



[Countries](#)

Nigeria



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[full report](#)

## Overview

*Nigeria is the largest oil producer in Africa and is among the world's top five exporters of LNG. Despite the relatively large volumes of oil it produces, Nigeria's oil production is hampered by instability and supply disruptions, while the natural gas sector is restricted by the lack of infrastructure to monetize natural gas that is currently flared (burned off).*

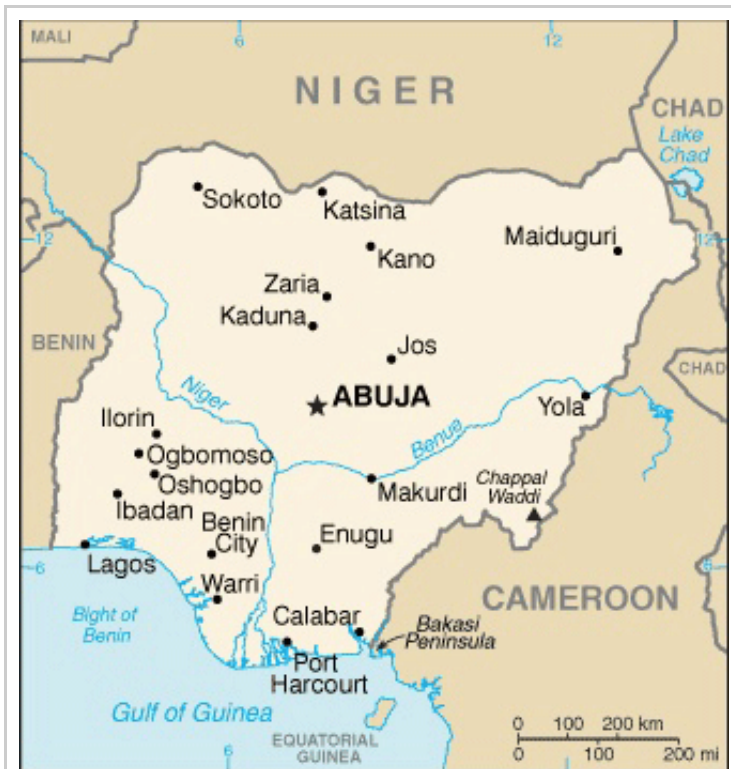
Nigeria is the largest oil producer in Africa, holds the largest natural gas reserves on the continent, and is among the world's top five exporters of liquefied natural gas (LNG). Nigeria became a member of the Organization of the Petroleum Exporting Countries (OPEC) in 1971, more than a decade after oil production began in the oil-rich Bayelsa State in the 1950s.<sup>1</sup> Although Nigeria is the leading oil producer in Africa, production suffers from supply disruptions, which have resulted in unplanned outages as high as 500,000 barrels per day (bbl/d).

Nigeria's oil and natural gas industry is primarily located in the southern Niger Delta area, where it has been a source of conflict. Local groups seeking a share of the wealth often attack the oil infrastructure, forcing companies to declare force majeure on oil shipments (a legal clause that allows a party to not satisfy contractual agreements because of circumstances that are beyond their control). At the same time, oil theft leads to pipeline damage that is often severe, causing loss of production, pollution, and forcing companies to shut in production.

Aging infrastructure and poor maintenance have also resulted in oil spills. Natural gas flaring, the burning of associated natural gas that is produced with oil, has contributed to environmental pollution. Protest from local groups over environmental damages from oil spills and natural gas flaring have exacerbated tensions between some local communities and international oil companies (IOCs). The industry has been blamed for pollution that has damaged air, soil, and water, leading to losses in arable land and decreases in fish stocks.

