and China National Petroleum Corporation)
- Long-term economic ties with CAR, Ethiopia, Kenya and Uganda
- BITs signed (not in force) with the UAE and Morocco
- Juba Special Economic Zone located 30 km from the South Sudan capital city.

Sudan

- Significant crude oil reserves (1,5 billion barrels)
- Operational bulk oil transmission pipelines, with a combined capacity of nearly 1 million bpd

- Bashayer Marine Terminal, import/export terminal, with a petroleum storage capacity of 2,5 million bpd
- Operational refineries with a capacity 110 000 bpd
- Strong ICT infrastructure, connected to three subsea cable systems in the Port of Sudan, and a terrestrial link to Egypt and Ethiopia
- Removal from SSTL by the US in 2020
- Presence of International Oil Companies (Petronas and China National Petroleum Corporation)
- Member of IGAD and COMESA
- Red Sea Free Zone located 38 km south of Port Sudan, and Garri Free Zone, located 70 km north of Khartoum.

3.2.1.2 Weaknesses

South Sudan

- High corruption (11% corruption perception index according to transparency.org) and mismanagement of oil revenues
- Political instability (-2,1 political stability index according to tradingeconomics.com) result of a civil war
- Less economically resilient (according to the African Development Bank's economic resilience index)
- High unemployment rate (12,66%)
- Landlocked country
- Net importer of refined petroleum products, despite local crude oil supply
- Economic instability due to high public revenue (>90%) and GDP (70%) dependence on the oil sector
- Midstream oil sector is dependent on Sudanese government-owned infrastructure (pipeline and export/import terminal)
- No gas sector associated infrastructure, with associated gas being reinjected or flared
- Presence of nepotism and tribalism in the oil industry, resulting in civil war
- Lowest mobile penetration rate in Africa, with negligible ICT infrastructure

- Lack of oil and gas sector regulatory enforcement.

Sudan

- Political instability (-1,76 political stability index according to globaleconomy.com) due to civil wars and 2021's military coup
- High corruption (20% corruption perception index according to transparency.org)
- Least economically resilient (according to the African Development Bank's economic resilience index)
- High unemployment (17,7%) and poverty (56%) rate
- Civil war, influenced by tribalism resulting in damage to oil infrastructure
- Economic recession, classified by the International Monetary Fund and the World Bank as being in debt distress
- Decreased oil production following South Sudan's independence
- Presence of nepotism and tribalism in the oil industry
- Presence of weak environmental regulating institutions
- No gas sector associated infrastructure, with associated gas being reinjected or flared
- Special Economic Zone programmes have not been integrated into national industrial plans.

3.2.1.3 Opportunities

South Sudan

- Licensing round with 14 blocks on offer will open early 2022
- Proposed crude oil (export) transmission pipeline destined for Kenya via Uganda, to reduce processing, transportation and associated tariffs through Khartoum
- Proposed crude oil (export) transmission pipeline destined for Djibouti via Ethiopia, to reduce processing, transportation and associated tariffs through Khartoum
- Proposed crude oil (export) transmission pipeline destined for Tanzania via Uganda, connecting to the East Africa Crude Oil Pipeline (AECOP), to reduce processing, transportation and associated tariffs through Khartoum



- The LAPSET, which includes an oil pipeline between South Sudan and Ethiopia, to allow for exploitation and monetisation of reserves
- Development of the Tangrial refinery (10 000 bpd), which was suspended in 2019 due to security concerns
- Commercialization of associated gas currently being flared e.g., as a replacement for HFO and diesel in the power sector, or for export
- Access to products and services associated with the Juba Special Economic Zone.

Sudan

- Refurbishment of the Port of Sudan refinery (21 700 bpd)
- Proposed new refineries (50 000 bpd Akona refinery and 100 000 bpd Gameza refinery)
- Access to products and services associated with the Red Sea and Garri Free Zones
- Licencing round expected with 27 Blocks (3 offshore and 24 on land) on offer to increase oil production
- Commercialization of associated natural gas, currently being flared e.g., as a replacement for HFO and diesel in the power sector, or for export.

3.2.1.4 Threats

South Sudan

- Tariff charges by the Sudanese Government on oil transport/export infrastructure
- Declining oil production/reserves (end of life expended 2035).

Sudan

Midstream and downstream oil sector development in South Sudan to neighbouring countries for export.

3.2.2 Tanzania

3.2.2.1 Strengths

- Sufficient gas reserves (57,54 tcf) on on-shore and offshore areas to ensure project sustainability
- Economically resilient (according to the African Development Bank's economic resilience index)
- Trans-border oil pipeline (22 000 bpd Tazama pipeline)

- Landing point for petroleum products destined for neighbouring landlocked countries
- Presence of favourable laws and policies that support and guide the implementation of oil and gas projects, such as PA 2015 and NGUMP 2016
- Favourable geographical location with respect to the growing Asian market
- Established deep-sea ports (Tanga, Dar es Salaam and Mtwara)
- Member of SADC and EAC
- BITs with China, Canada, Turkey, Italy, United Kingdom, Germany, Sweden, Finland, Mauritius, etc.
- Presence of International Oil Companies (Equinor, Pan-African Energy, ExxonMobil)
- Continuous development in ICT infrastructure, connection to several East African sub-sea fibre systems (2Africa, EASSy, Seacom, TEAMs) and the second largest telecommunication market in East Africa.

3.2.2.2 Weaknesses

- Political instability (-0,41 political stability index according to globaleconomy.com)
- High corruption (39% corruption perception index according to transparency.org)
- Moderate unemployment rate (9,5%)
- Inadequate oil and gas infrastructure (limited natural gas transmission/distribution networks and no crude oil refinery)

3.2.2.3 Opportunities

- Access to EACOP pipeline network, which could potentially serve as tie in point for new developments
- Access to Tazama pipeline network (seeking investors for a proposed expansion), which could potentially serve as tie in point for new developments
- Access to underutilised gas processing facilities at Madimba and Mnazi
- Available liquid fuel power generation plants that can be converted to operate on natural gas
- Establishment of special economic zones on the operational deep-sea ports (Tanga, Dar es Salaam and Mtwara)
- Fifth upstream licensing round (8 deep-water blocks) anticipated in 2022.

3.2.2.4 Threats

The 2 100 MW hydropower project.

3.2.3 Uganda

3.2.3.1 Strengths

- Large oil reserves (6,5 billion barrels)
- More economically resilient (according to the African Development Bank's economic resilience index)
- Low and continuously decreasing unemployment rate (2,44%)
- Currently negotiating exploration licences for five oil blocks along the western border
- Presence of International Oil Companies (TotalEnergies, Tullow Oil, China National Offshore Oil Corporation and Armour Energy Australia)
- Vast geothermal potential (450 MW), particularly in eastern Uganda around Lake Albert.

3.2.3.2 Weaknesses

- Political instability (-0,78 political stability index according to globaleconomy.com)
- High corruption (27% corruption perception index according to transparency.org)
- Limited access to electricity, as a result of low generation capacity and poor transmission and distribution infrastructure
- Poorly developed ICT, attributed to a difficult investment environment
- Net importer of refined petroleum products, despite sufficient domestic crude oil reserves

3.2.3.3 Opportunities

- Proposed refinery (60 000 bpd Uganda Oil Refinery)
- Proposed trans-border export pipeline (216 000 bpd EACOP), currently in tender phase
- Exploitation of geothermal potential in eastern Uganda
- Access to products and services associated with the Uganda Free Zones
- Proposed trans-border pipeline (Kenya-Uganda-Rwanda Petroleum Products Pipeline)

- Access to transit infrastructure at Mahathi Uganda's lakeside oil complex.

3.2.3.4 Threats

- High dependency on renewable energy (hydropower)
- Terrorist presence (Allied Democratic Forces terrorist group).

3.3 Southern African Countries

3.3.1 Angola

3.3.1.1 Strengths

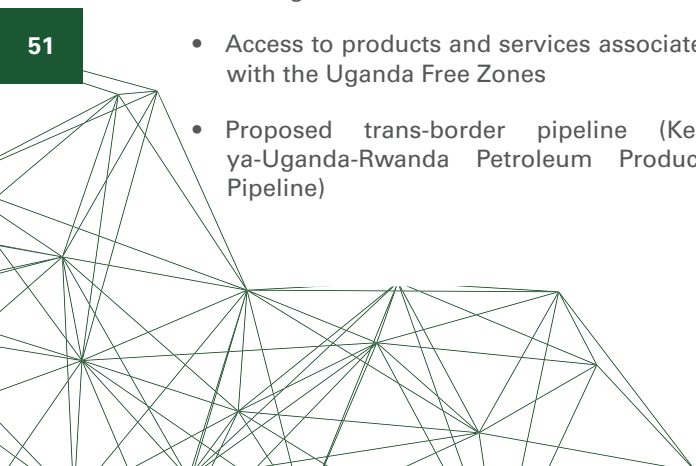
- Established oil sector, with significant crude oil reserves (7,8 billion barrels)
- Revised license and tax regime (2021) providing more favourable investment terms
- Presence of International Oil Companies (TotalEnergies, Chevron, Exxon Mobil and BP)
- Member of OPEC, SADC and ECCAS
- Member of GAFTA and AfCFTA
- Special Economic Zone (Luanda-Bengo)
- Connection to subsea fibre systems (SACS and WACS)
- Excellent geographic location, serving as a gateway to neighbouring nations, many of which are landlocked.

3.3.1.2 Weaknesses

- A challenging business environment, particularly in the oil industry (national oil company, Sonangol), is attributed to high levels of corruption (29% corruption perception index according to transparency.org)
- Political instability (-0,52 political stability index according to globaleconomy.com) attributed to government change
- Less economically resilient (according to the African Development Bank's economic resilience index)
- High unemployment rate (31,60%)
- Net importer of refined petroleum products, despite significant domestic oil reserves.

3.3.1.3 Opportunities

- Improved business environment following the ongoing restricting process of Sonangal, to combat previously reported corruption



- Undeveloped gas reserves (10,6 tcf)
- Underexplored oil deep water and pre salt acreage
- New hydrocarbon exploration strategy focused on stabilizing oil production
- Monetization of associated gas (18 bcf per annum) currently being flared
- Access to products and services associated with the Luanda-Bengo Special Economic Zone
- Access to underutilised Soyo LNG plant (5,2 MTPA)
- Upcoming auctions of the oil rich continental shelf of the Angolan coast's 55 blocks before 2025
- Proposed trans-border AZOP pipeline (100 000 bpd)
- Proposed 750 MW CCGT power generation plant (2024)

3.3.1.4 Threats

- Deteriorating relationships between Sonangol and International Oil Companies
- Declining rates of production at existing oil fields.

3.3.2 Mozambique

3.3.2.1 Strengths

- Abundant offshore natural gas reserves (193,3 tcf)
- Favourable geographical location, with a long coastline (2 700 km) and proximity to the South African and Asian markets
- Operational large scale gas transmission infrastructure servicing South Africa (570 MMscfd ROMPCO pipeline)
- Construction of large LNG export facilities (Rovuma LNG and Mozambique LNG) underway
- Connection to subsea fibre systems (EAS-Sy, Seacom, PEACE, 2Africa)
- Presence of International Oil Companies (ExxonMobil, Sasol, ENI, TotalEnergies and China National Petroleum Corporation)
- Ratified SADC Trade Protocol
- Industrial Free Zones in Beluluane (Maputo province), Locone (Nampula province), Minheuene (Nampula province), Mocuba (Nampula province), Revúboè (Tete province)

ince)

- Bilateral trade agreements with Malawi and Zimbabwe, as well as a bilateral investment treaty and cross border gas trade agreement with South Africa
- High labour force participation rate (>76%), with approximately 300 000 new entrants into the labour market each year.

3.3.2.2 Weaknesses

- Political instability (-1,16 political stability index according to globaleconomy.com)
- High corruption (26% corruption perception index according to transparency.org)
- Less economically resilient (according to the African Development Bank's economic resilience index)
- Moderate unemployment rate (3,8%)
- Endemic diseases (malaria, cholera and yellow fever).

3.3.2.3 Opportunities

- Access to ROMPCO pipeline (spare capacity: 41,5 MMscfd; 311,6 MMscfd with loop 3 and 4 upgrades) servicing South Africa
- Access to products and services associated with the Industrial Free Zones (Beluluane, Locone, Minheuene, Mocuba, Revúboè)
- Replacing coal-fired power generation capacity (1 700 MW envisioned in the Master Plan until 2042) with gas-fired power generation
- Access to logistics corridors (including Nacala, Beira and Maputo railroads) linking deepwater coastal ports with neighbouring countries such as Zimbabwe, Malawi and Zambia
- Sixth licencing round (online and in-person), closing end-August 2022, offering 16 blocks geographically spread across the Rovuma Basin, Angoche Basin, Zambezi Delta and the Save area.

3.3.2.4 Threats

- Poor security situation with Islamist rebel activity in central and northern regions
- Vulnerability to natural disasters (climate shocks), such as floods, droughts and cyclones.

3.3.3 South Africa

3.3.3.1 Strengths

- Multiple indigenous gas (60 tcf conventional and unconventional) and oil (9 billion barrels) resources
- More economically resilient (according to the African Development Bank's economic resilience index)
- Existing gas infrastructure available in proximity to Mozambique and Tanzania
- Existing mid- and downstream oil and gas infrastructure clustered around major demand centres
- Active exploitation of biogenic gas resources
- International subsea fibre system, EACS, connecting South Africa and West Africa to Europe, as well as the 2Africa network currently under construction
- Established trade agreement with countries reporting significant regional gas discoveries (including Mozambique)
- Concluded FTAs with the EU and EFTA, and has preferential trade agreements with MERCOSUR and India
- Concluded co-operative trade arrangement, TIDCA, and is a beneficiary of AGOA
- Political support from government as a whole and Operation Phakisa ocean economy for gas market development
- Presence of International Oil Companies (TotalEnergies, ENI, Sasol, BHP Billiton, Cairn Energy and Shell)
- Musina-Makhado Special Economic Zone, strategically located near the Beitbridge Border Post between South Africa and Zimbabwe, serving as a gateway to SADC countries and a critical location on the north-south trade corridor
- InvestSA One Stop Shops, located in the Western Cape and KwaZulu Natal, to fast-track projects and reduce government red-tape
- Coega Special Economic Zone, located near the Port of Ngqura, earmarked as South Africa's LNG hub.

3.3.3.2 Weaknesses

- Political instability (-0,24 political stability index according to globaleconomy.com) and rampant social discontent
- High levels of corruption (44% corruption perception index according to transparency.org) and mismanagement
- Negative outlook credit rating from Fitch
- High unemployment rate (34,9%)
- Net importer of refined petroleum products due to inadequate, and drastically declining crude oil refining capacity
- Depleted offshore gas fields, resulting in suspension of GTL operations
- Undersupplied electricity network and restrictive grid capacity
- Fragmented domestic gas demand
- 2021 Revised Upstream Petroleum Resources Development Bill still needs to undergo an extensive Parliamentary process.

3.3.3.3 Opportunities

- Exploitation of indigenous gas (conventional and unconventional) resources
- Access to products and services associated with the Musina-Makhado and Coega Special Economic Zones, as well as InvestSA One Stop Shops
- Potential conversion of existing OCGT and mothballed coal-fired power plants, increasing natural gas electricity generation contribution from 2,6% to 15,7% by 2030 (IRP 2019).

3.3.3.4 Threats

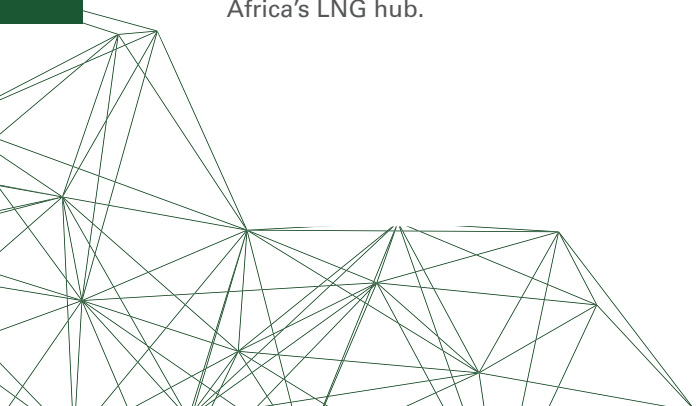
- Environmental lobbyist delaying/halting oil and gas developments in South Africa
- Hostile labour relationships, service delivery protests and youth protests (seeking employment opportunities)
- Xenophobic attacks a result of illegal immigration into South Africa.

3.4 Western African Countries

3.4.1 Ghana

3.4.1.1 Strengths

- More economically resilient (according to the African Development Bank's economic resilience index)



- LNG importation infrastructure (3,4 MTPA Tema)
- Operational oil (45 000 bpd TOR) and gas (150 MMscfd Atuao gas processing) infrastructure
- 800 MMscfd WAGP, linking Ghana to Nigeria, Benin and Togo
- Connection to subsea fibre systems (ACE, WACS, GLO-1)
- Tema Free Zone, facilitated by the World Bank's Ghana Gateway initiative
- Shama Export Processing Zone, located in the Shama Ahanta East Metropolitan area (in proximity to offshore oil blocks)
- Strong track record of political stability (functional democracy) (0,13 political stability index according to globaleconomy.com)
- Strong connections with the United Kingdom, the US, the EU, China, India, and South Africa.
- Member of WTO and a signatory to the African, Caribbean, and Pacific Partnership Agreement (ACP-EU Partnership Agreement)
- Member of ECOWAS and a beneficiary of AGOA
- Prioritized infrastructure development plan to meet its national development goals, aligned with the Sustainable Development Goals and Paris Agreement
- Presence of International Oil Companies (Tullow Oil, Vitol, Kosmos Energy, ENI, Aker Energy)
- Advanced stage of exploration and production negotiations with the Western basin licence winners.

3.4.1.2 Weaknesses

- High corruption (43% corruption perception index according to transparency.org)
- Moderate unemployment rate (4,53%)
- No further development of Ghana-Cote d'Ivoire Gas bidirectional pipeline proposed in 2019
- Net importer of LNG and refined petroleum products despite domestic natural gas (2 tcf) and oil (700 million barrels) reserves
- Lack of public-private partnership agreements in critical downstream infrastructure (refinery and distribution pipelines), leading to inefficient and ineffective operation and management of key infrastructure.

3.4.1.3 Opportunities

- Available gas-to-power generation capacity (OCGTs), with fuel conversion a key objective of the Government and the Power Generation Authority
- Access to the WAGP
- Surplus (30 MMscfd) capacity available at the gas processing plant located at Atuabo
- Scalable Tema LNG offshore terminal (initially 1,75 MTPA; scalable to 3,4 MTPA)
- Proposed Petroleum Hub in western Ghana, Bonyere
- Access to products and services associated with the Tema Free Zone and the Shama Export Processing Zone
- Eastern basin exploration opportunities.

3.4.1.4 Threats

Separatist tendencies on the eastern border with Togo.

3.4.2 Nigeria

3.4.2.1 Strengths

- Economically resilient (according to the African Development Bank's economic resilience index)
- Abundant oil (36,9 billion barrels) and natural gas (193,3 tcf) reserve
- Member of OPEC
- Strategically located oil pipeline network connecting refineries with distribution networks
- 800 MMscfd WAGP, connecting Nigeria to Ghana, Benin and Togo
- Significant LNG export infrastructure (22 MTPA LNG; 2019 FID to increase capacity to 30 MTPA; 5 MTPA NGLs)
- Presence of International Oil Companies (Chevron, Eni, ExxonMobil, Shell and TotalEnergies)
- Signed the AfCFTA in 2019 and implemented in ECOWAS CET in 2015
- Oil and Gas Free Zones located in the heart of Niger Delta, are strategically located at the ports of Warri, Onne and Lagos.

3.4.2.2 Weaknesses

- Political instability (-1,86 political stability index according to globaleconomy.com)
- High corruption (24% corruption perception index according to transparency.org) and mismanagement
- High unemployment rate (33,3%)
- Net importer of refined petroleum products, despite significant refining capacity and domestic crude oil supply
- High government take
- Recurring oil spills due to pipeline corrosion, maintenance issues, equipment failure, sabotage and theft
- Lack of utilising capacity of domestic refineries due to poor maintenance and lack of skilled labour
- Localise civil unrest in the Nigeria Delta provinces.

3.4.2.3 Opportunities

- Access to surplus processing capacity at the Accugas onshore processing plant, strategically located in southeast Nigeria
- Commercialization of flared associated gas (54 bcf/d), driven by the Zero Routine Flaring by 2030 initiative
- Access to products and services associated with the Oil and Gas Free Zones
- Kwanza Basin (onshore and shallow off-shore blocks).

3.4.2.4 Threats

- Terrorist activities (Boko Haram Islamic Insurgency) in the North-East
- Exploitation of large solar potential.

3.4.3 Senegal

3.4.3.1 Strengths

- Significant oil (1 billion barrels) and natural gas (40 tcf) reserves off the coast
- Favourable geographic location, with a major seaport and easy access to European and North American markets

- Member of EITI, ECOWAS, WAEMU, AfCFTA and WTO
- Eligible for US market access benefits under AGOA, set to expire in 2025
- Presence of International Oil Companies (BP, Kosmos Energy and Woodside Energy)
- Connection to submarine cables (ACE and SHARE)
- Investment One-Stop Shop (Agence de Promotion des Investissements et Grands Travaux), located in Dakar
- Support from international donors under the Emerging Senegal Plan, in particular the IMF with its Economic Policy Coordination Instrument.

3.4.3.2 Weaknesses

- Political instability (-0,02 political stability index according to globaleconomy.com)
- High corruption (43% corruption perception index according to transparency.org)
- Less economically resilient (according to the African Development Bank's economic resilience index)
- No upcoming oil and gas bidding rounds
- Inadequate power generation and grid availability, combined with delays in the power supply infrastructure development
- Significant unemployment (22,6%) and widespread poverty
- Deficient infrastructure (oil and gas transmission, processing and storage facilities)
- Inflexibility of the SAR refinery plant (processing limited to a single crude oil, currently imported)
- Complex institutional and regulatory ecosystem with too many stakeholders
- Recurring social unrest (Casamance).

3.4.3.3 Opportunities

- Access to government services and administrative support at the Investment One-Stop Shop in Dakar
- Incipient regional interconnection (oil, gas and other associated products) for landlocked West African Countries
- Access to new international bandwidth routes through connection to the SHARE submarine cable system



- Gas-to-power generation, supported by government strategies to increase the contribution of natural gas in the country's electricity generation mix through purpose-build (CCGT) and converted (OCGT) power generation plants
- Proposed bi-directional oil pipelines at the Port of Mineralier de Bargny.

3.4.3.4 Threats

None quantified to date

3.5 Central African Countries

3.5.1 Chad

3.5.1.1 Strengths

- Considerable oil reserves (1,5 billion barrels)
- Low unemployment rate (2,26%), with a high labour force participation rate (68%)
- Currently reviewing fiscal policies to make investment more attractive
- Net exporter of refined petroleum products, utilising the Chad-Cameroon pipeline
- Presence of International Oil Companies (ExxonMobil, Shell, Glencore and Taiwanese Chinese Petroleum Corporation)
- Principal member of CEN-SAD, CEEAC and CEMAC
- Associated with WTO and EITI.