Nigeria's oil and natural gas resources are the mainstay of the country's economy. The country's oil and natural gas industry typically accounts for 75% of government revenue and 95% of total export revenue.<sup>2</sup> Nigeria's economy is vulnerable to a drop in crude oil prices as it is very dependent on oil revenue. Nigeria's fiscal buffers, the Excess Crude Account

and Sovereign Wealth Fund, include savings generated when oil revenues exceed budgeted revenues. However, those funds declined from US\$11 billion at end-2012 to US\$3 billion at end-2013.<sup>3</sup>



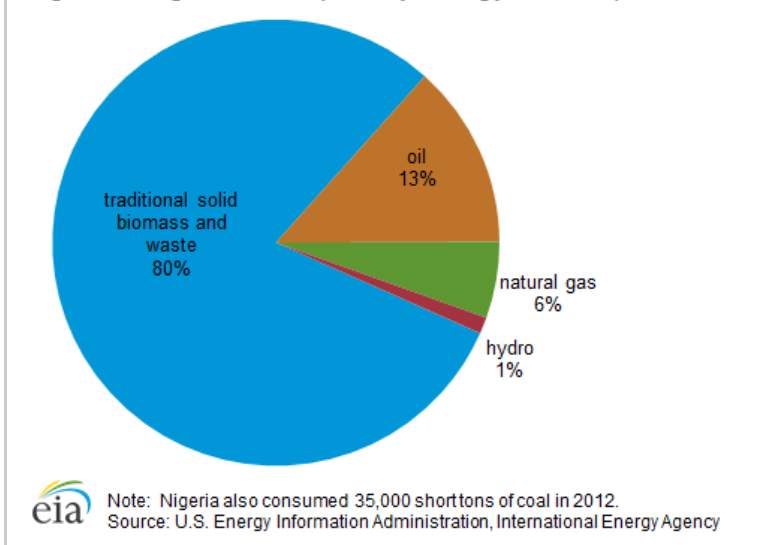
Source: U.S. Department of State

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## Total primary energy consumption

The U.S. Energy Information Administration (EIA) estimates that in 2012 total primary energy consumption in Nigeria was about 4.5 quadrillion British thermal unit (Btu). Of this amount, traditional biomass and waste (typically consisting of wood, charcoal, manure, and crop residues) accounted for 80%. This high share represents the use of biomass to meet off-grid heating and cooking needs, mainly in rural areas. It's important to note that estimates of traditional biomass consumption are imprecise because biomass sources are not typically traded in easily observable commercial markets. The electrification rate in Nigeria is estimated at 41%—leaving approximately 100 million people in Nigeria without access to electricity.<sup>4</sup>

Figure 1. Nigeria's total primary energy consumption, 2012



## Regulation of oil and natural gas industry

*The Petroleum Industry Bill (PIB), which was initially proposed in 2008, is expected to change the organizational structure and fiscal terms governing the oil and natural gas industry if it becomes law. IOCs are concerned that proposed changes to fiscal terms may make some projects commercially unviable, particularly deepwater projects that involve greater capital spending.*

The Nigerian National Petroleum Corporation (NNPC) was created in 1977 to oversee the regulation of the oil and natural gas industry, with secondary responsibilities for upstream and downstream developments. In 1988, the NNPC was divided into 12 subsidiary companies to regulate the subsectors within the industry.<sup>5</sup> The Department of Petroleum Resources, within the Ministry of Petroleum Resources, is another key regulator, focused on general compliance, leases and permits, and environmental standards.<sup>6</sup>

Currently, most of Nigeria's major oil and natural gas projects are funded through joint ventures (JV) between IOCs and NNPC, where NNPC is the majority shareholder. The rest of the projects are managed through production-sharing contracts (PSCs) with IOCs. PSCs are the fiscal regime typically, but not always, governing deepwater projects and contain more attractive terms than those in JV arrangements, which is the fiscal regime typically governing onshore/shallow water projects. PSC terms on deepwater projects tend to be more favorable to incentivize the development of deepwater projects.

NNPC has JV arrangements and/or PSCs with [Shell](#), [ExxonMobil](#), [Chevron](#), [Total](#), and [Eni](#). Other companies active in Nigeria's oil and natural gas industry are Addax Petroleum, Statoil, and several Nigerian companies. IOCs participating in onshore and shallow water oil projects in the Niger Delta region have been affected by the instability in the region. As a result, there has been a general trend for IOCs, particularly Shell, Total, Eni, Chevron, and

ConocoPhillips, to sell their interests in marginal onshore and shallow water oil fields, mostly to Nigerian companies and smaller IOCs, and to focus their investments on deepwater projects and onshore natural gas projects.

The Petroleum Industry Bill (PIB), which was initially proposed in 2008, is expected to change the organizational structure and fiscal terms governing the oil and natural gas industry if it becomes law. IOCs are concerned that proposed changes to fiscal terms may make some projects commercially unviable, particularly deepwater projects that involve greater capital spending. Some of the most contentious areas of the PIB include the potential renegotiation of contracts with IOCs, changes in tax and royalty structures, deregulation of the downstream sector, restructuring of NNPC, a concentration of oversight authority in the Minister of Petroleum Resources, and a mandatory contribution by IOCs of 10% of monthly net profits to the Petroleum Host Communities Fund.

The latest draft of the PIB was submitted to the National Assembly by the Ministry of Petroleum Resources in July 2012. The delay in passing the PIB has resulted in fewer investments in new projects, and there has not been a licensing round since 2007, mainly because of regulatory uncertainty. The regulatory uncertainty has also slowed the development of natural gas projects as the PIB is expected to introduce new fiscal terms to govern the natural gas sector.

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## Petroleum and other liquids

*Nigeria has the second largest amount of proven crude oil reserves in Africa, but reserve estimates have been stagnant as exploration activity has been low. Rising security problems coupled with regulatory uncertainty have contributed to decreased exploration activity.*

According to the *Oil & Gas Journal* (OGJ), Nigeria has an estimated 37 billion barrels of proved crude oil reserves as of January 2015—the second-largest amount in Africa after [Libya](#).<sup>7</sup> The majority of reserves are found along the country's Niger River Delta and offshore in the Bight of Benin, the Gulf of Guinea, and the Bight of Bonny. Current exploration activities are mostly focused in the deep and ultra-deep offshore. NNPC had undertaken onshore exploration activities in northeast Nigeria, within the Chad basin, but the lack of discoveries and the presence of the militant group Boko Haram put exploration at a standstill. Exploration activities in the onshore Niger Delta have decreased because of the rising security problems related to oil theft and pipeline sabotage. Several major IOCs have divested from their onshore assets, which has created opportunity for local Nigerian companies to step in. The investment uncertainties surrounding the long-delayed PIB have also contributed to delayed investment in deepwater projects, and the start dates for these projects have continuously been pushed back.

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## Production and consumption

*Crude oil production in Nigeria reached its peak of 2.44 million bbl/d in 2005, but it began to decline*

*significantly as violence from militant groups surged, forcing many companies to withdraw staff and shut in production. Oil production recovered somewhat after 2009 but still remains lower than its peak level because of ongoing supply disruptions.*

Nigeria produces mostly light, sweet (low sulfur) crude oil of which the vast majority is exported to global markets. Crude oil production in Nigeria reached its peak of 2.44 million bbl/d in 2005, but began to decline significantly as violence from militant groups surged, forcing many companies to withdraw staff and shut in production. The lack of transparency of oil revenues, tensions over revenue distribution, environmental damages from oil spills, and local ethnic and religious tensions created a fragile situation in the oil-rich Niger Delta. By 2009, crude oil production plummeted by more than 25% to average 1.8 million bbl/d.

In late 2009, amnesty was declared, and the militants came to an agreement with the Nigerian government whereby they handed over weapons in exchange for cash payments and training opportunities. The rise in oil production after 2009 was partially because of the reduction in attacks on oil facilities following the implementation of the amnesty program, which allowed companies to repair some damaged infrastructure and bring some supplies back online.