3.5.1.2 Weaknesses

- Political instability (-1,26 political stability index according to globaleconomy.com)
- High corruption (20% corruption perception index according to transparency.org)
- Less economically resilient (according to the African Development Bank's economic resilience index)
- Underdeveloped, as illustrated by a lack of infrastructure, skill, ICT and electricity
- Landlocked, resulting in high product-associated transport costs for the oil and gas industry
- Inability to progress the Niger-Chad oil pipeline project to financial close since 2019
- No Special Economic Zones
- Youth population (30,8% of the population is between 15 and 24 years old).

3.5.1.3 Opportunities

- Access to the 225 000 bpd export oil pipeline through Cameroon
- Proposed trans-border Niger-Chad oil pipeline (60 000 bpd)
- Commercialization of flared associated gas.

3.5.1.4 Threats

- Terrorist activities (ISIS-West Africa), such as those against military and civilian targets in the Lake Chad region in 2020
- The New CEMAC Regulation may hinder the advancement of the oil and gas sector due to the requirement to repatriate export proceeds.

3.5.2 Republic of the Congo

3.5.2.1 Strengths

- Abundant oil (2,9 billion barrels) and natural gas (10 tcf) reserves
- High literacy (80%)
- Presence of International Oil Companies (TotalEnergies, Perenco, Chevron, Lukoil)
- Special Economic Zones established (Pointe Noire SEZ, Brazzaville SEZ, Ouessou SEZ and Oyo-Ollombo SEZ)
- AfCFTA signed and instruments of ratification deposited
- Connection to submarine cable (WACS)
- Member of OPEC, WTO, SADC, COMESA, ECCAS, NBI, ECLC, OHADA.

3.5.2.2 Weaknesses

- Political instability (-0,9 political stability index according to globaleconomy.com)
- High corruption (21% corruption perception index according to transparency.org) and low administrative capabilities outside of major cities
- Less economically resilient (according to the African Development Bank's economic resilience index)
- High unemployment rate (23%)
- Low labour force participation rate (38,8%)
- Weak public infrastructure (transport, energy, water, sanitation).

3.5.2.3 Opportunities

- ENI's Congolese gas export project, scheduled to begin in 2023
- Access to products and services associated with the four SEZs
- Proposed refined petroleum product pipeline from Pointe-Noire to Ouessou (2027)
- New 110 000 bpd oil refinery at the Port of Pointe-Noire
- Optical fibre infrastructure for regional integration (Central African Backbone project).

3.5.2.4 Threats

- Persistent ethno-regional clashes (such as the recent Pool conflict)
- Instability in neighbouring countries spilling over into Republic of Congo
- Global Climate Risk Index score of 109, with an increase in intensity and frequency of extreme events caused by climate change
- The New CEMAC Regulation may hinder the advancement of the oil and gas sector due to the requirement to repatriate export proceeds
- Resurgence of the Ebola.

3.5.3 Equatorial Guinea

3.5.3.1 Strengths

- Large oil (1,1 billion barrels) and natural gas (1,4 tcf) reserves
- LNG export facility (3,7 MTPA) located at Bioko Island
- Special Economic Zone at the deep-water Port of Bioko Island and a Single Window business portal
- Presence of International Oil Companies (ExxonMobil, Chevron, TotalEnergies, Ophir Energy, Noble Energy EG, Marathon Oil)
- Connection to submarine cable (ACE)
- Bilateral agreements with other countries such as China, France, Russia, Spain, UAE, South Africa, Morocco and Ethiopia
- Presence of economic agreements such as Cotonou Agreement with the EU, CEMAC investment agreement, AfCFTA and Preferential Trade status with China

- Member of OPEC and GECF.

3.5.3.2 Weaknesses

- Political instability (-0,19 political stability index according to globaleconomy.com)
- High corruption (17% corruption perception index according to transparency.org), bureaucracy and mismanagement of oil and gas revenues
- Less economically resilient (according to the African Development Bank's economic resilience index)
- Moderate unemployment rate (7,95%)
- Net importer of refined petroleum products despite local crude oil reserves
- Slow progress following the 2019 announcement by government regarding a planned 20 000 bpd refinery.

3.5.3.3 Opportunities

- Development of the Bioko Oil Terminal, serving as a major West African transit hub for crude oil and refined petroleum products
- Development of domestic refining capacity (proposed 5 000 bpd refinery supplied from the Alba and Alén fields)
- Revival of development plans for a FLNG in Block EG-27 (2.2 MTPA)
- Proposed Gas Mega Hub, to monetize offshore gas in Cameroon and Nigeria
- Conversion of locally produced methanol (19 000 bpd AMPCO) to gasoline and derivatives
- Exporting surplus electricity (generated from natural gas) to neighbouring countries such as Cameroon and Gabon.

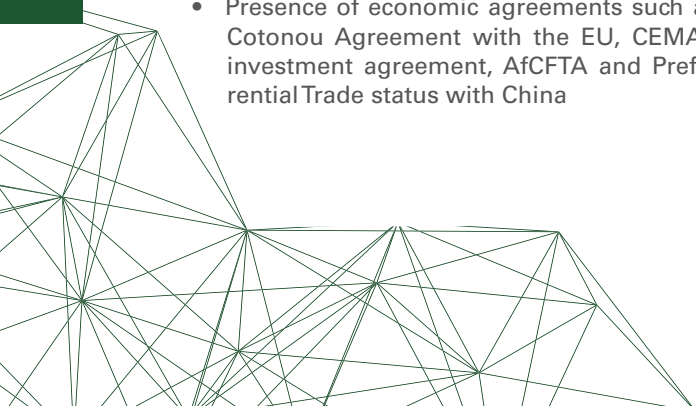
3.5.3.4 Threats

- Declining oil reserves (average decline rate of 10% per year)

3.5.4 Gabon

3.5.4.1 Strengths

- More economically resilient (according to the African Development Bank's economic resilience index)
- Mature oil producer, with significant crude oil reserves (2 billion barrels)
- Operational deep-sea oil export terminals (Cape Lopez and Gamba)
- Connection to submarine cable (ACE)



- Presence of International Oil Companies (Perenco, TotalEnergies, Vaalco Energy, Addax Petroleum).
- Special economic zone, GSEZ, located 27 km from Libreville intended for general manufacturing, including oil and gas activities
- 2019's new hydrocarbon code (Law no. 002/2019) provides a more attractive environment for investors, having reduced tax and government royalties on oil and gas activities
- Bilateral agreements with Belgium, Luxembourg, China, Egypt, France, Germany, Italy, Lebanon, Mali, Portugal, South Africa, Spain and Turkey
- Member of OPEC and CEMAC
- Conclusion of the 12th oil and gas exploration licence round.

3.5.4.2 Weaknesses

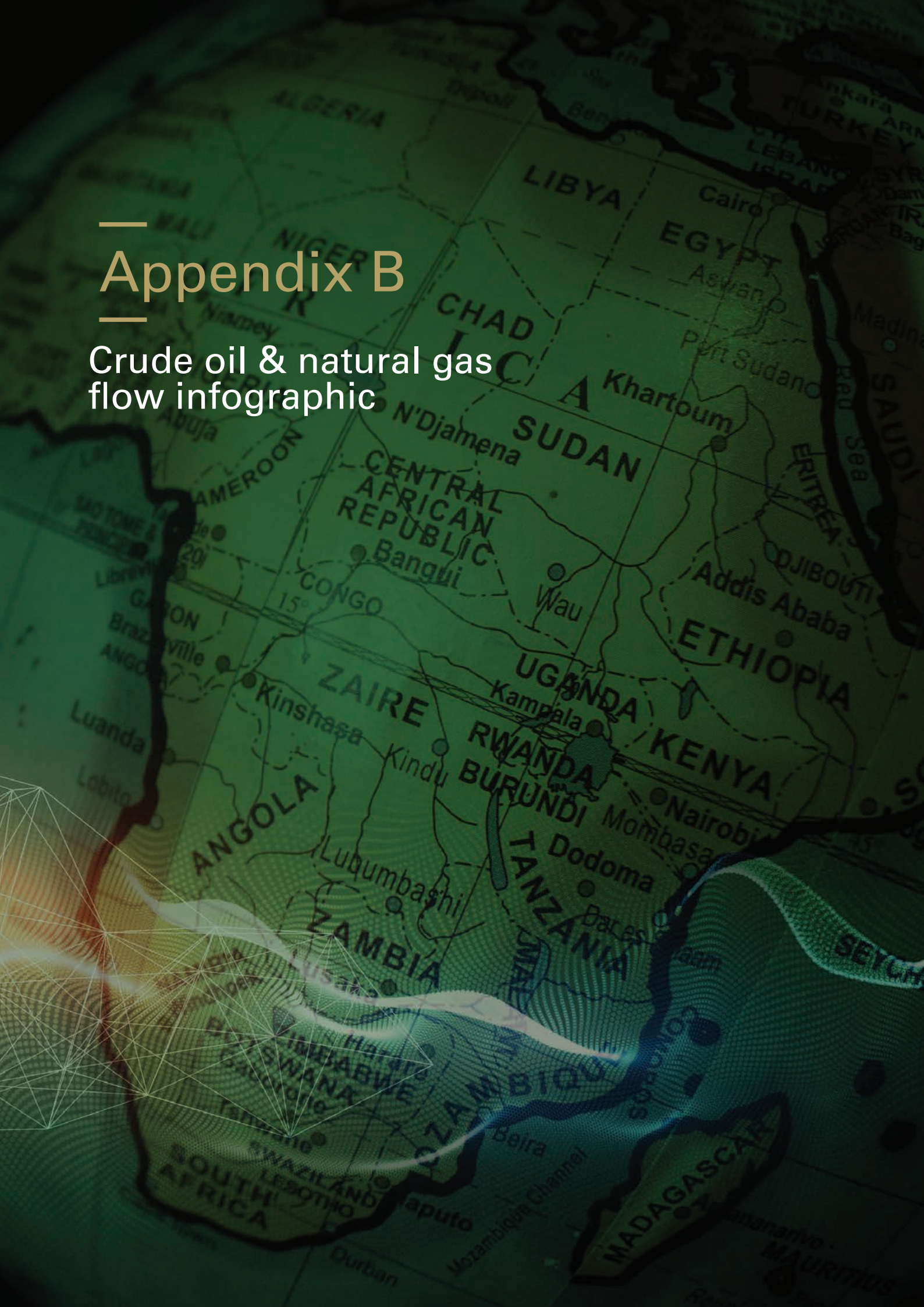
- Political instability (-0,08 political stability index according to globaleconomy.com)
- High corruption (31% corruption perception index according to transparency.org) preventing oil and gas revenue from benefiting citizens
- High unemployment rate (20,5%)
- Privately owned gas transmission/distribution infrastructure.

3.5.4.3 Opportunities

- Access to products and services associated with the GSEZ
- Monetization of flared associated natural gas
- Proposed 15 000 tonnes per annum LPG plant in Batanga (2023).

3.5.4.4 Threats

- Declining oil reserves
- The New CEMAC Regulation may hinder the advancement of the oil and gas sector due to the requirement to repatriate export proceeds
- Increasing renewable energy (hydropower generation) efforts.



Appendix B

Crude oil & natural gas flow infographic

1. Crude Oil Flow

The following infographics provide a detailed overview of the flow of crude oil (and refined petroleum products) through selected African countries.

Data presented below are from publicly available sources (2020) and pertains only to the countries selected for analysis in this study.

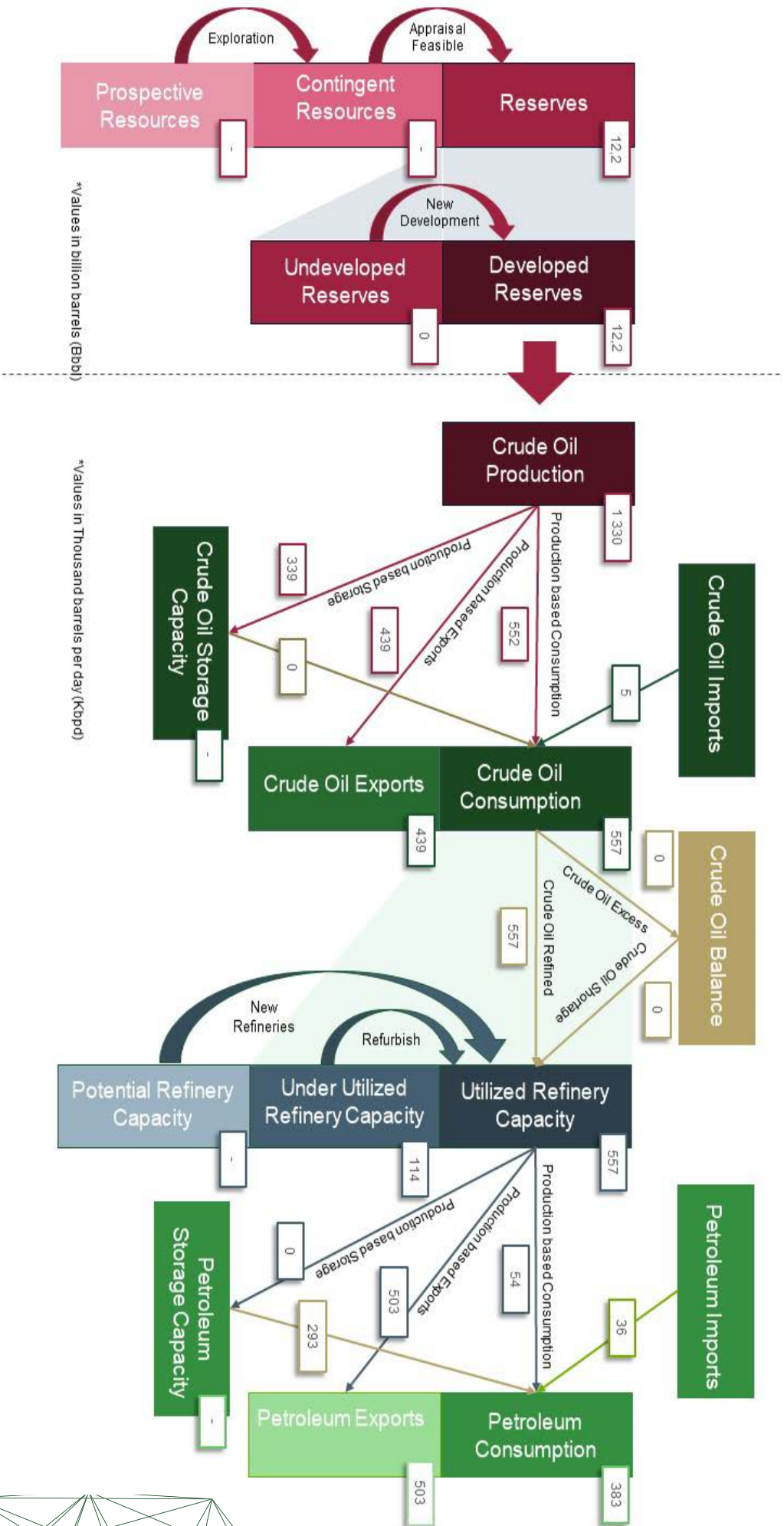


Figure 1 Flow infographic for crude oil and refined petroleum products: Algeria

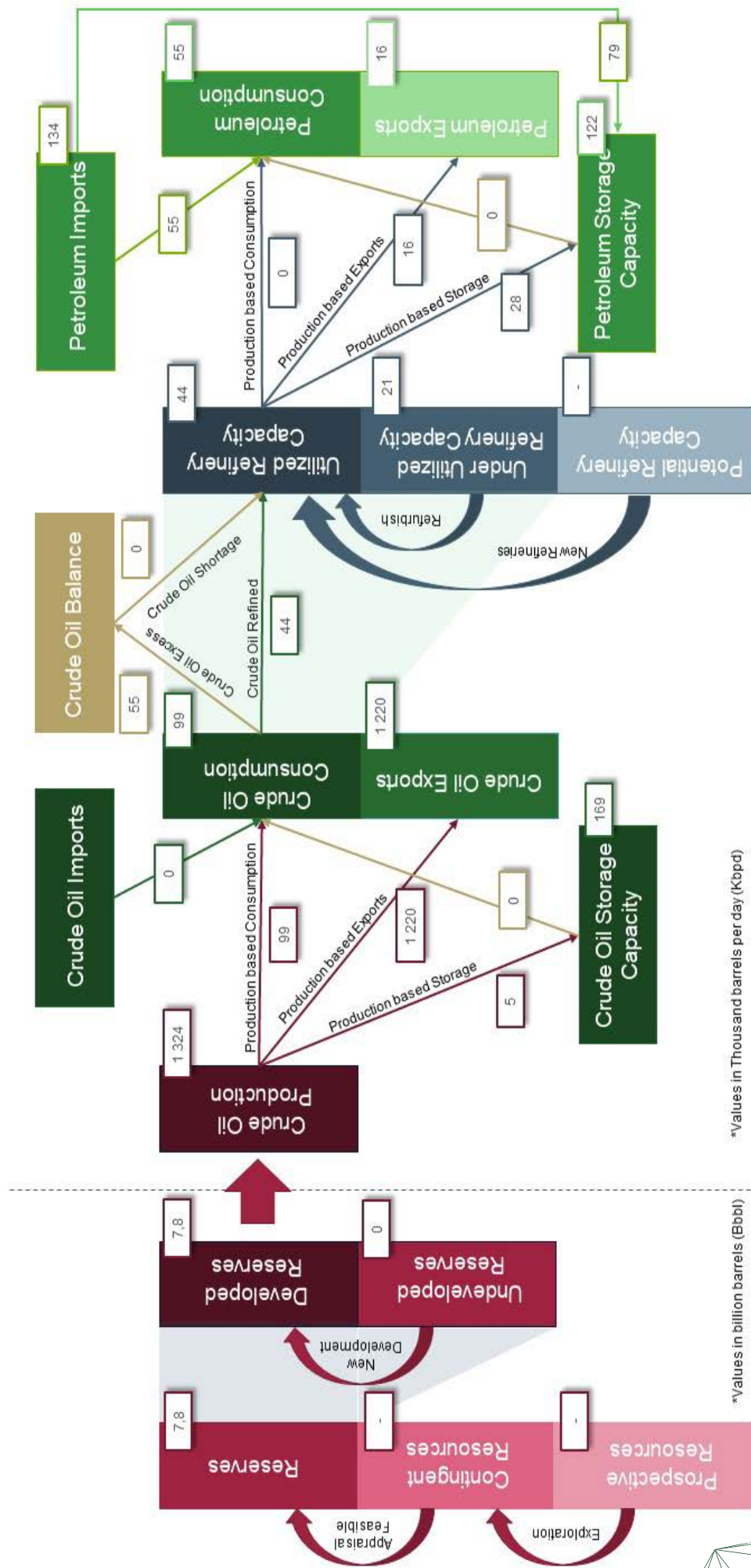
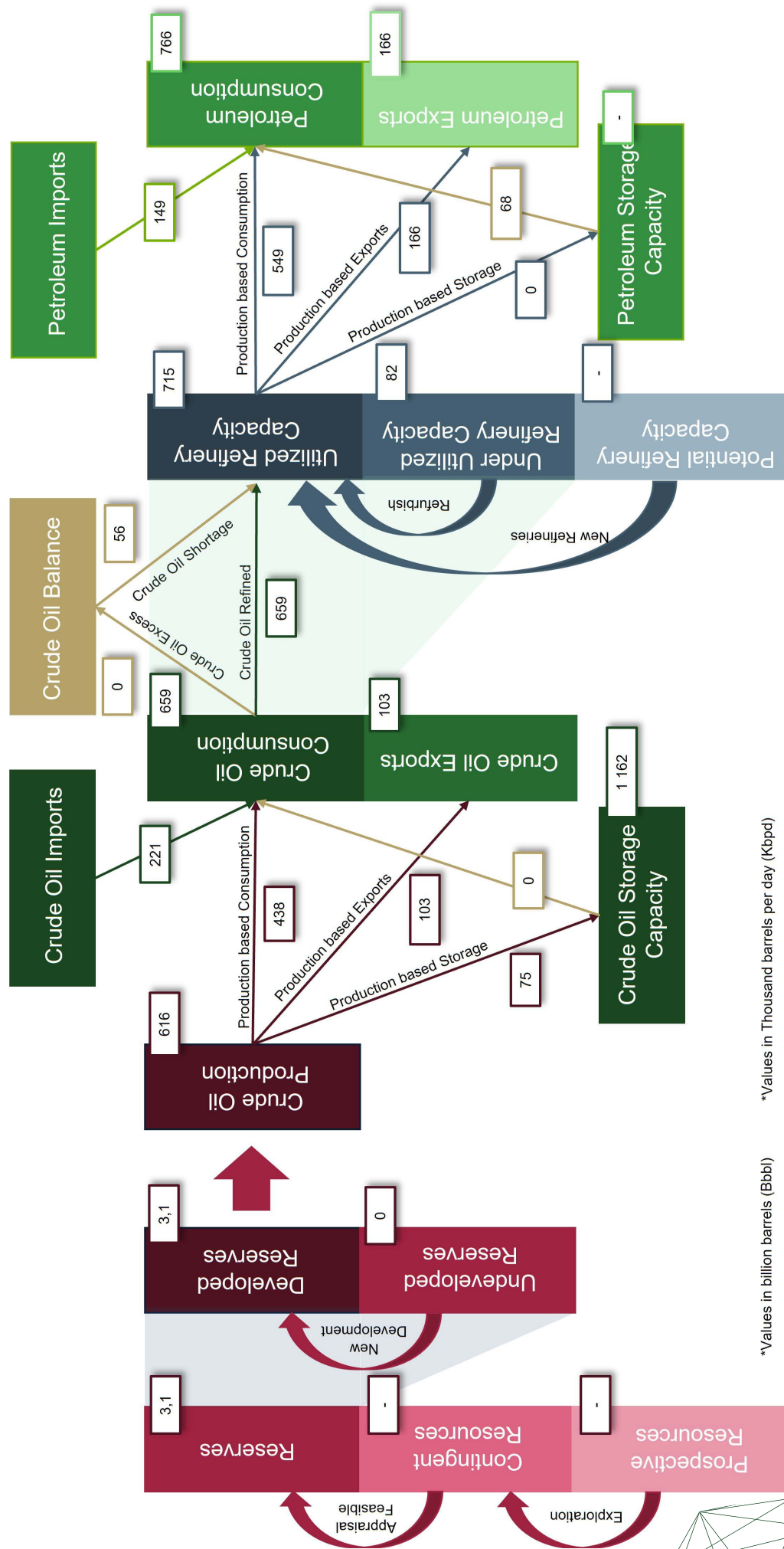


Figure 2 Flow infographic for crude oil and refined petroleum products: Angola



Figure 3 Flow infographic for crude oil and refined petroleum products: Chad



*Values in Thousand barrels per day (Kbp/d)

*Values in billion barrels (Bbbl)