Another major factor that contributed to the upward trend in output was the continued increase in new deepwater offshore production. The government took measures to attract investment in deepwater acreage in the 1990s to boost production capacity and to diversify the location of the country's oil fields. To encourage investments in deepwater areas, which involve higher capital and operating costs, the government offered PSCs in which IOCs received a greater share of revenue as the water depth increased.

In 2014, Nigeria produced 2.4 million bbl/d of petroleum and other liquids, of which 2.0 million bbl/d was crude oil and the remainder was condensate, natural gas plant liquids, and refinery processing gains. Nigeria's 2014 production was slightly higher than in 2013 because of fewer supply disruptions but still lower than previous years. No major oil fields have started production since the 125,000-bbl/d Usan deepwater field came online in February 2012. The 40,000-bbl/d Bonga North West field came online in 2014, helping to offset production declines.

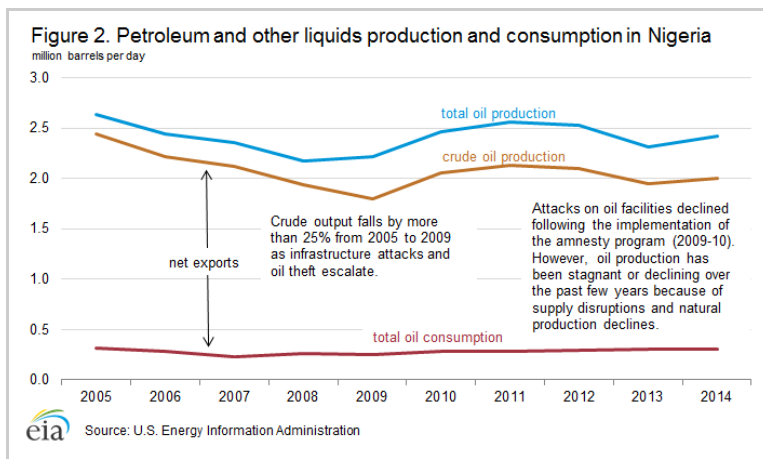
There are several planned deepwater projects in Nigeria that have been repeatedly pushed back because of the delayed passing of the PIB and the uncertainty that new fiscal/regulatory terms will impose on the oil industry. The latest drafts of the PIB have also prompted questions about the commercial viability of deepwater projects under the proposed changes to fiscal terms. Deepwater projects have typically included more favorable fiscal terms than onshore/shallow water projects, but the PIB, if passed into law, is expected to increase the government's share of production revenue coming from deepwater projects. As a result of the uncertainty, only two of nine planned deepwater oil projects have been sanctioned by IOCs, while the rest have not received a final investment decision to develop. The planned deepwater oil projects have the potential to bring online 1.1 million bbl/d of new production over the next five or more years, however, only 23% (260,000 bbl/d) reached the critical development milestone. Additionally, [global crude oil](#)

prices have fallen substantially since mid-2014. If global crude oil prices remain low, this will also exacerbate project delays in Nigeria.

**Table 1. Planned liquid fuels projects in Nigeria**

Project name	Operator	Type	Plateau liquids production (000 bbl/d)	Final investment decision?	Est. start
Dibi Long-Term Project	Chevron	onshore oil	70	yes	2016
Sonam Field Development	Chevron	natural gas project	30	yes	2016
Gbaran-Ubie Phase Two Project	Shell	natural gas project	20	yes	2017
Erha North Phase 2	ExxonMobil	deepwater oil	60	yes	2018+
Egina	Total	deepwater oil	200	yes	2019+
Bonga Southwest and Aparo	Shell	deepwater oil	225	no	2020+
Bonga North	Shell	deepwater oil	100	no	2020+
Zabazaba-Etan	Eni	deepwater oil	120	no	2020+
Bosi	ExxonMobil	deepwater oil	140	no	2020+
Satellite Field Development Phase 2	ExxonMobil	deepwater oil	80	no	2020+
Uge	ExxonMobil	deepwater oil	110	no	2020+
Nsiko	Chevron	deepwater oil	100	no	2020+

Source: U.S. Energy Information Administration based on reports from Chevron Corporation, ExxonMobil, Royal Dutch Shell, Total, and Oil & Gas Journal



## Oil theft

*The instability in the Niger Delta has resulted in significant amounts of shut-in production at onshore and shallow offshore fields, forcing companies to frequently declare force majeure on oil shipments.*

Since the mid-2000s, Nigeria has experienced increased pipeline vandalism, kidnappings, and militant takeovers of oil facilities in the Niger Delta. In the past, the Movement for the Emancipation of the Niger Delta (MEND) was one of the main groups attacking or threatening attacks on oil infrastructure for political objectives, claiming to seek a redistribution of oil wealth and greater local control of the oil sector.

Security concerns have led some oil services firms to pull out of the country and oil workers' unions to threaten strikes over security issues. The instability in the Niger Delta has also resulted in significant amounts of shut-in production at onshore and shallow offshore fields, forcing companies to frequently declare force majeure on oil shipments.

The amnesty program implemented in 2009 led to fewer attacks and supply disruptions in 2009-10, and some companies were able to repair damaged oil infrastructure. However, the lack of progress in job creation and economic development has contributed to increased oil theft and other attacks in recent years.

Nigeria's oil theft and trade business is based on a complex system of networks comprised of domestic, regional, and international actors, involving various people—local youth and communities, professionals such as corrupt bank managers, and high-level elites such as government officials and security force personnel. Oil is stolen at various stages of the production process from upstream to downstream operations—wellheads, manifolds, pipelines, and storage tanks at export terminals. Most oil theft operations typically involve tapping or siphoning oil from a pipeline by a hose and pumping the oil onto barges or small tankers.<sup>8</sup>

Some stolen crude oil is taken to illegal refineries along the Niger Delta's swampy bush areas and the refined products are then sold domestically and regionally. However, the bulk of the crude oil makes its way to international markets. Most of that oil is sold to world markets directly from Nigeria's export terminals, which is known as white collar theft. White



collar theft entails filling tankers (or topping them off) with stolen oil at export terminals or stealing crude from storage tanks and loading it onto trucks. A portion of the global illegally traded oil also involves the transfer of crude oil from small tankers to larger tankers waiting further offshore, also known as ship-to-ship transfers.

Estimates of stolen crude oil vary and can reach as high as 400,000 bbl/d, but some believe that estimate is too high and may include the volume lost in oil spills. It is difficult to measure the volume of stolen crude oil because metering systems are usually at export terminals and, therefore, oil stolen between the wellhead and pipelines is not easily detected.<sup>9</sup> Furthermore, IOCs do not collectively report volumes stolen, so there is no authoritative source for total volumes stolen.

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## Environmental damages

*Poorly maintained, aging pipelines and pipeline sabotage from oil theft have caused oil spills. The oil spills have resulted in land, air, and water pollution, severely affecting surrounding villages by decreasing fish stocks and contaminating water supplies and arable land.*

The Niger Delta region suffers from environmental damage caused by pipeline sabotage from oil theft and also spills from illegal refineries. Poorly maintained, aging pipelines have contributed to oil spills as old pipelines can rupture when they corrode. The amounts spilled because of oil theft versus aging infrastructure and/or operational failures are highly debated among oil companies and environmental and human rights groups.

The oil spills have caused land, air, and water pollution, severely affecting surrounding villages by decreasing fish stocks and contaminating water supplies and arable land. The United Nations Environment Program released a study on Ogoniland and the extent of environmental damage from more than 50 years of oil production in the region. The study confirmed community concerns regarding oil contamination across land and water resources, stating that the damage is ongoing and estimating that it could take 25 to 30 years to repair.<sup>10</sup>

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## Piracy in offshore West Africa