Figure 4 Flow infographic for crude oil and refined petroleum products: Egypt

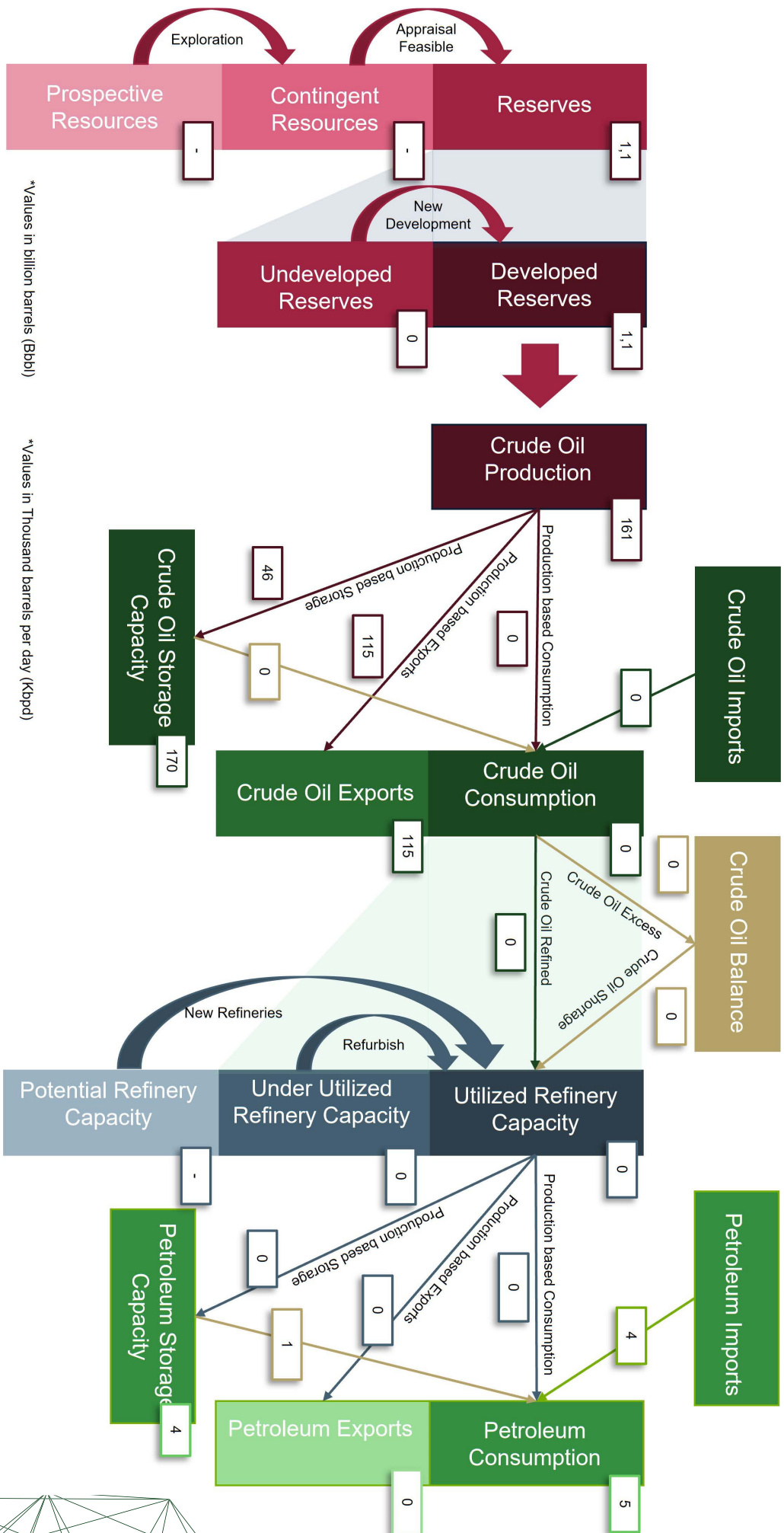


Figure 5 Flow infographic for crude oil and refined petroleum products: Equatorial Guinea

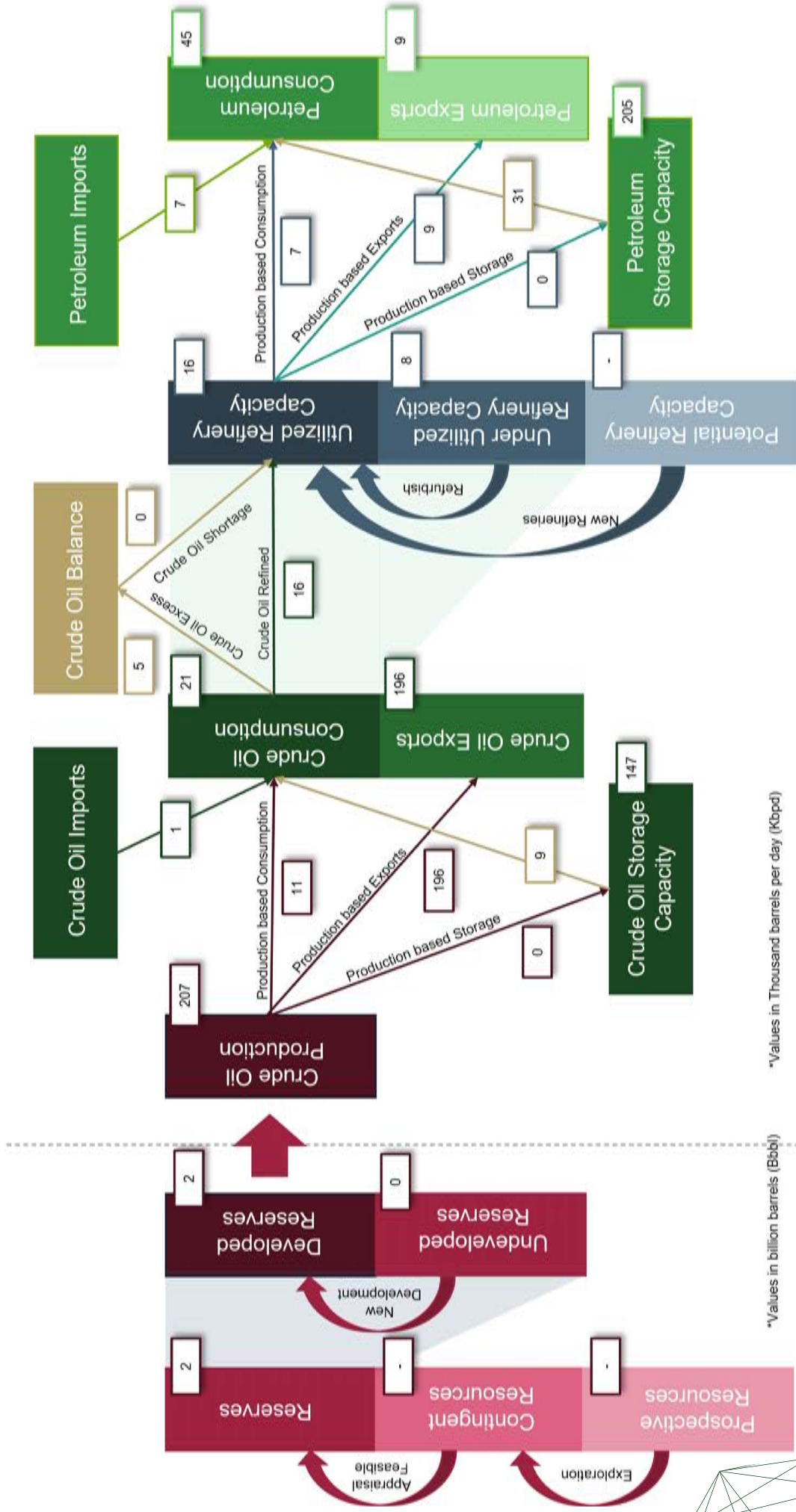


Figure 6 Flow infographic for crude oil and refined petroleum products: Gabon

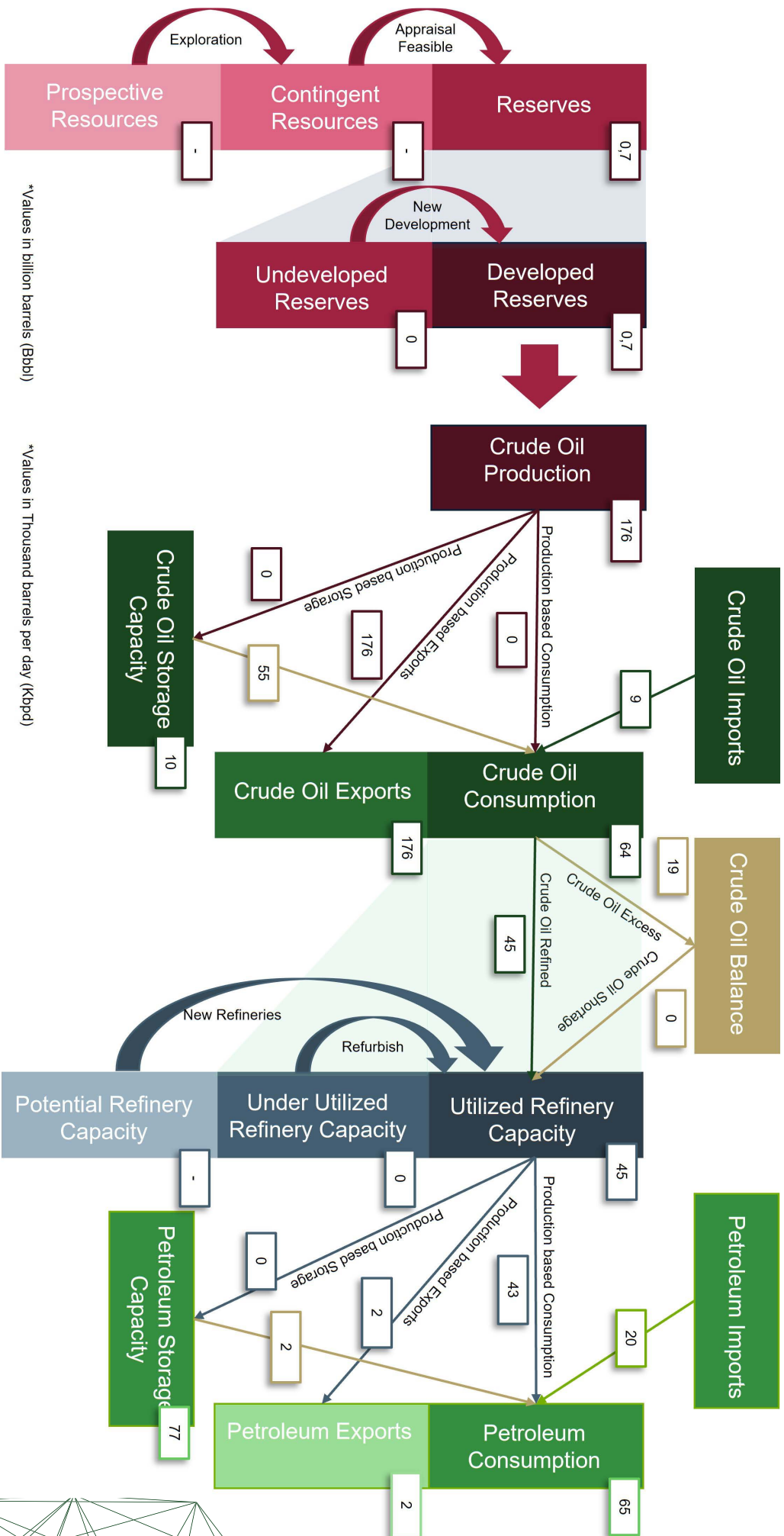
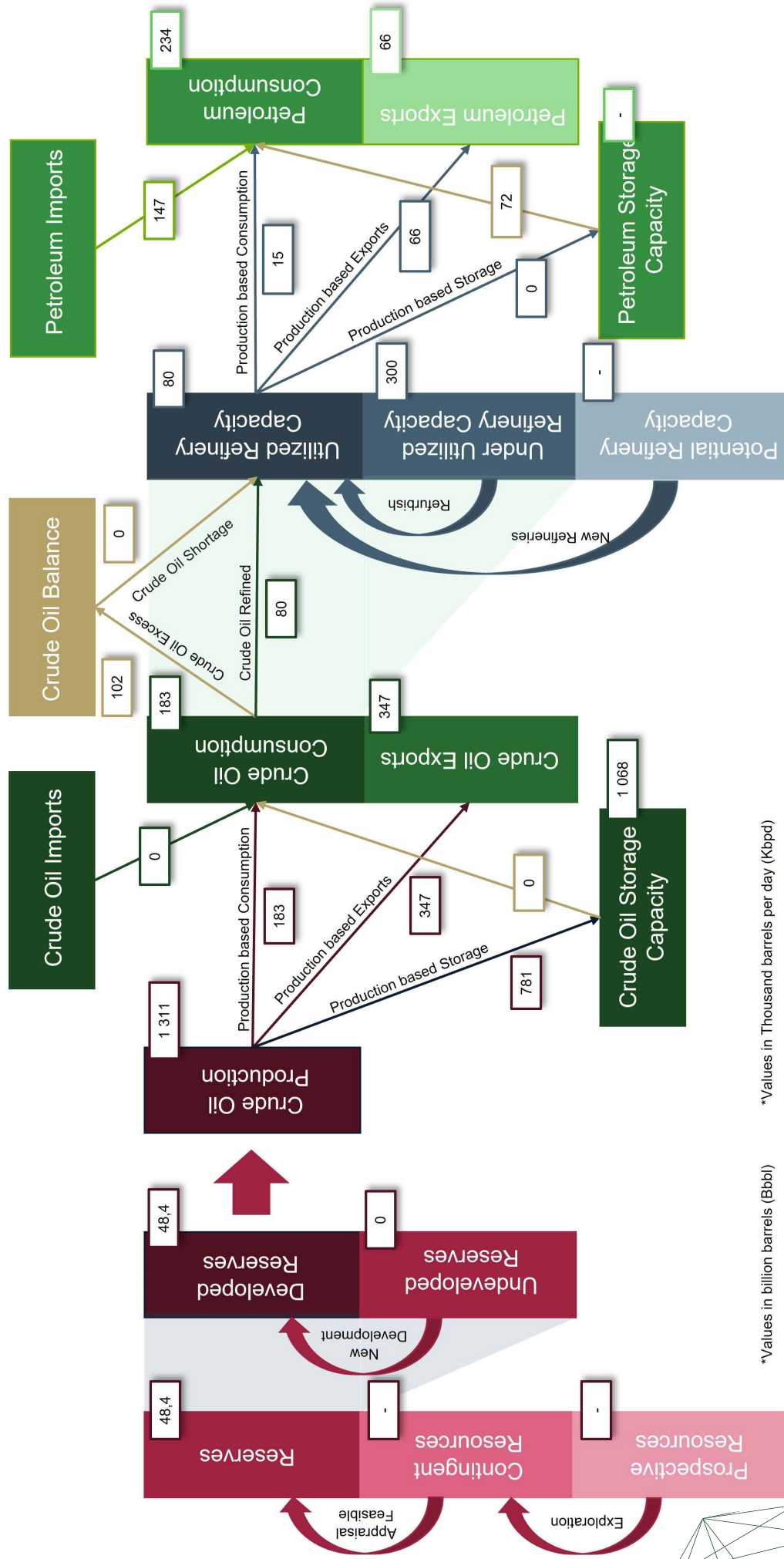


Figure 7 Flow infographic for crude oil and refined petroleum products: Ghana

*Values in billion barrels (Bbb)

*Values in Thousand barrels per day (kbbpd)



*Values in Thousand barrels per day (Kbp/d)

*Values in billion barrels (Bbbl)

Figure 8 Flow infographic for crude oil and refined petroleum products: Libya

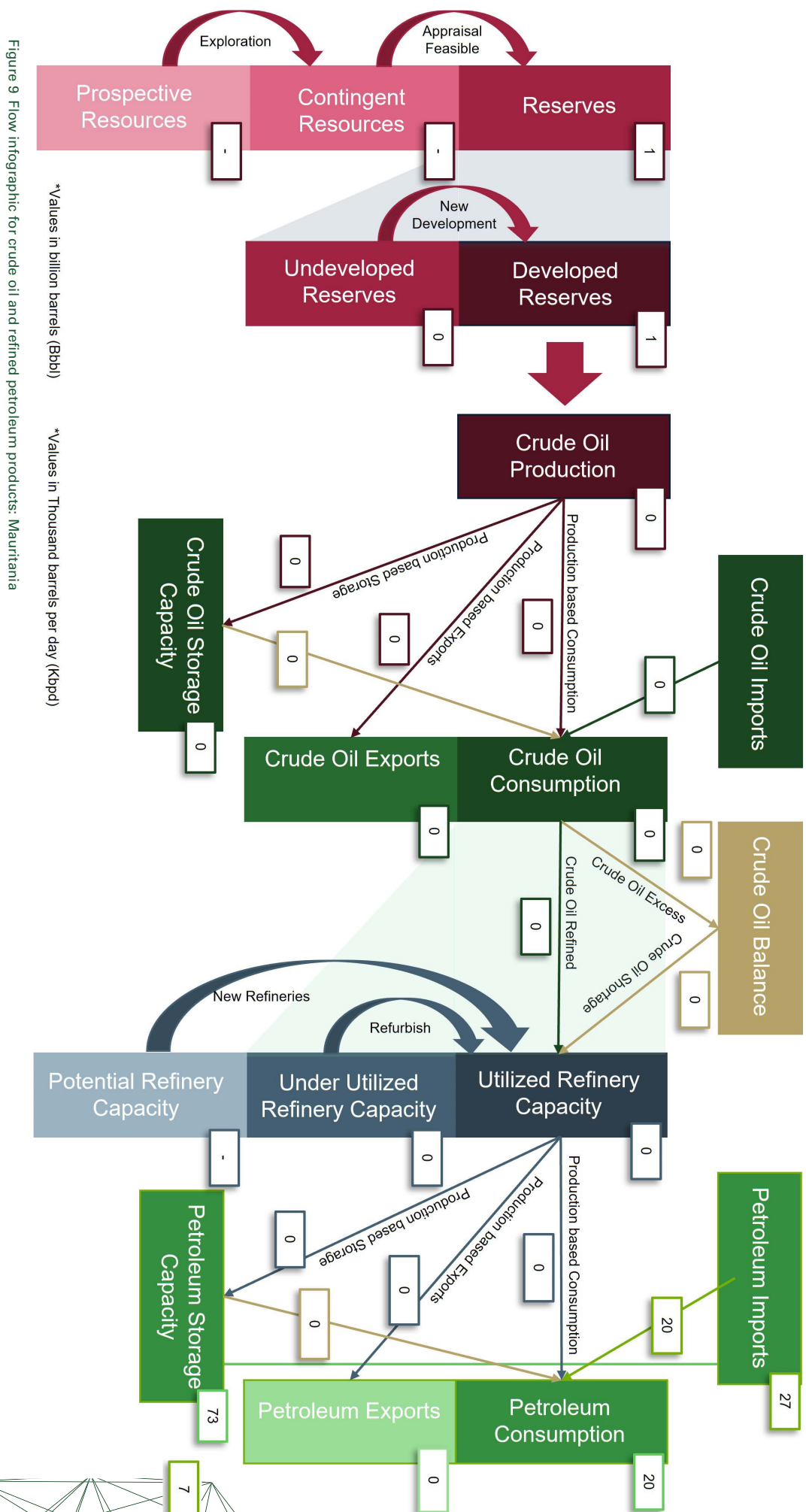
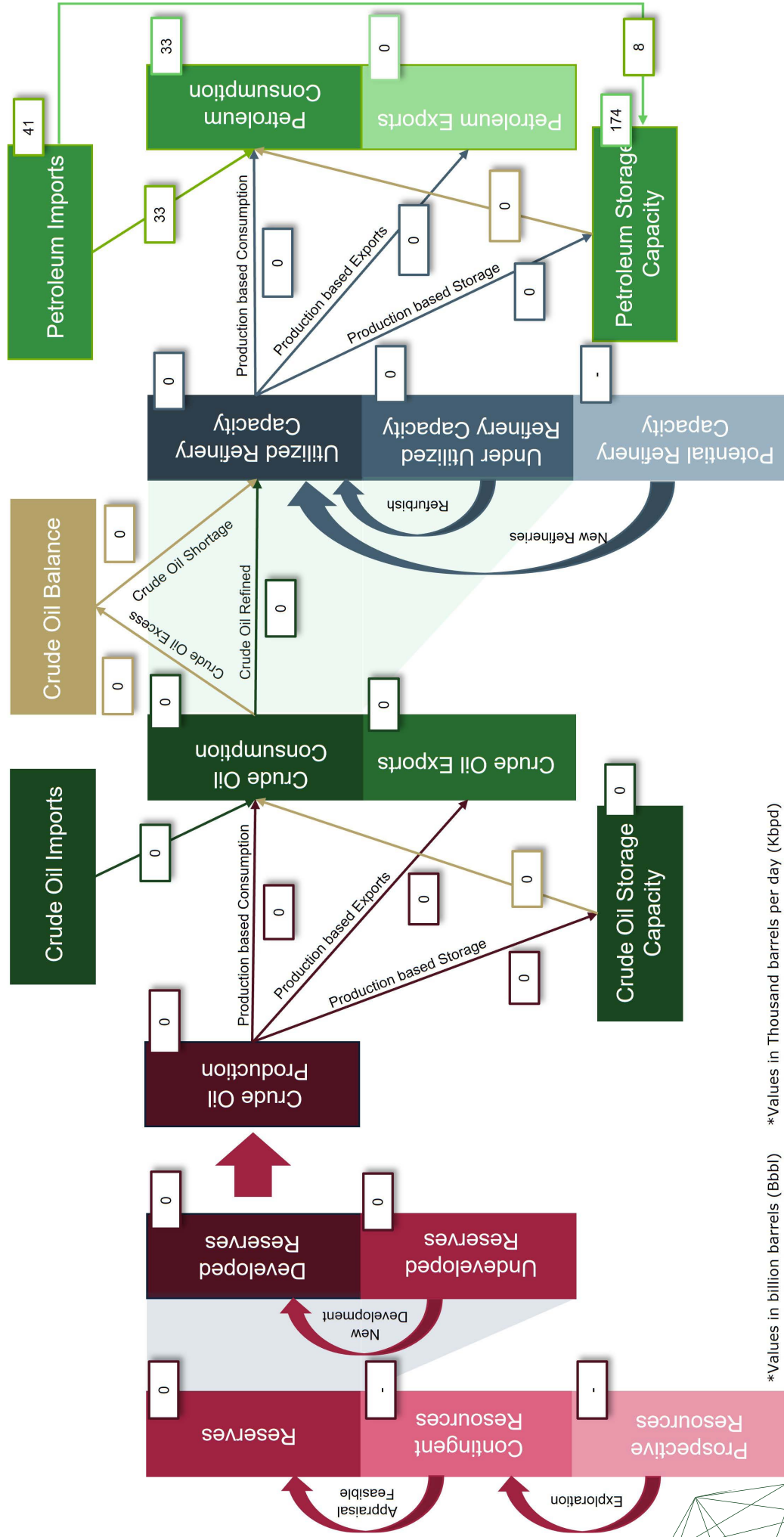


Figure 9 Flow infographic for crude oil and refined petroleum products: Mauritania

*Values in billion barrels (Bbb)

*Values in Thousand barrels per day (kbpd)



*Values in billion barrels (Bbbl) *Values in Thousand barrels per day (Kbpd)

Figure 10 Flow infographic for crude oil and refined petroleum products: Mozambique

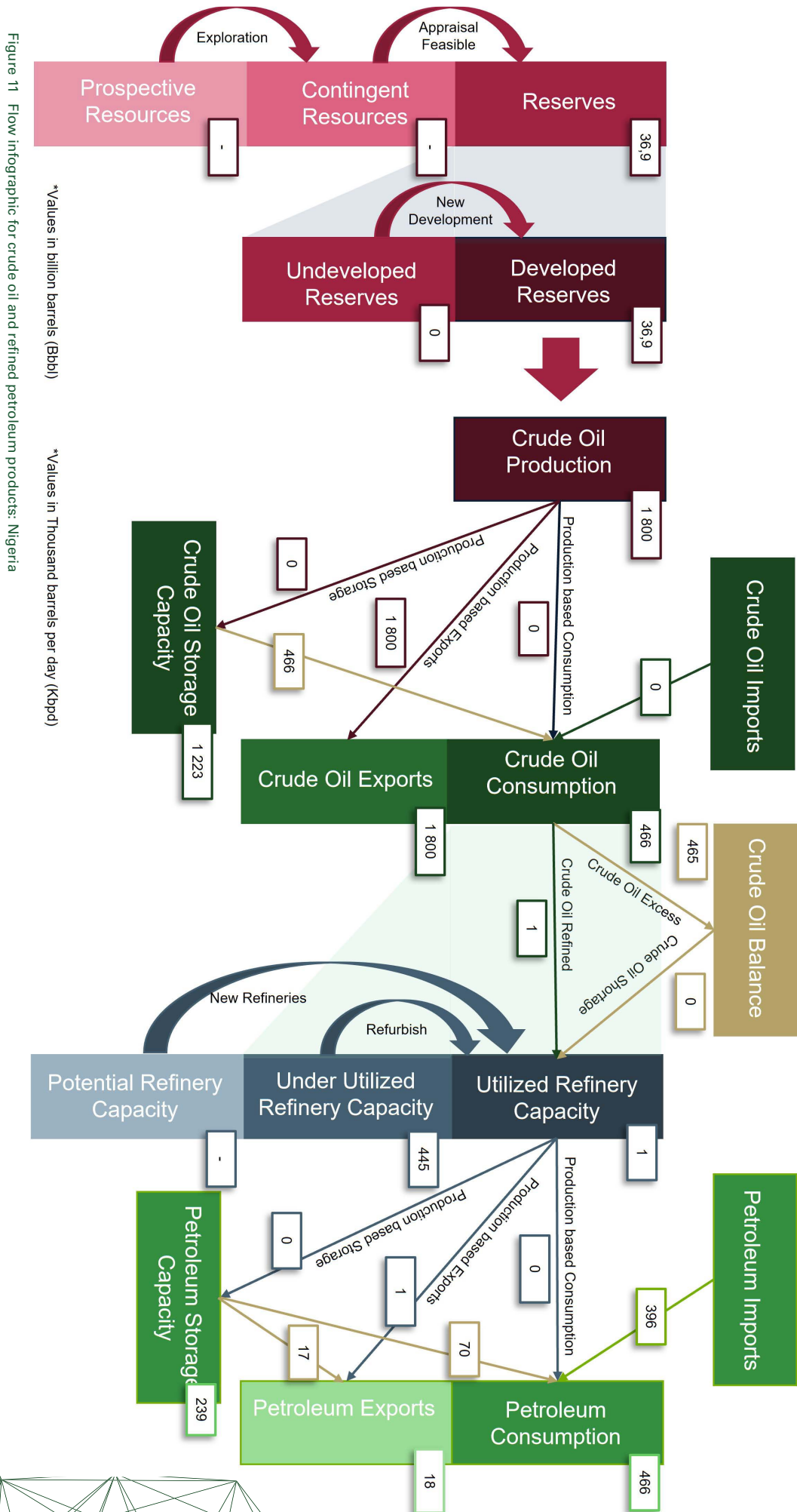
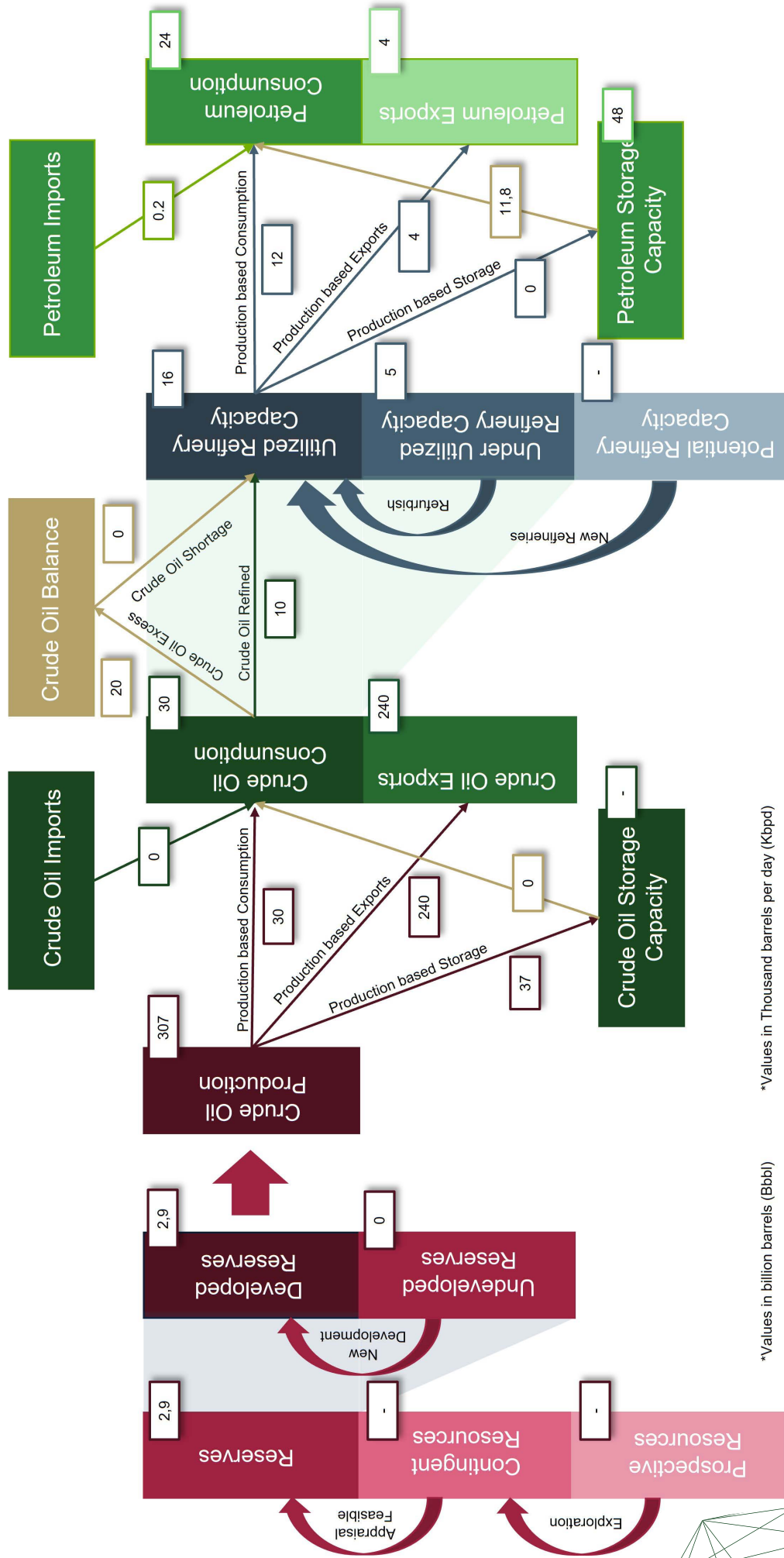


Figure 11 Flow infographic for crude oil and refined petroleum products: Nigeria

*Values in billion barrels (Bbb)

*Values in Thousand barrels per day (Kbpd)



*Values in Thousand barrels per day (Kbpd)

*Values in billion barrels (Bbbl)

Figure 12 Flow infographic for crude oil and refined petroleum products: Republic of Congo

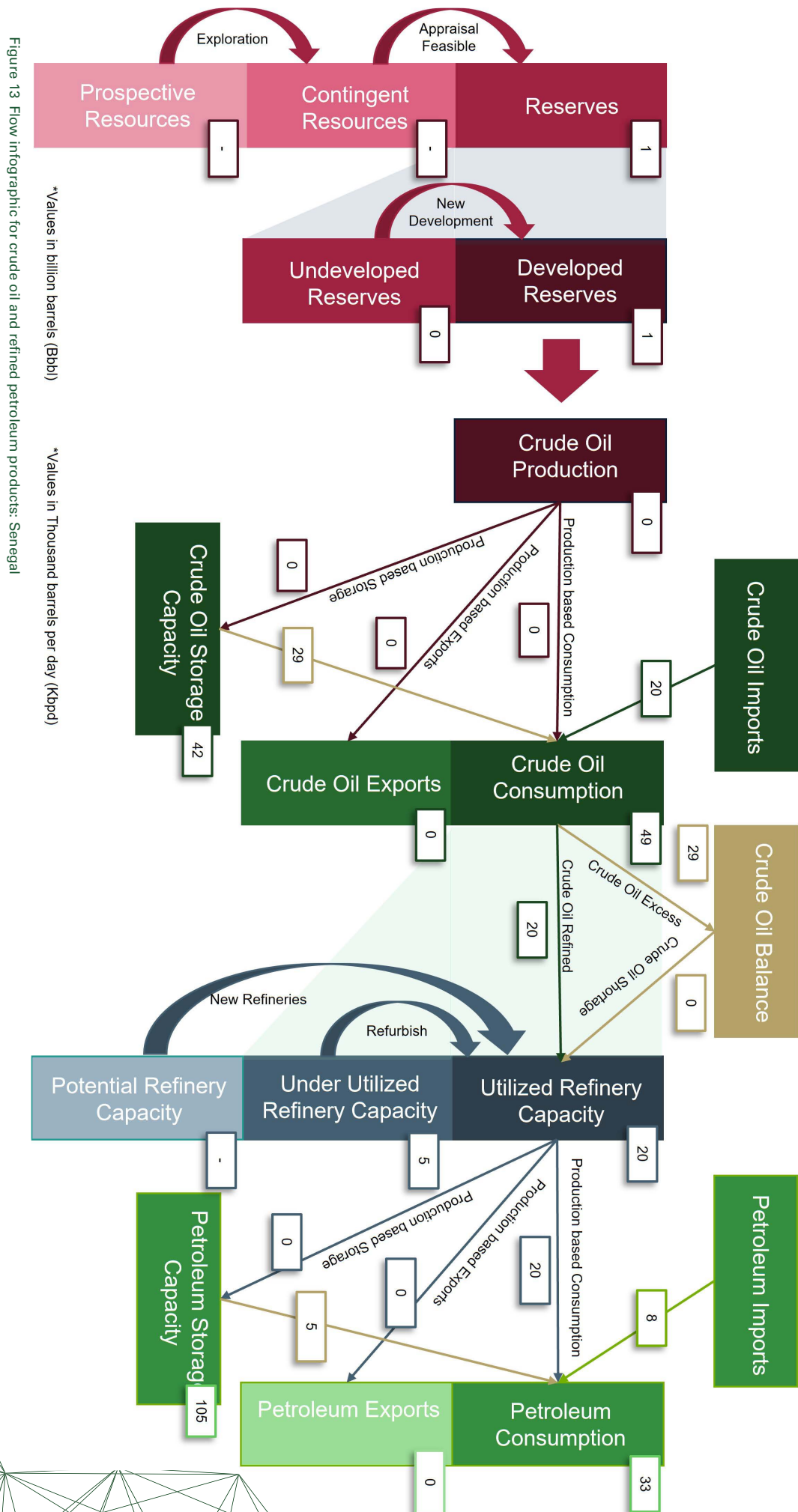
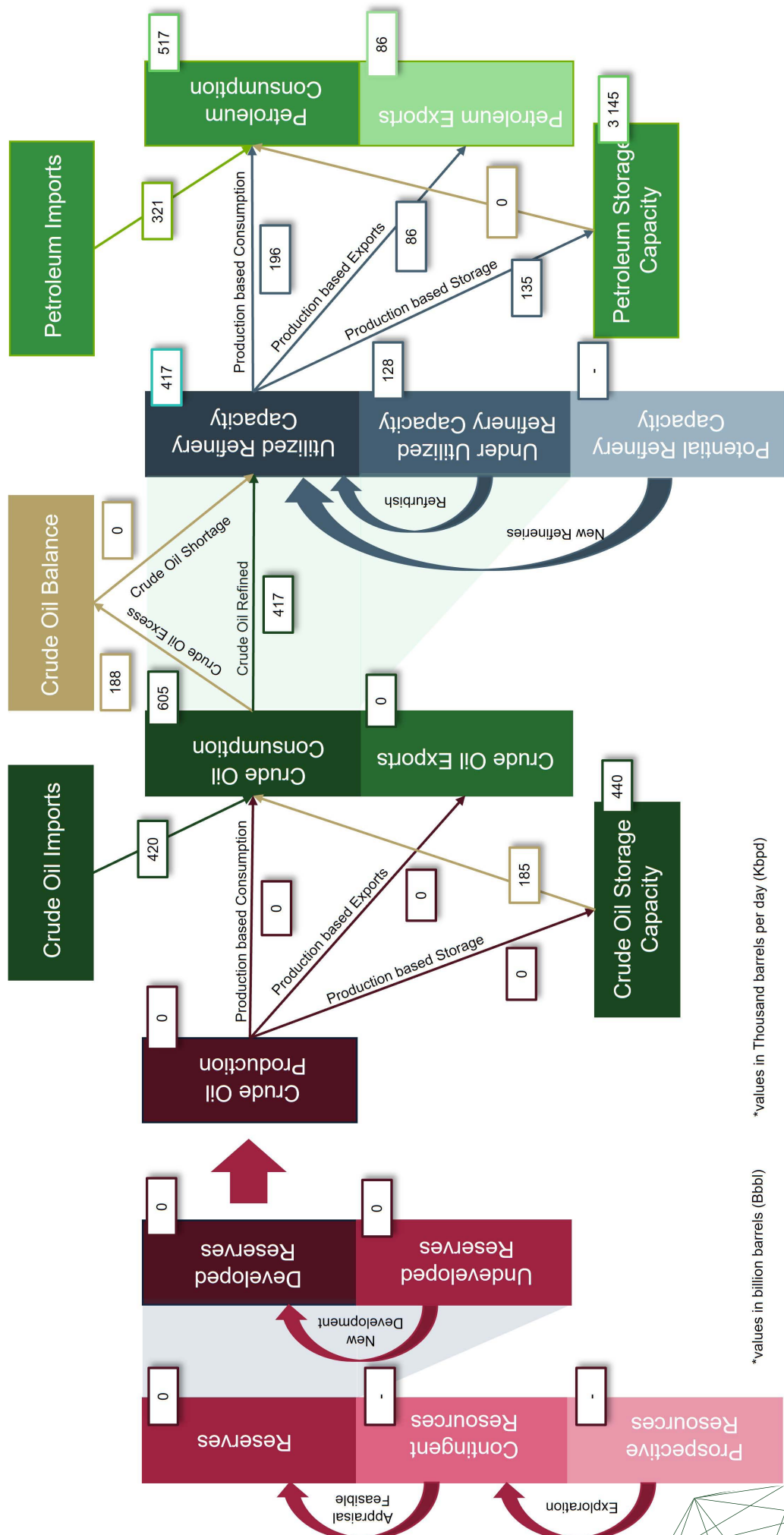


Figure 13 Flow infographic for crude oil and refined petroleum products: Senegal

*Values in billion barrels (Bbb)

*Values in Thousand barrels per day (kbpd)



*values in Thousand barrels per day (Kbp/d)

*values in billion barrels (Bbbl)

Figure 14 Flow infographic for crude oil and refined petroleum products: South Africa

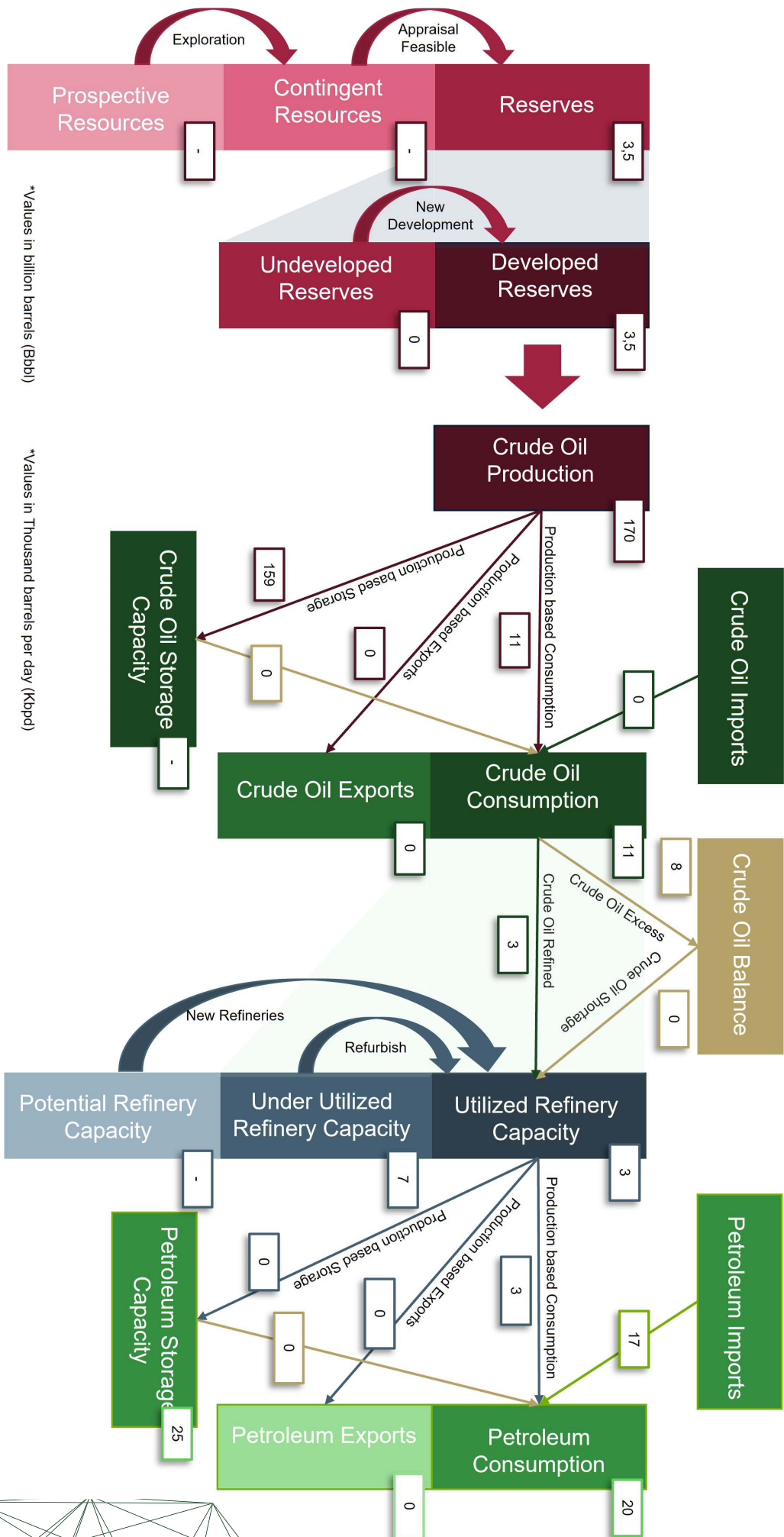
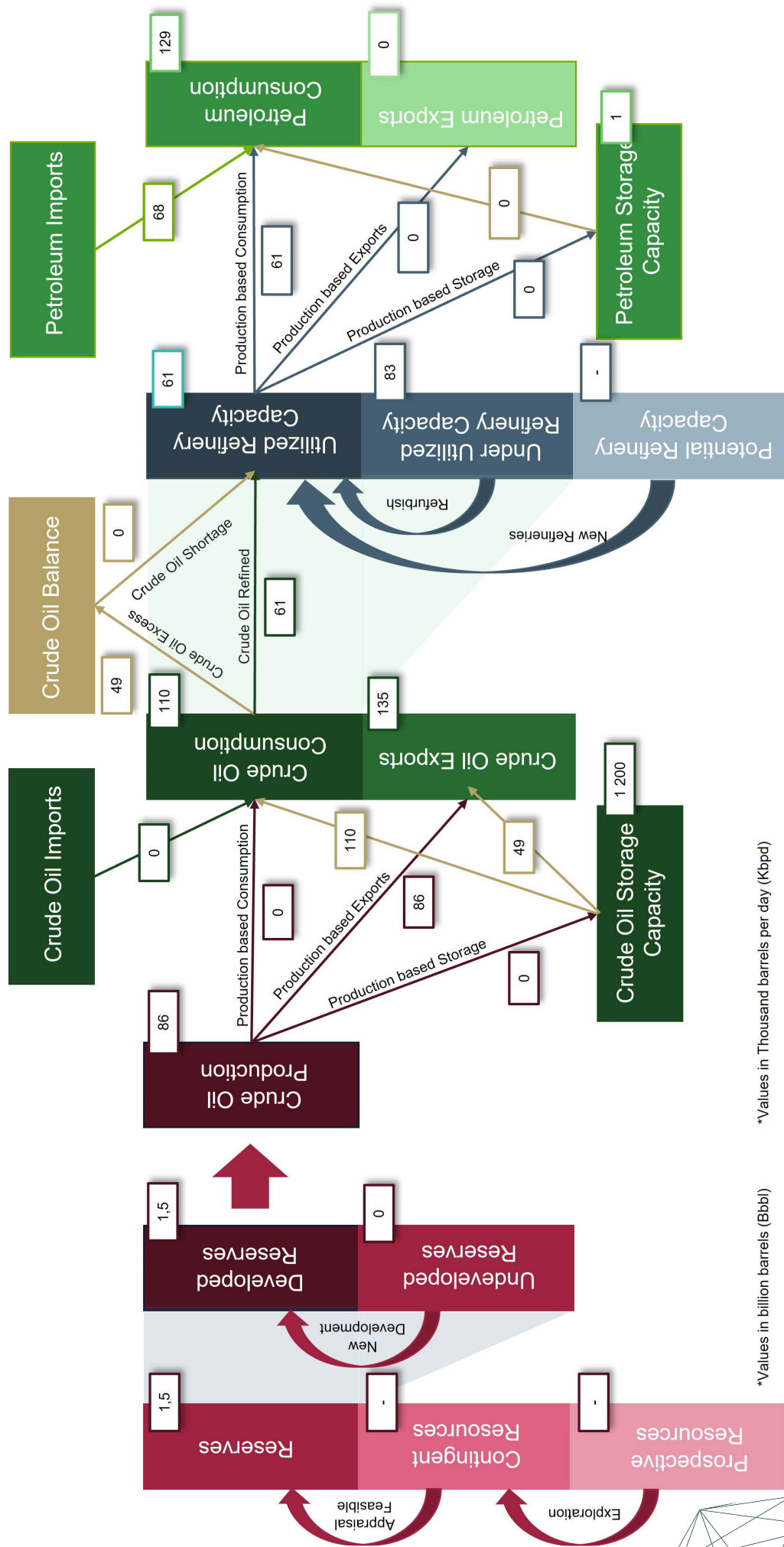


Figure 15 Flow infographic for crude oil and refined petroleum products: South Sudan



*Values in Thousand barrels per day (Kbpd)

*Values in billion barrels (Bbbl)

Figure 16 Flow infographic for crude oil and refined petroleum products: Sudan

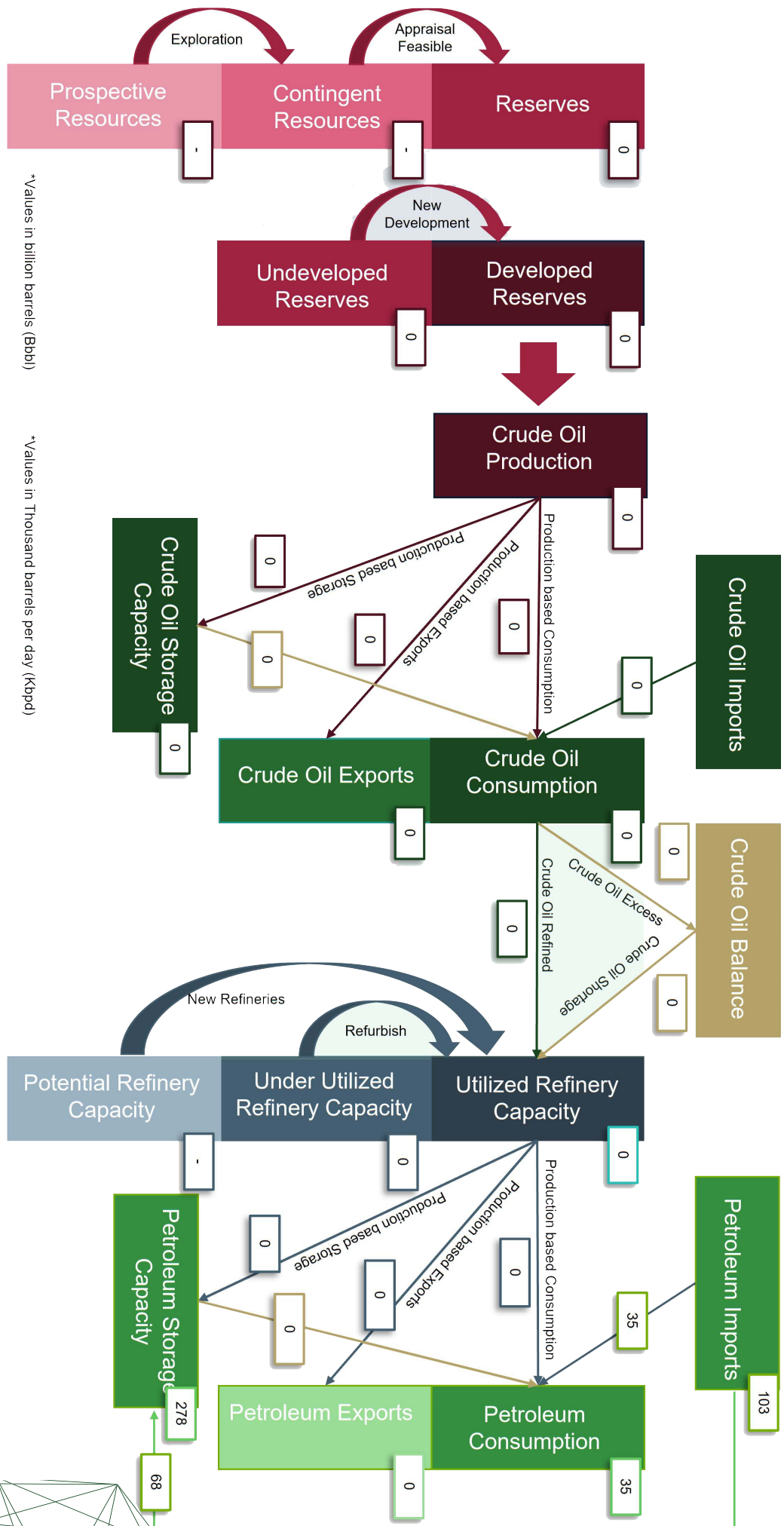
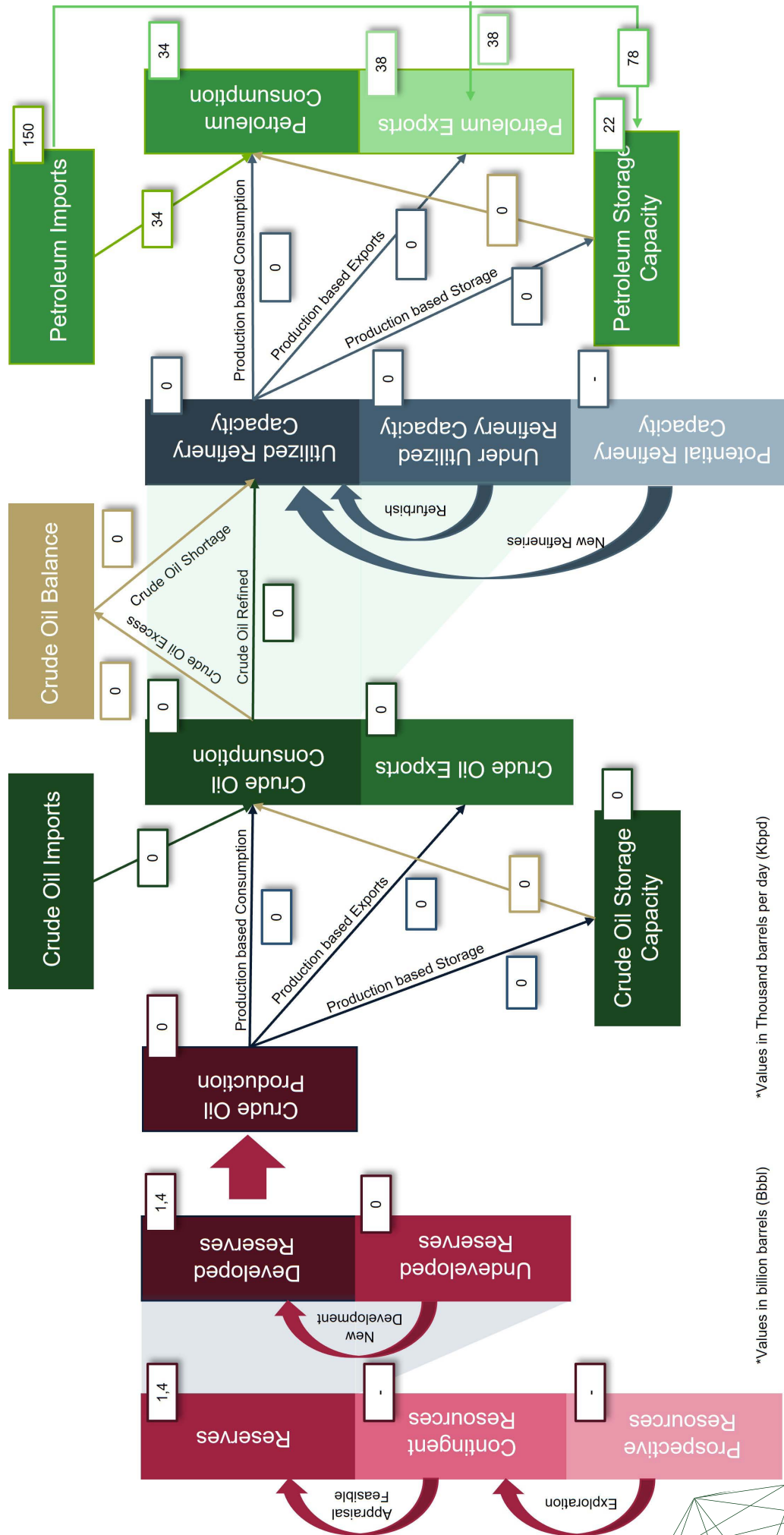


Figure 17 Flow infographic for crude oil and refined petroleum products: Tanzania

*Values in billion barrels (Bbb)

*Values in Thousand barrels per day (Kbpd)



*Values in Thousand barrels per day (Kbpd)

*Values in billion barrels (Bbbl)

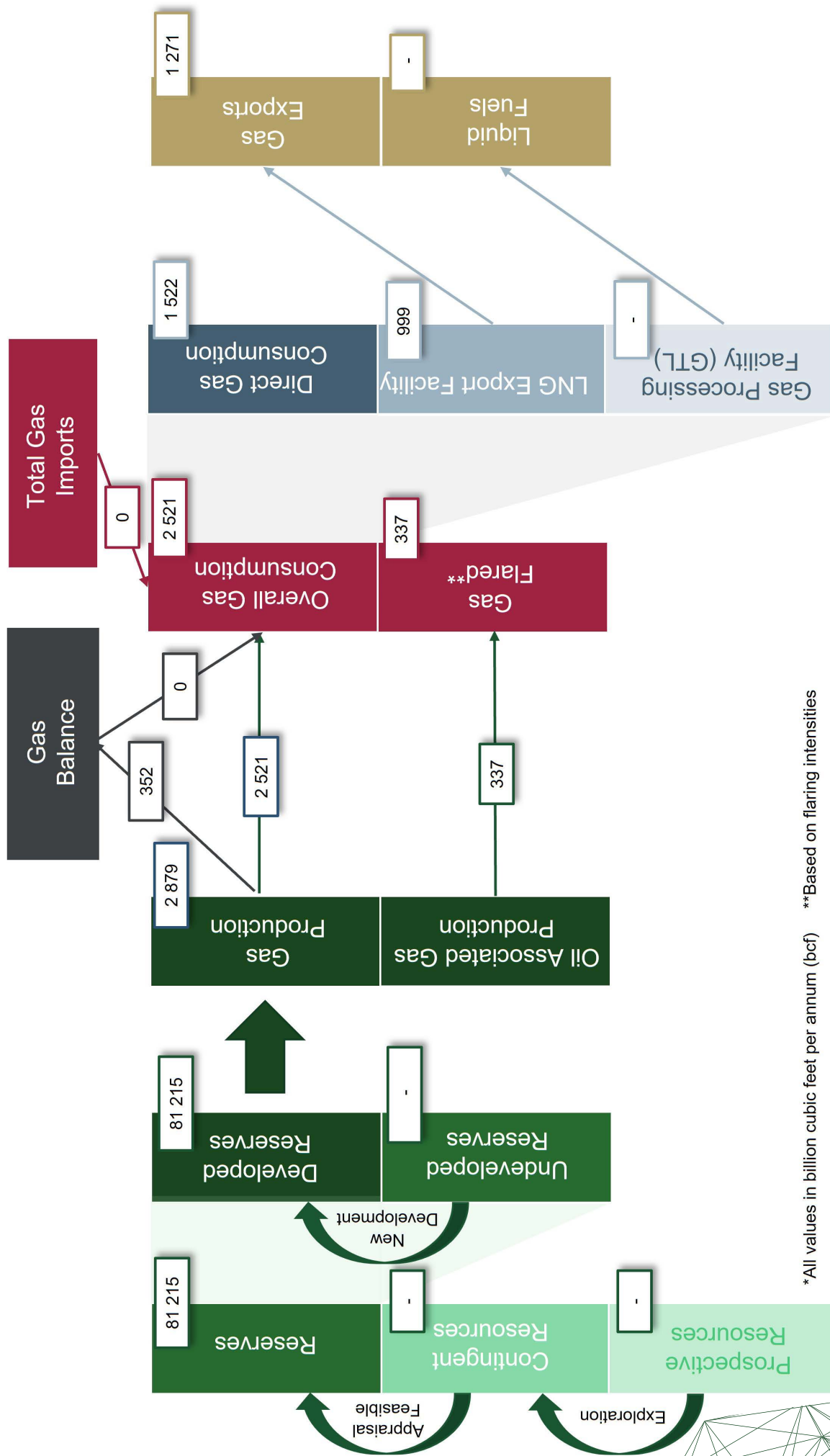
Figure 18 Flow infographic for crude oil and refined petroleum products: Uganda

2. Natural Gas

The following infographics provide a detailed overview of the flow of natural gas through selected African countries.

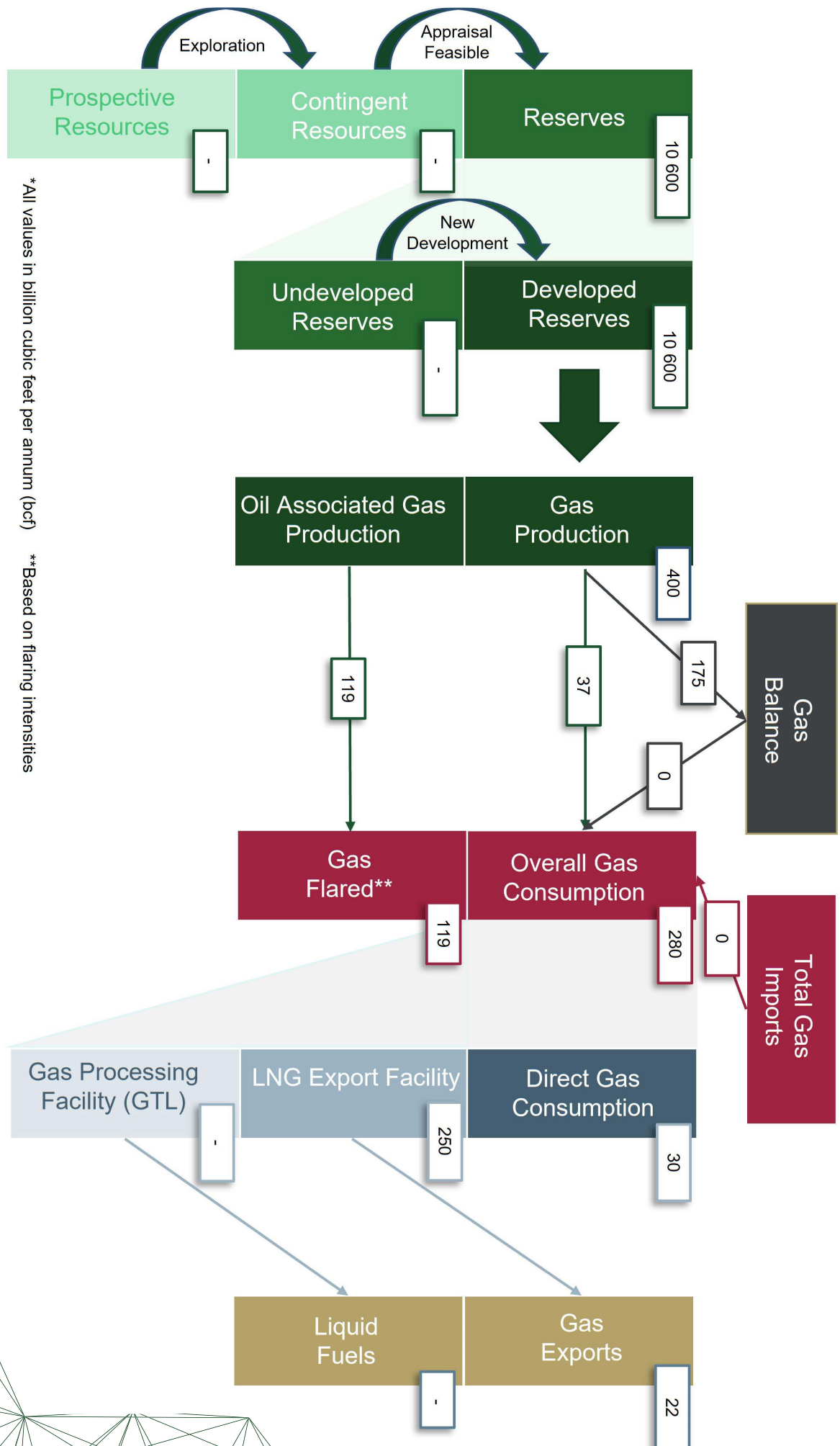
Data presented below are from publicly available sources (2020) and pertains only to the countries selected for analysis in this study.

Associated gas production rates were calculated using flaring intensities from ACTING's State of Play: African Gas 2021 report.



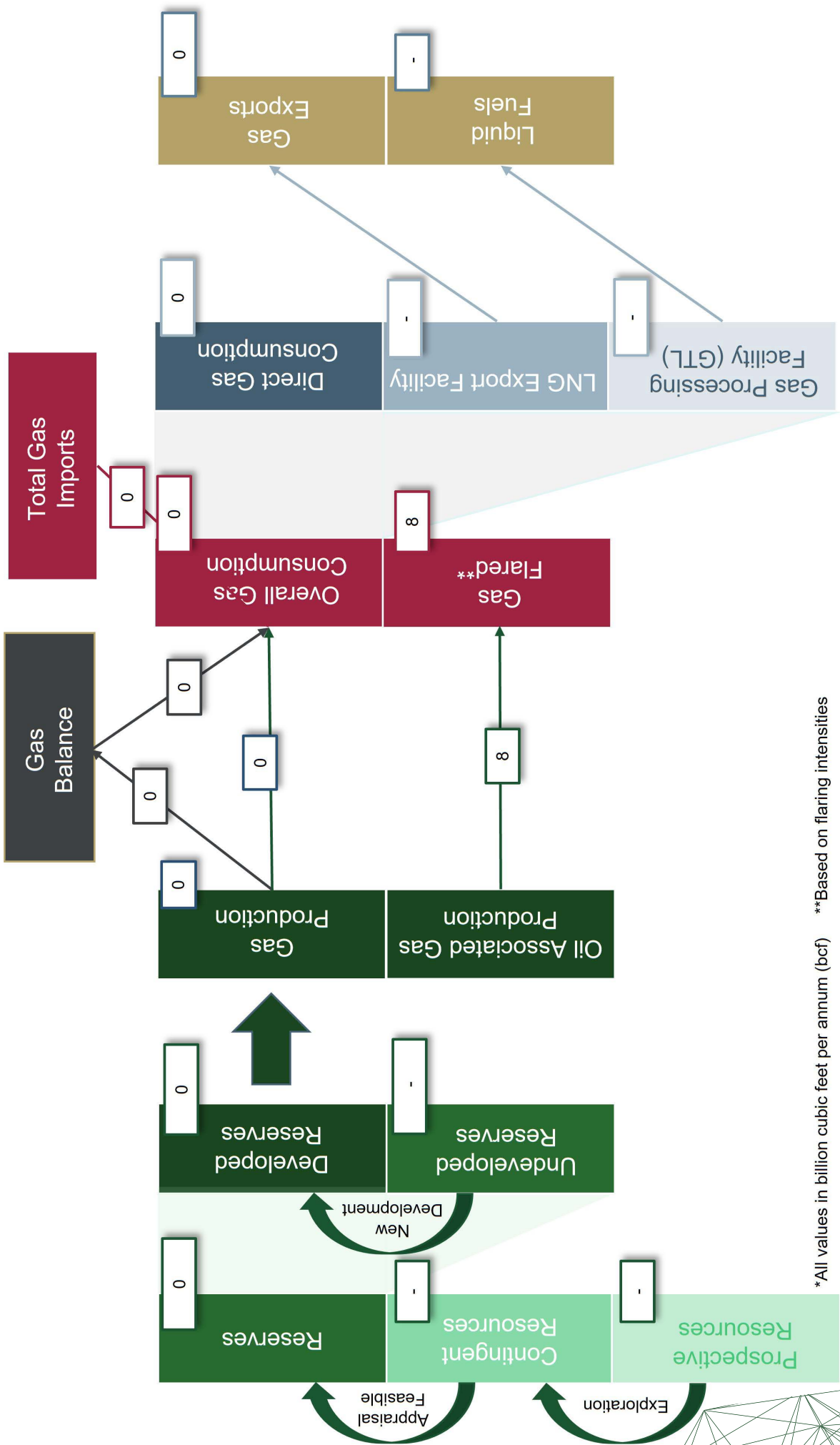
*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

Figure 19 Flow infographic for natural gas: Algeria



*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

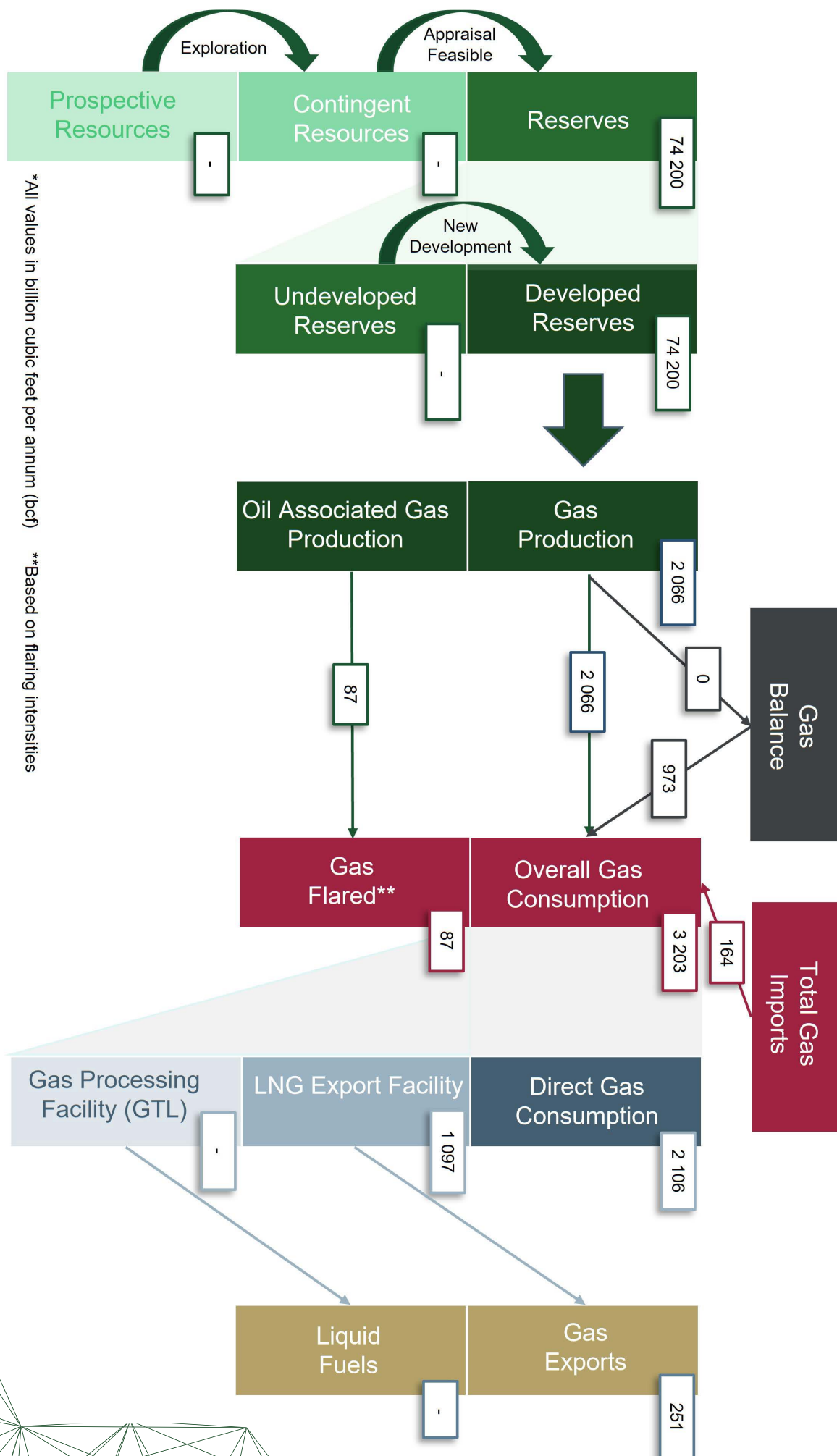
Figure 20 Flow infographic for natural gas: Angola

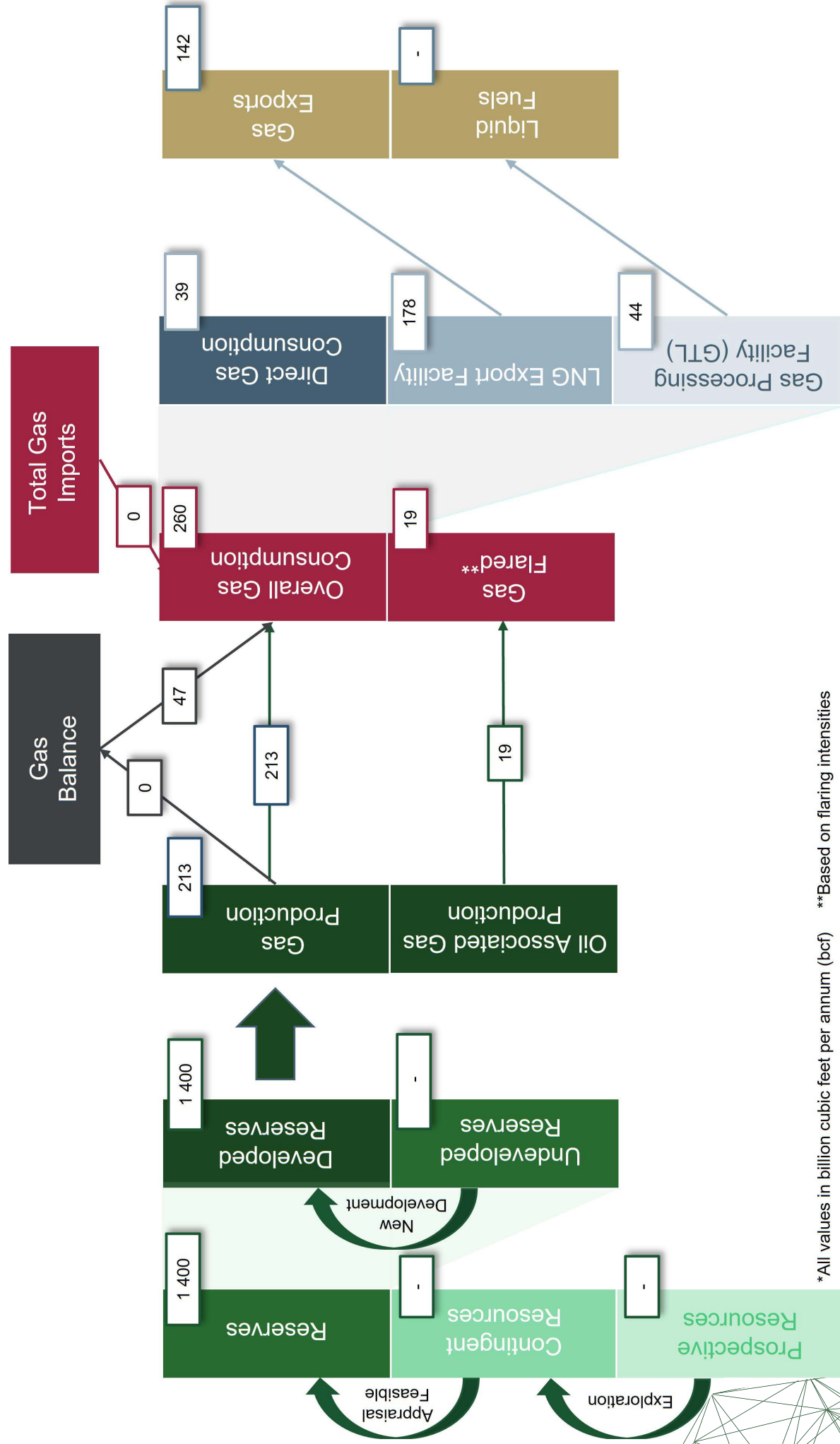


*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

Figure 21 Flow infographic for natural gas: Chad

Figure 22 Flow infographic for natural gas: Egypt





*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

Figure 23 Flow infographic for natural gas: Equatorial Guinea

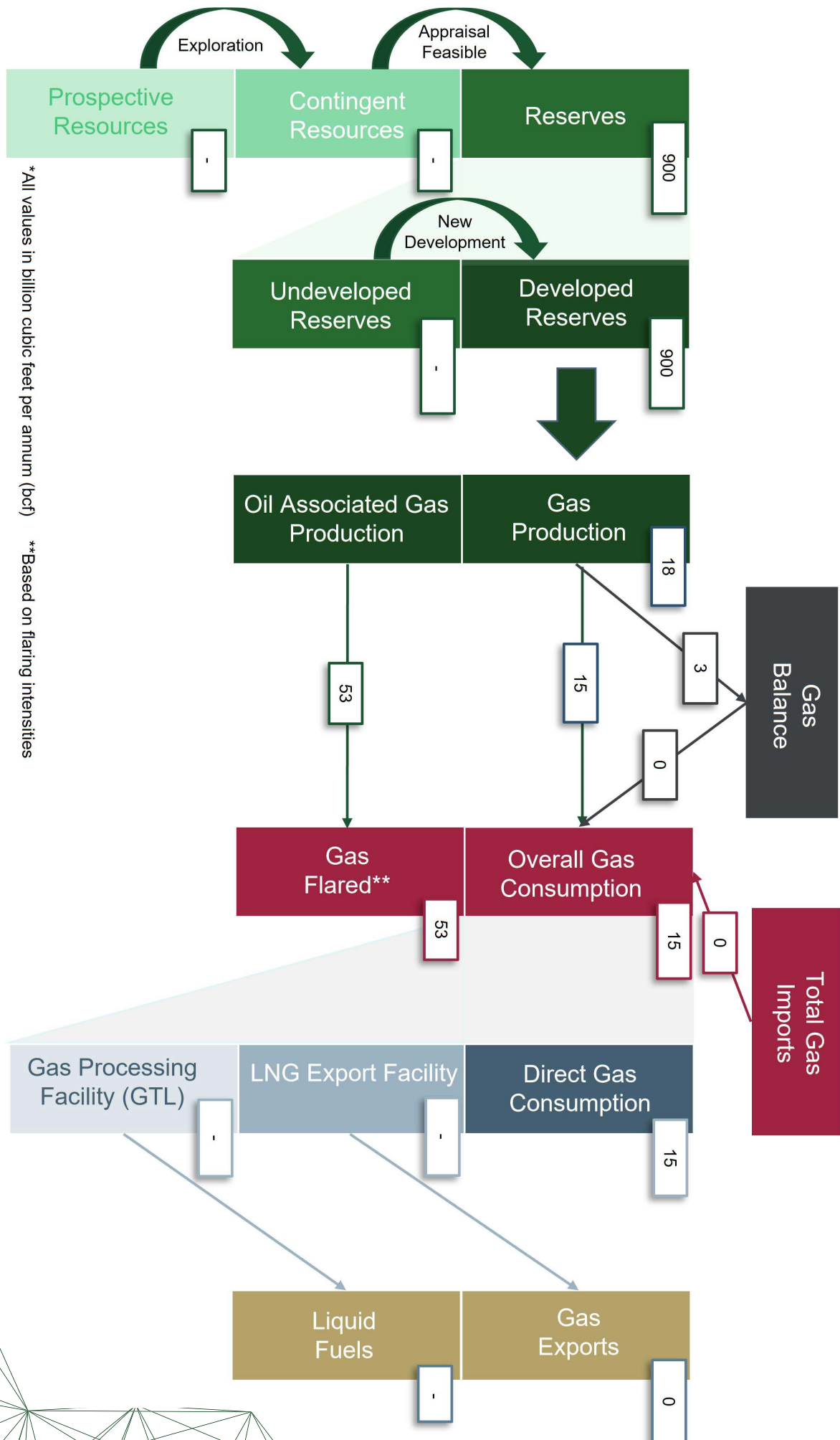
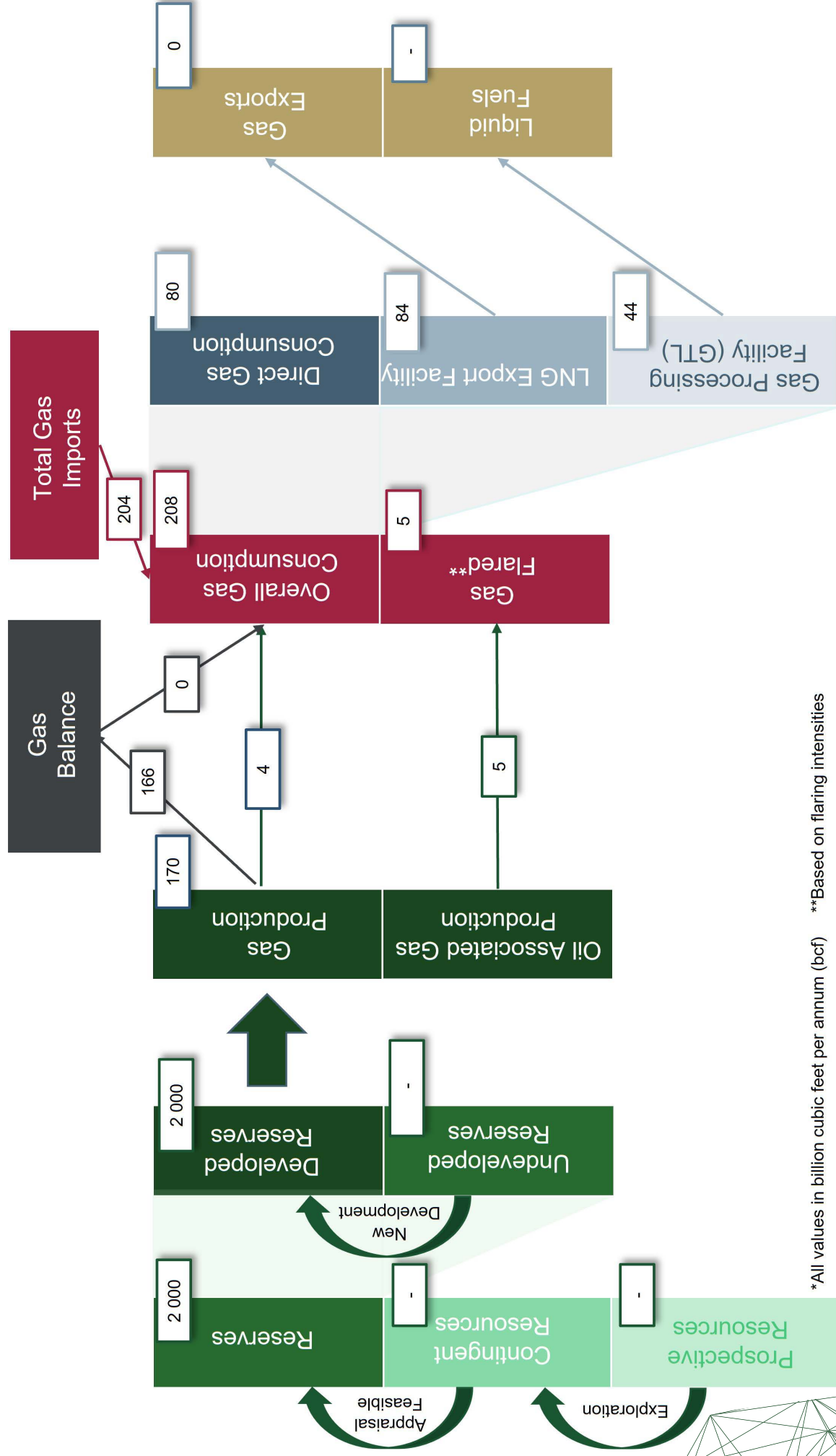


Figure 24. Flow infographic for natural gas: Gabon

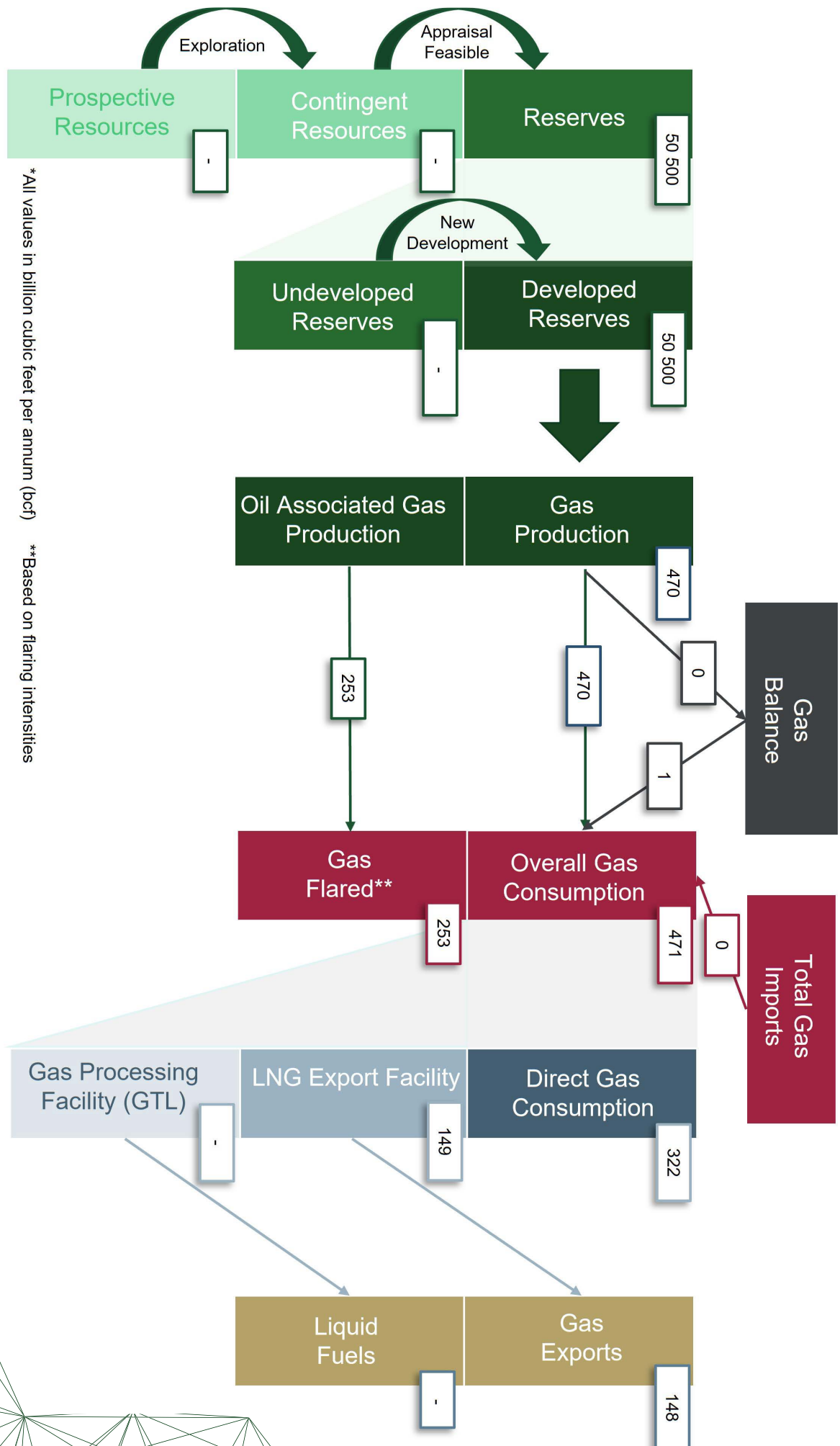
*All values in billion cubic feet per annum (bcf)

**Based on flaring intensities



*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

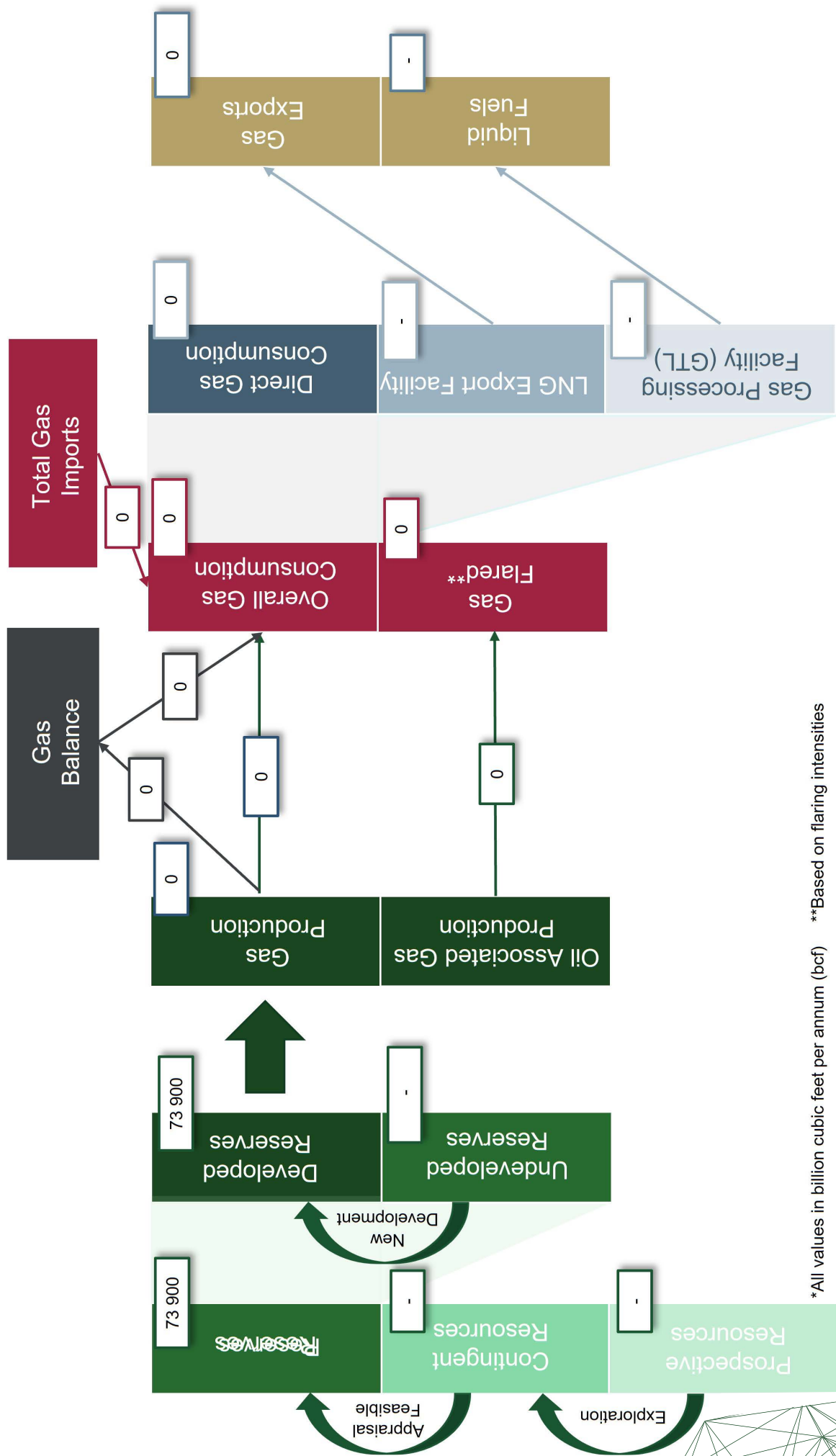
Figure 25 Flow infographic for natural gas: Ghana



*All values in billion cubic feet per annum (bcf)

**Based on flaring intensities

Figure 26 Flow infographic for natural gas: Libya



*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

Figure 27 Flow infographic for natural gas: Mauritania

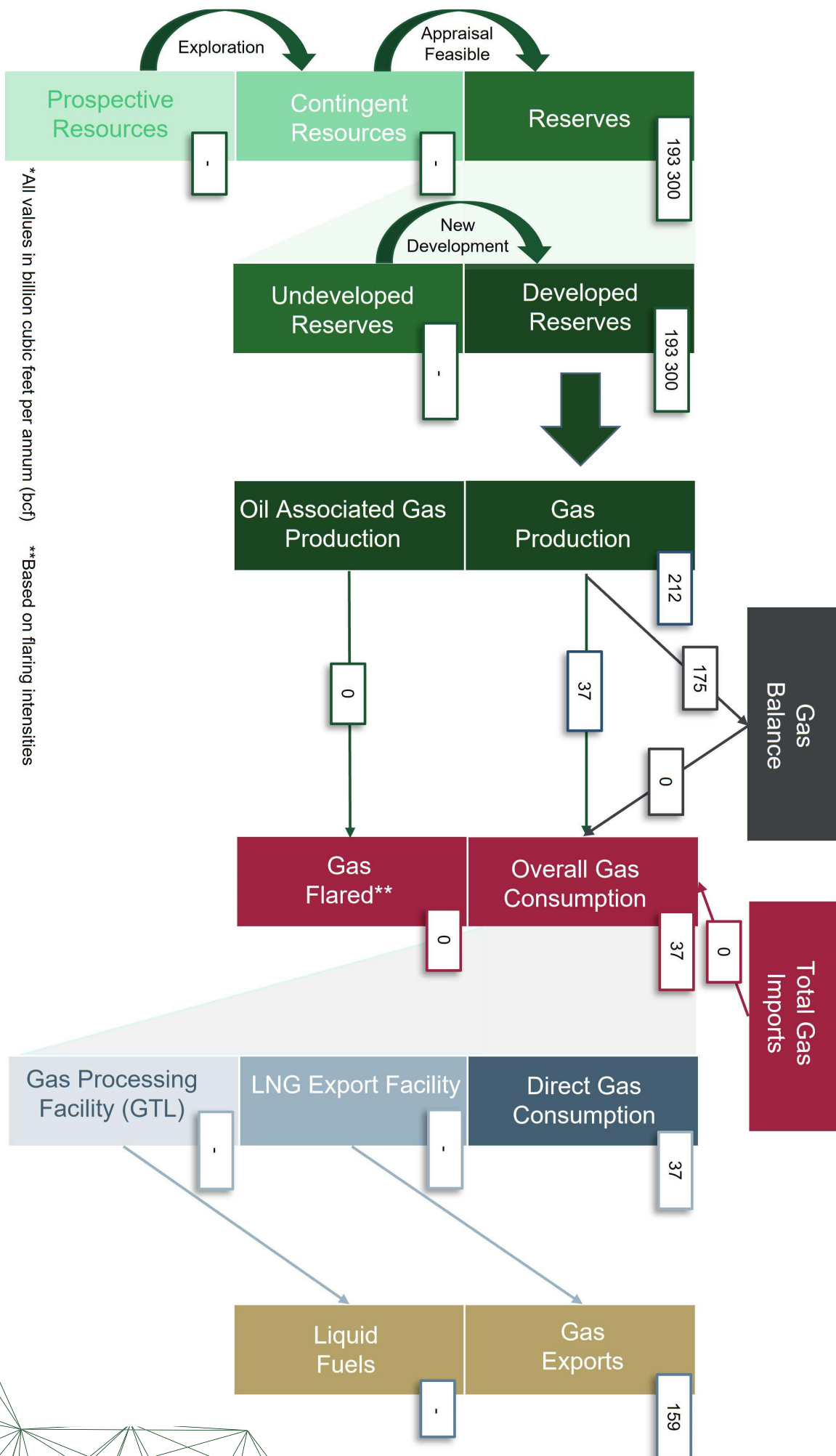
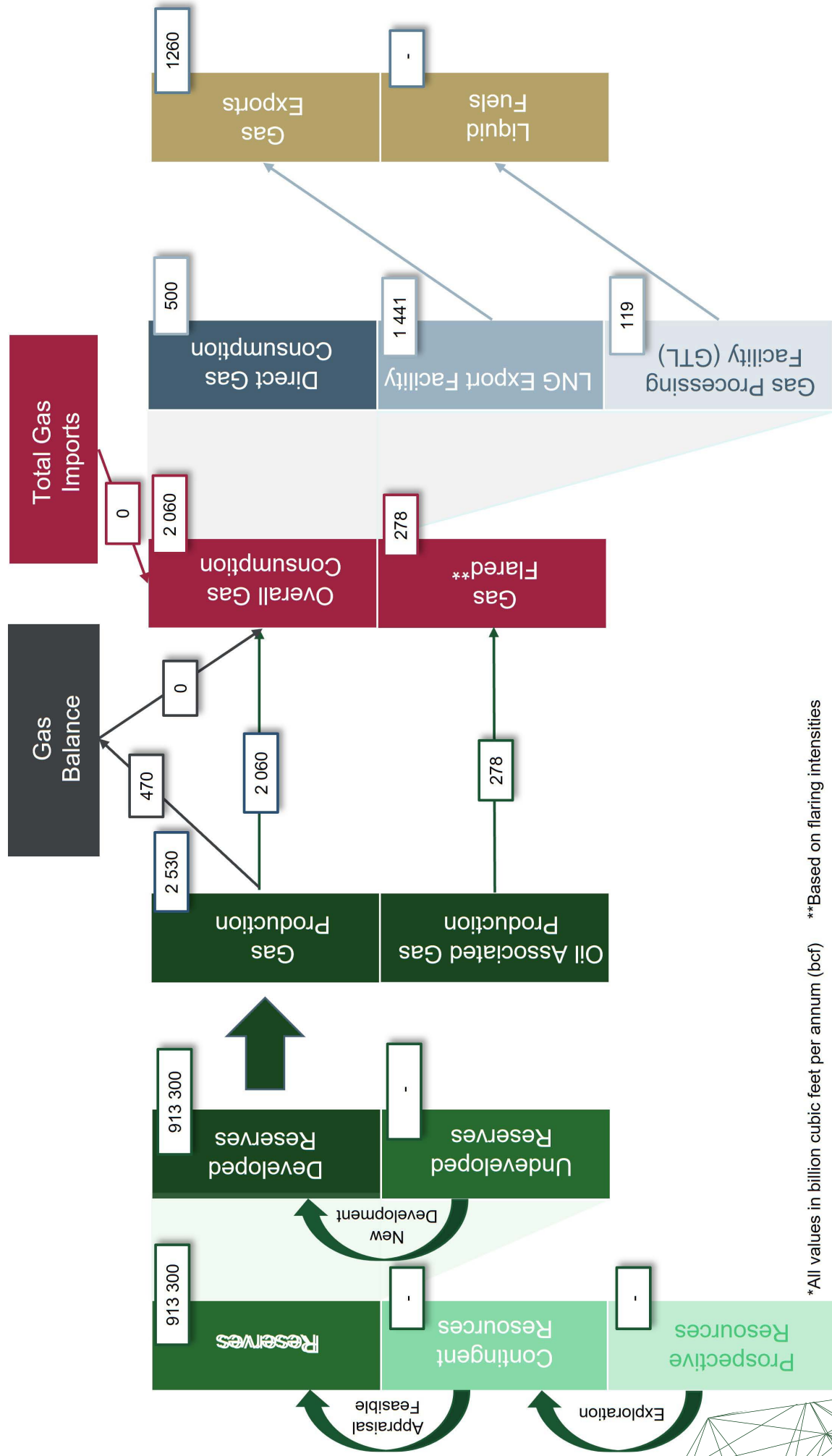


Figure 28 Flow infographic for natural gas: Mozambique

*All values in billion cubic feet per annum (bcf)

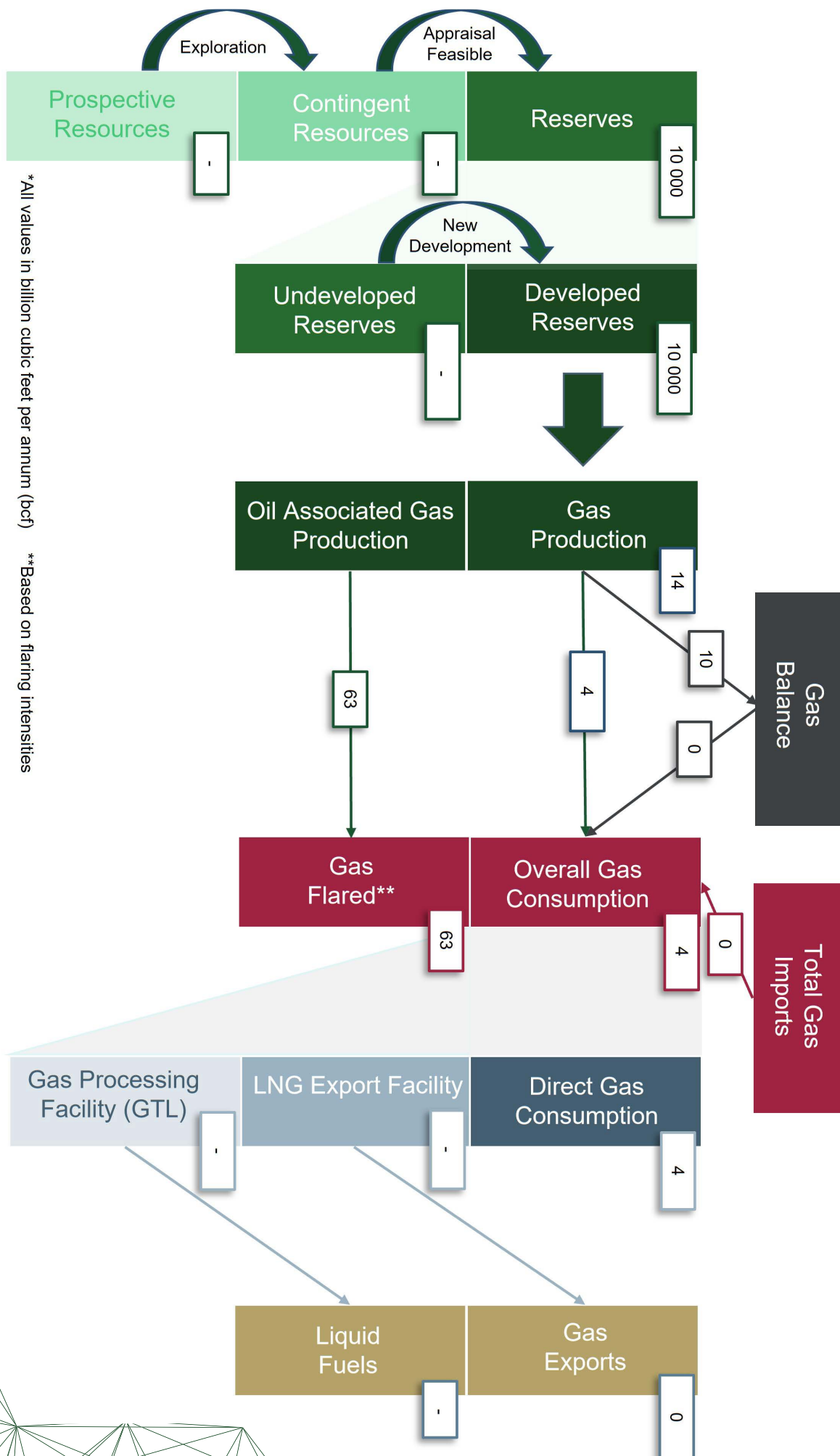
**Based on flaring intensities

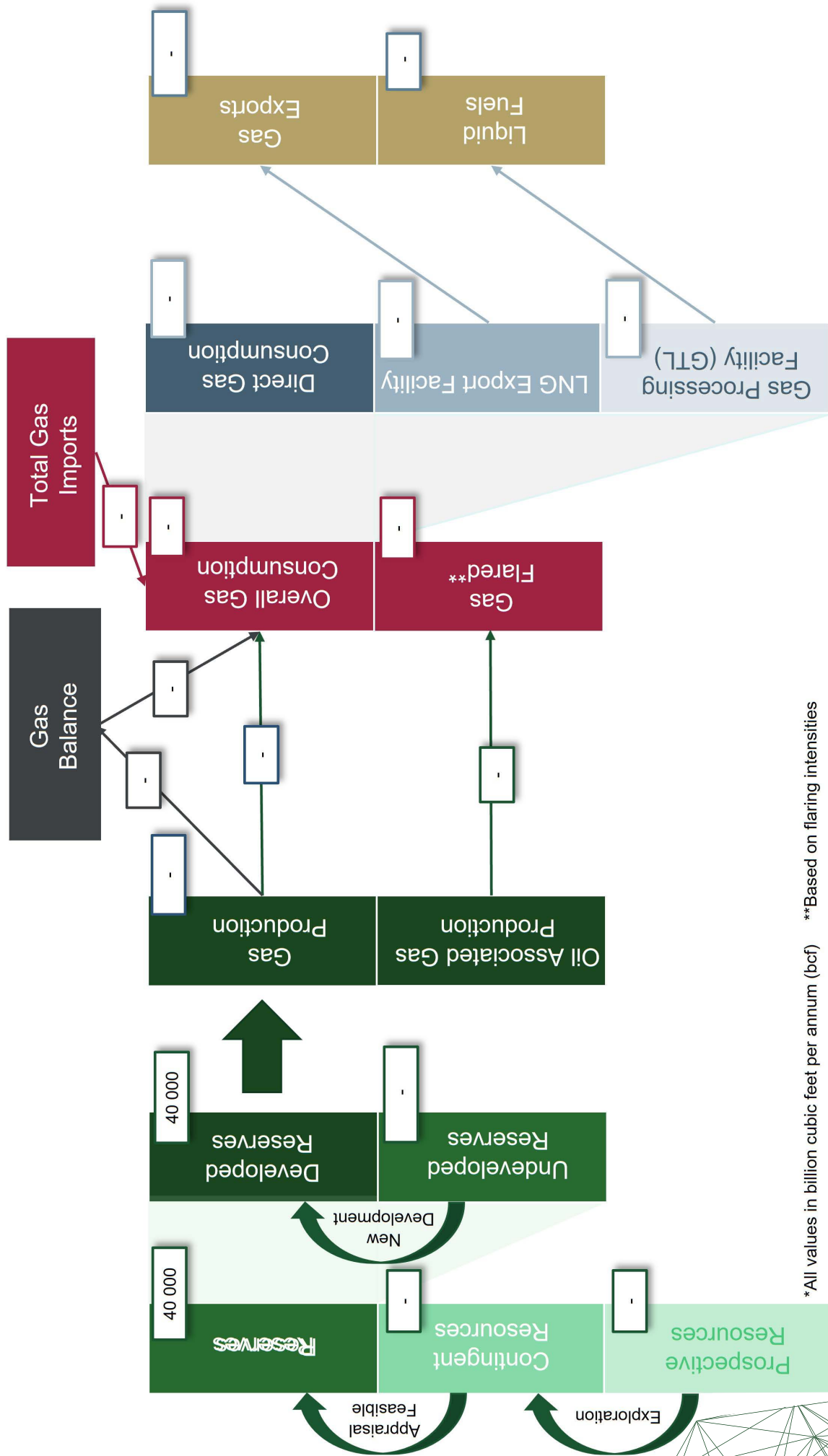


*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

Figure 29 Flow infographic for natural gas: Nigeria

Figure 30 Flow infographic for natural gas: Republic of Congo

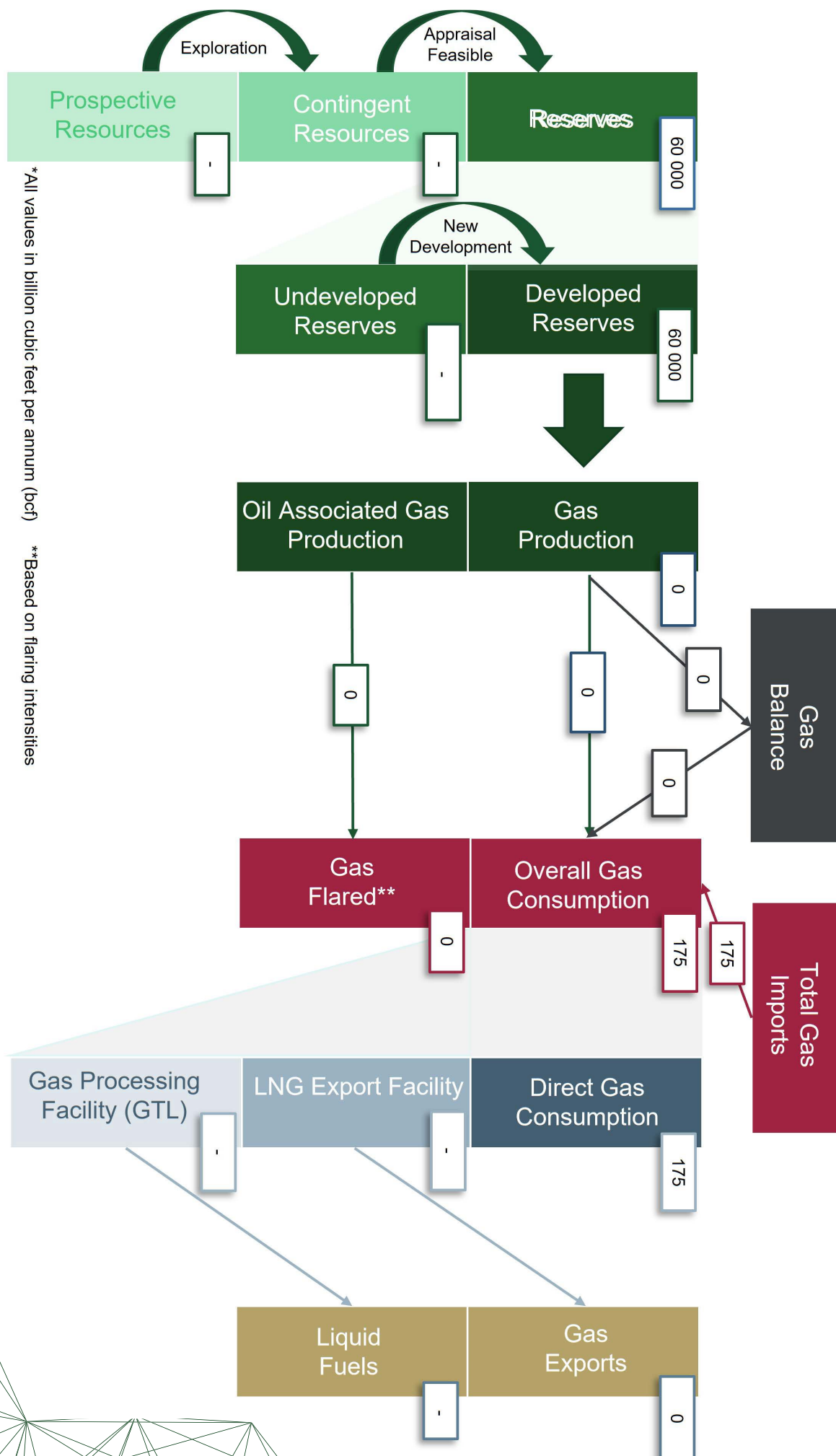


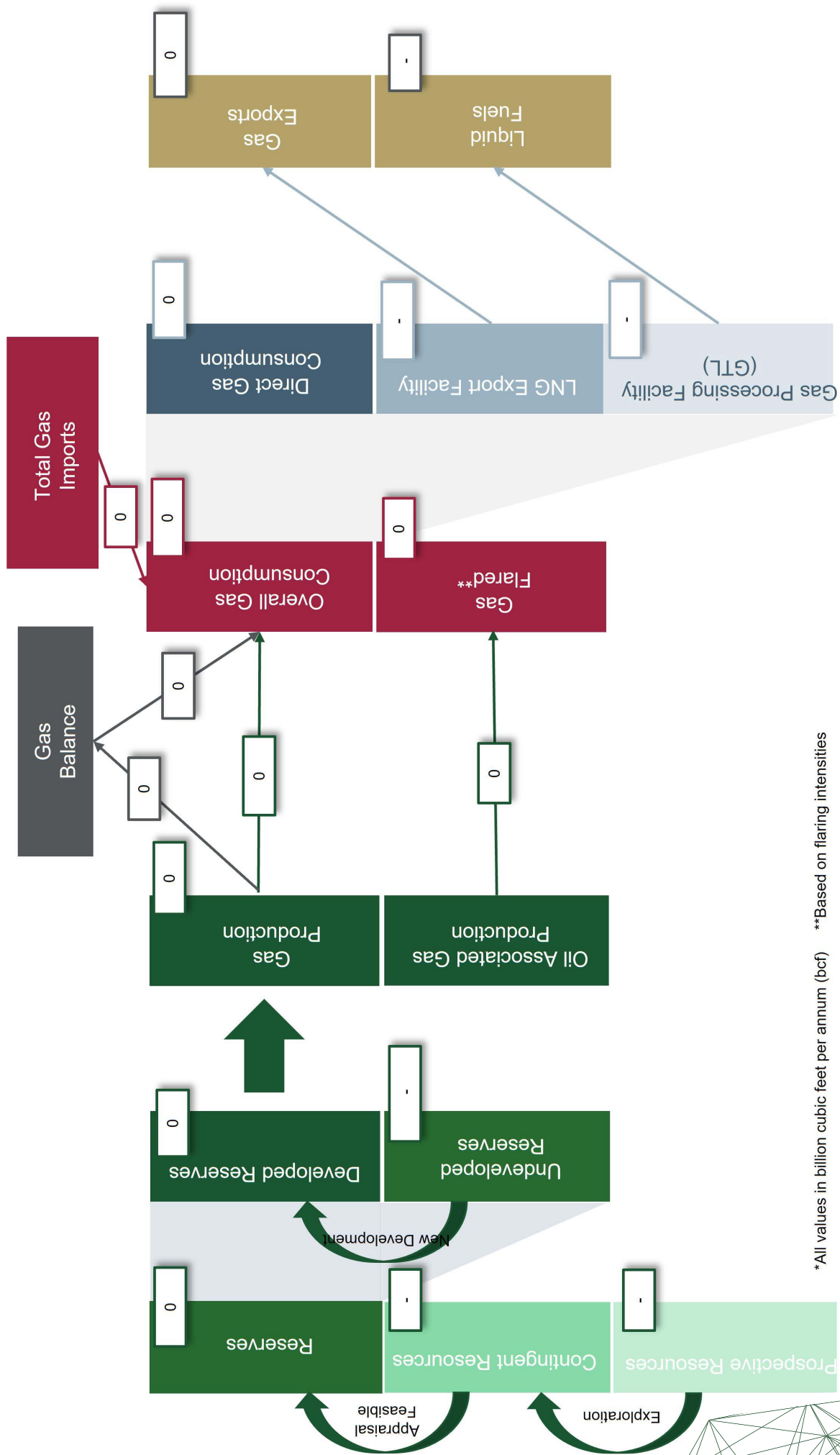


*All values in billion cubic feet per annum (bcf)

Figure 31 Flow infographic for natural gas: Senegal

Figure 32 Flow infographic for natural gas: South Africa

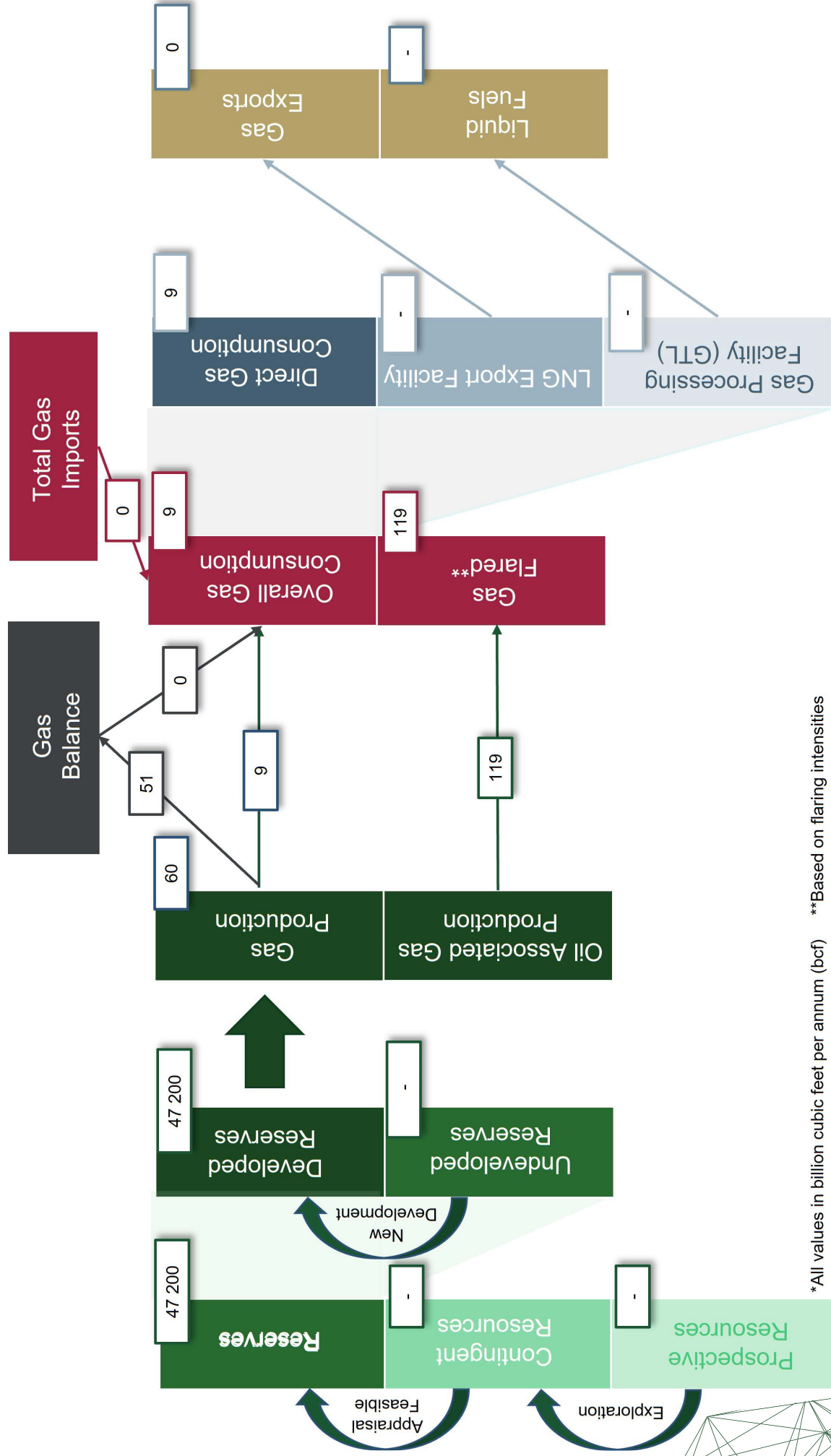




*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

Figure 33 Flow infographic for natural gas: South Sudan

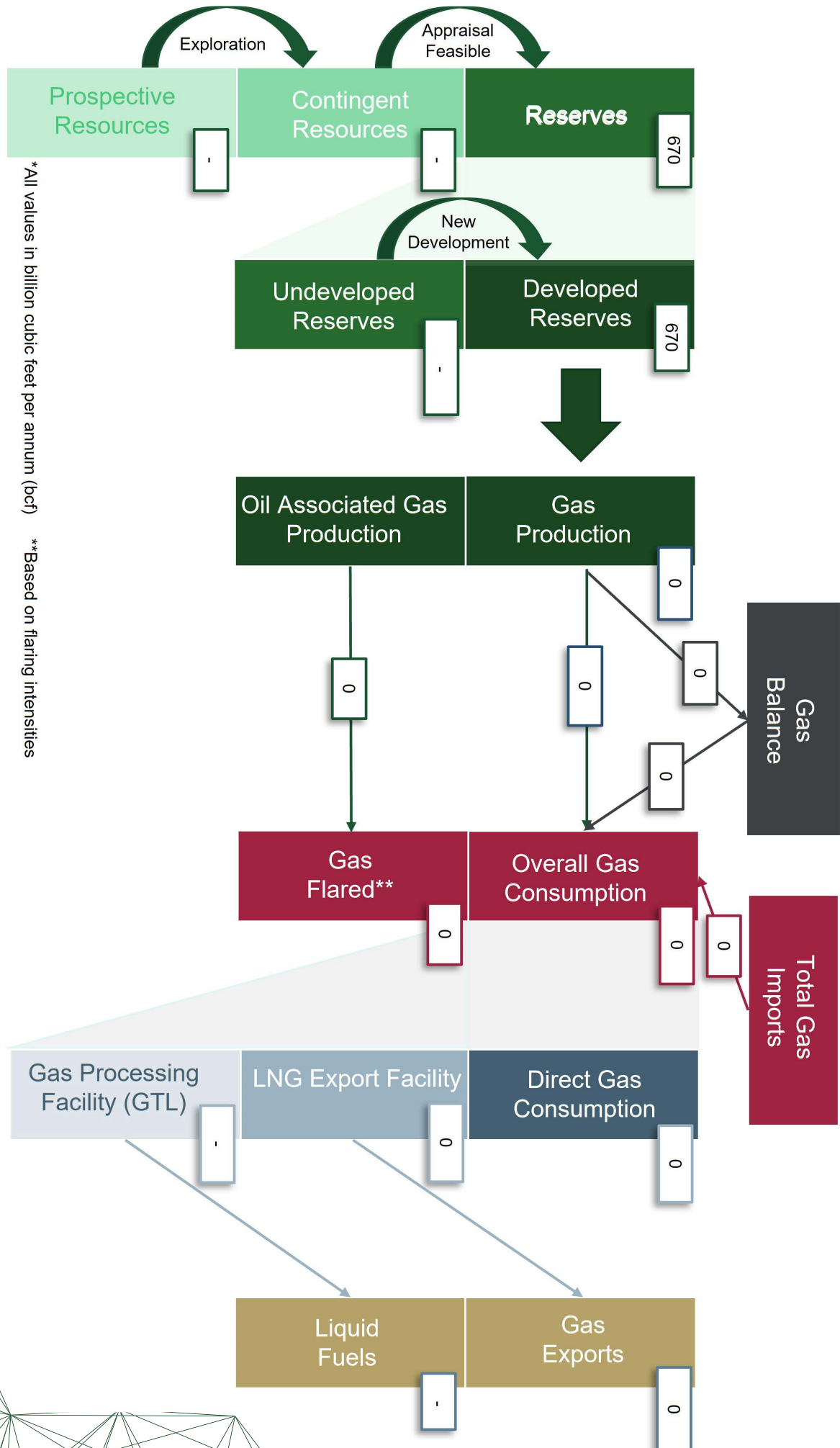




*All values in billion cubic feet per annum (bcf) **Based on flaring intensities

Figure 35 Flow infographic for natural gas: Tanzania

Figure 36 Flow infographic for natural gas: Uganda



Appendix C

Reserve outlook

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1. Short-, Medium- and Long-Term Reserve Outlook

Below is a summary of the expected remaining crude oil and natural gas reserves based on current conditions (2020 production and reserve data).

Please note that the data shown below is only for the countries selected for analysis in this study that were producing in 2020.

1.1 Crude Oil

Crude oil reserves of the producing countries selected for this study have been estimated to be around 123 billion barrels, with the majority

of the reserves located in Northern and Western Africa, as shown in Figure 2.

Oil monopolies, such as Libya in the north, Nigeria in the west, and Angola in the south, may pose a threat to regional security of supply.

The oil fields in Southern Africa are expected to deplete over the medium-term, and the oil fields in Central Africa will gradually deplete over the longer-term, as summarized in

Figure 1. Detailed reserve information regarding each period considered in this study can be found in Figure 3, Figure 4 and Figure 5.

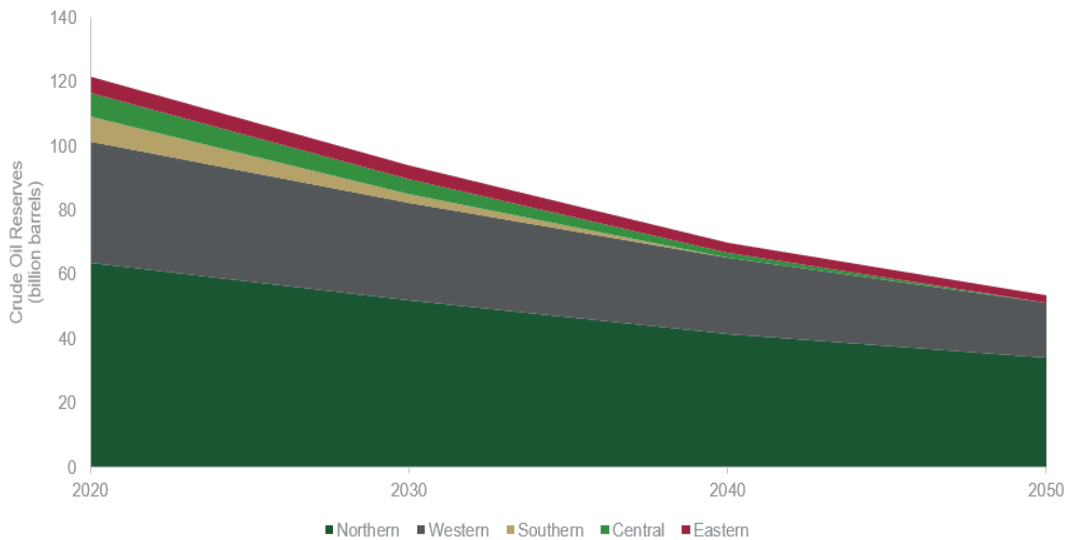


Figure 1 Regional reserve outlook: Crude oil

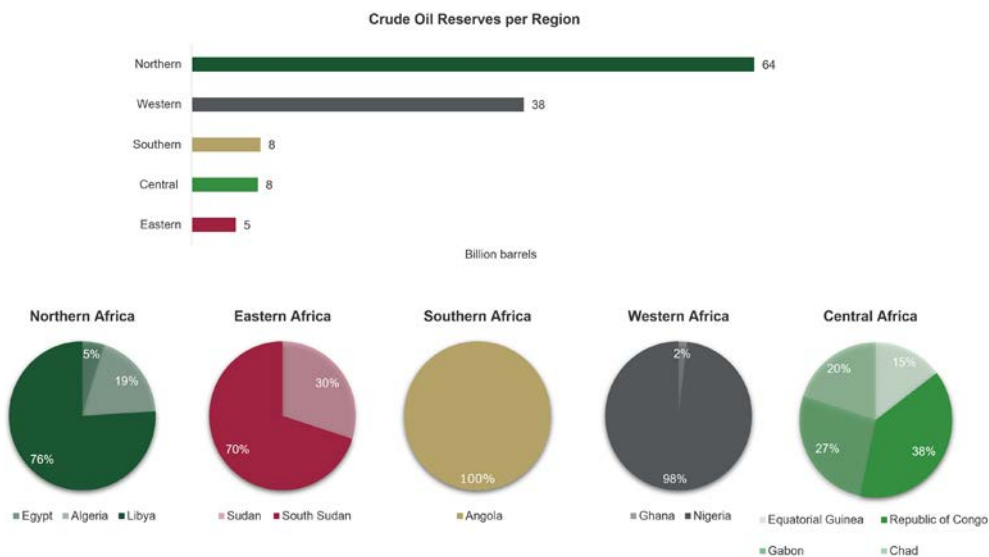


Figure 2 Regional crude oil reserves and weighted breakdown of producing countries: Current

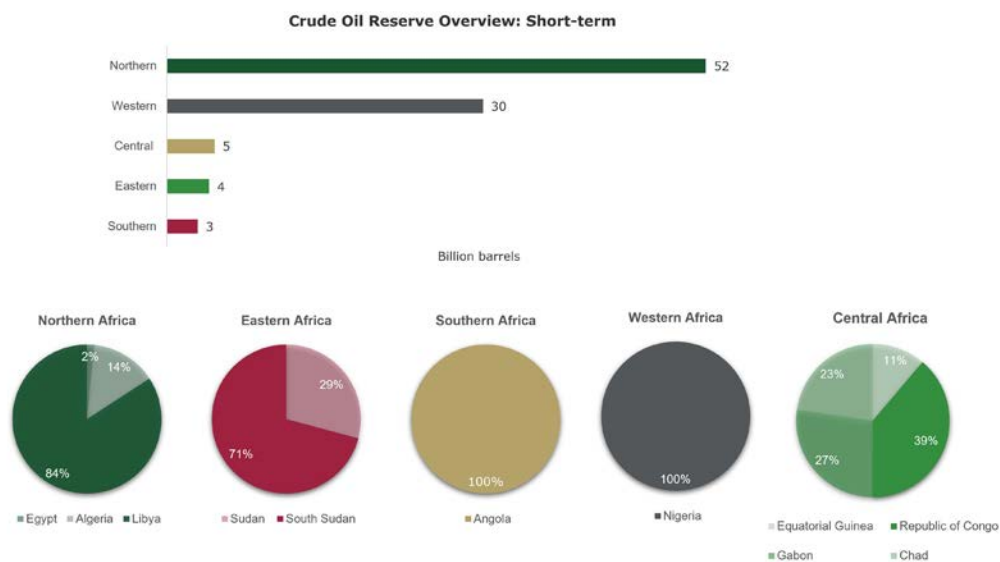


Figure 3 Regional crude oil reserves and weighted breakdown of producing countries: Short-term

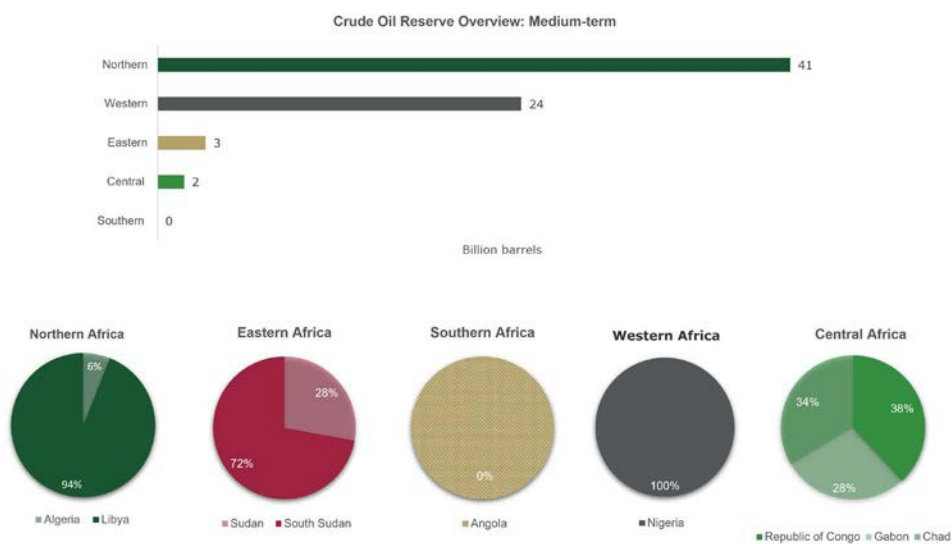


Figure 4 Regional crude oil reserves and weighted breakdown of producing countries: Medium-term

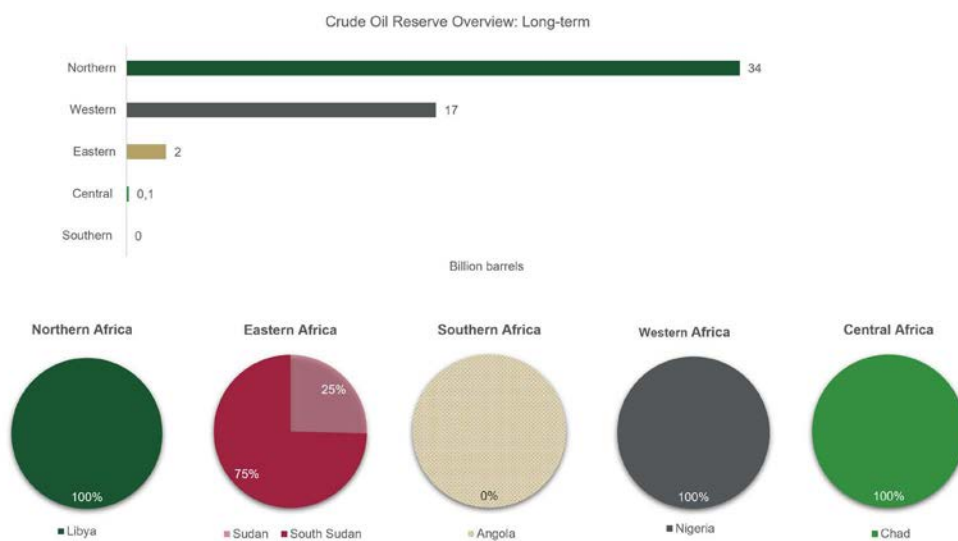


Figure 5 Regional crude oil reserves and weighted breakdown of producing countries: Long-term

1.2 Natural Gas

Figure 7 illustrates the distribution of natural gas reserves in the countries evaluated as part of this study, which are estimated at around 738 tcf, with the highest concentration in Northern, Southern and Western Africa.

Natural gas monopolies, such as Mozambique in the south, Nigeria in the north, Tanzania in the east and the Republic of Congo in Central Africa, may pose a threat to regional security of supply.

In light of the low production volumes on the continent, it is expected that there will be substantial natural gas reserves for the foreseeable future, as summarized in Figure 6. The reserve details regarding each period under consideration are shown in Figure 8, Figure 9 and Figure 10.

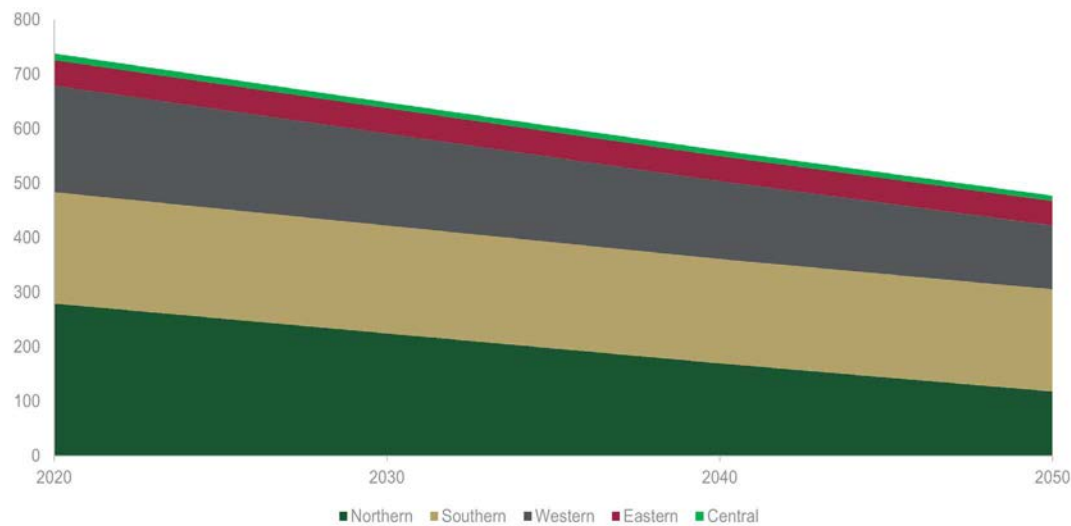


Figure 6 Regional reserve outlook: Natural gas

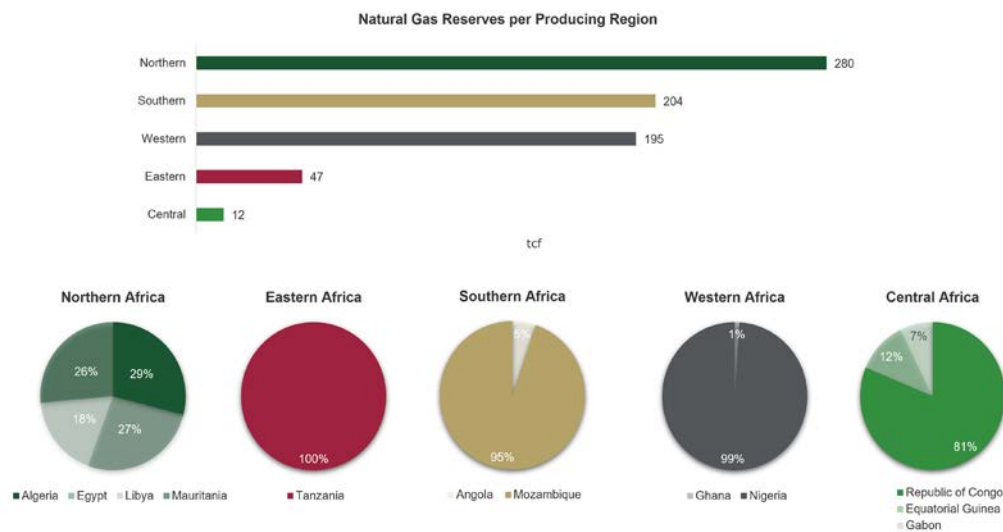


Figure 7 Regional natural gas reserves and weighted breakdown of producing countries: Current

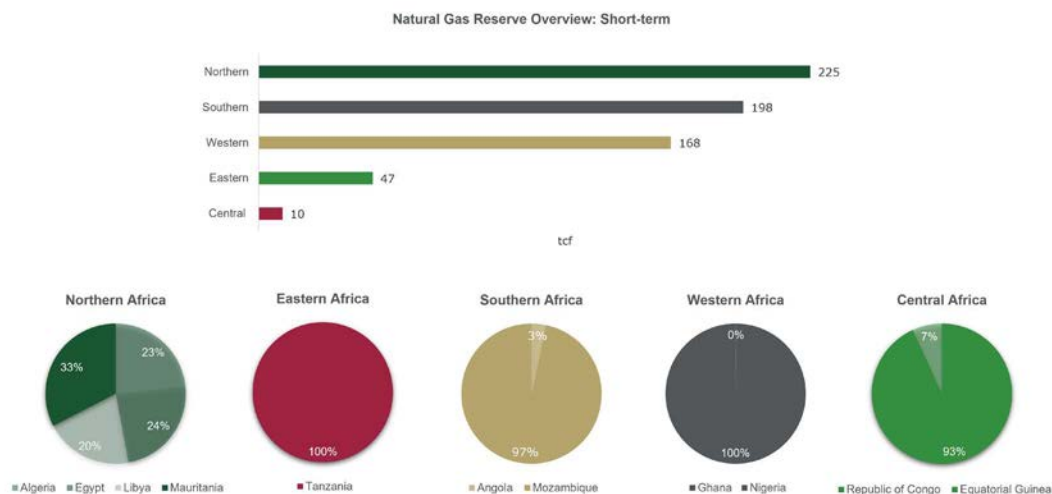


Figure 8 Regional natural gas reserves and weighted breakdown of producing countries: Short-term

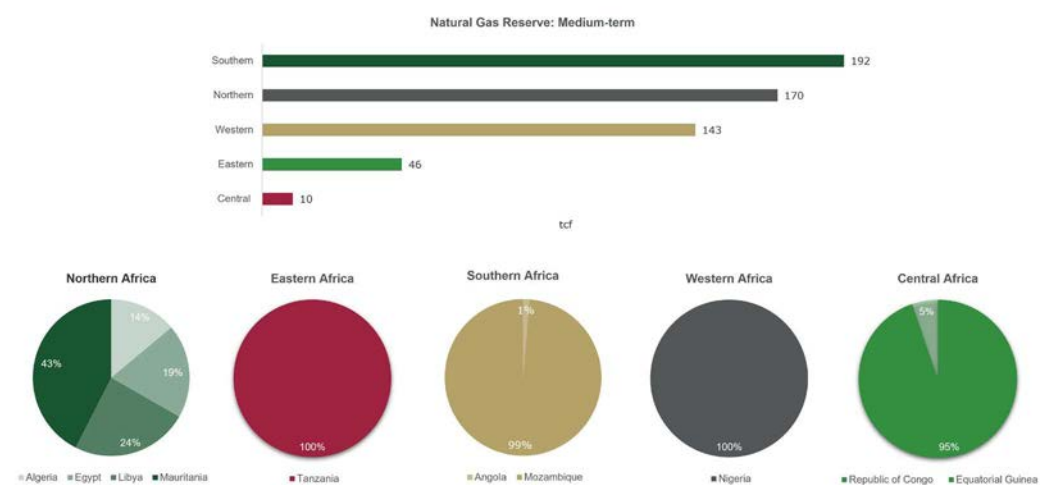


Figure 9 Regional natural gas reserves and weighted breakdown of producing countries: Medium-term

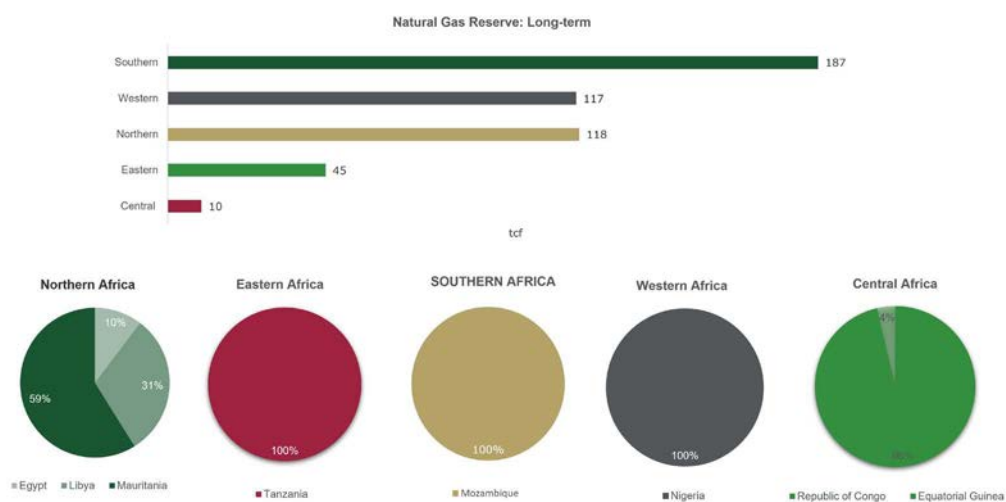


Figure 10 Regional natural gas reserves and weighted breakdown of producing countries: Long-term