Piracy in West Africa has increased over the past few years, affecting the region's oil industry and naval transportation. Security experts say that the West African coast has become the most dangerous in the world as the amount of piracy incidents has surpassed those in East Africa (particularly around offshore Somalia) and several piracy attacks have resulted in the injury or deaths of crew members. The International Maritime Bureau, an agency that tracks piracy incidents, believes that piracy occurrences are underreported in West Africa's waters because of a fear of more attacks, potential increased insurance costs, and the proprietary information about vessels.<sup>11</sup>

Piracy attacks include armed robbery, kidnapping for ransom, boarding offshore oil platforms, and stealing tankers or siphoning oil from tankers. Piracy in West Africa has



focused more on crude oil and refined product theft compared with piracy in East Africa, which mostly involves kidnapping for ransom. Some oil companies have reported stolen cargoes of crude oil.<sup>12</sup> Some analysts believe that the pirates are from Nigerian militant groups such as the Movement for the Emancipation of the Niger Delta (MEND). One of the major impediments to reducing piracy incidents, particularly those offshore Nigeria, is that the Nigerian government does not allow foreign armed guards in its waters, which was a successful tactic used to curtail piracy in East Africa.<sup>13</sup> According to the United Nation's Operational Satellite Applications Program (UNOSAT), the number of piracy-related attacks in offshore West Africa, particularly the Gulf of Guinea, shows no signs of decreasing, and the attacks have become more violent.<sup>14</sup>

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## Methodology matters

Oil production and supply disruption estimates for Nigeria can vary widely among Nigerian government officials, global consulting firms, and other international organizations. The main reasons underlying the different production estimates are the classification of crude versus condensate and the type of liquids that are included in the total oil supply estimate. The disruption estimates vary because of the methods and definitions used to measure outages.

EIA's total oil (petroleum and other liquids) supply estimates include crude oil, condensate, natural gas plant liquids (ethane, propane, butane, and natural gasoline), and refinery processing gain. Nigeria's total oil production is typically reported differently among groups and depends on what liquid streams are included in the numbers. Furthermore, Nigeria's crude oil production may be reported differently among groups because of the classification of crude versus condensate. A large portion of Nigeria's oil production, about 350,000 to 400,000 bbl/d, may be considered either crude or condensate (the latter has a higher API gravity) depending on the qualification on the API scale. The qualification used to classify crude and condensate can differ among groups.

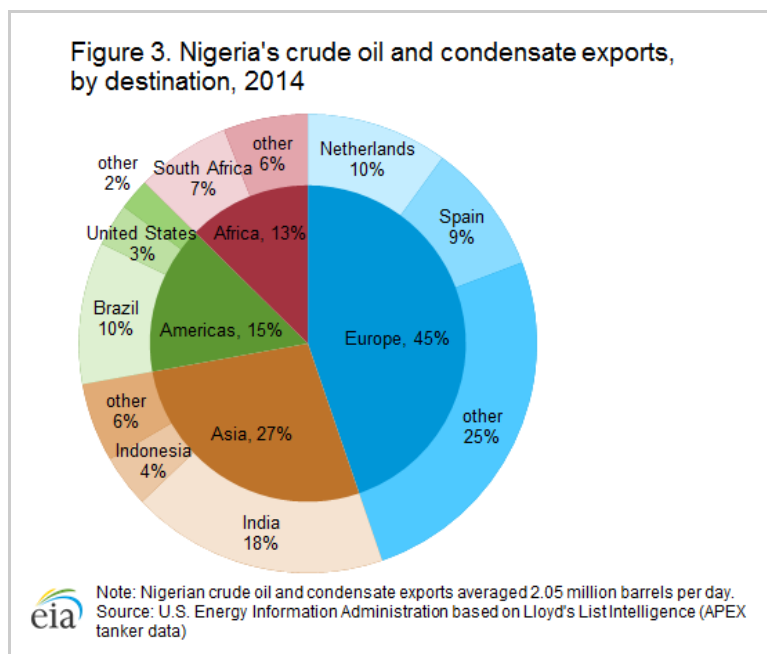
EIA estimates that [unplanned supply outages](#) to Nigeria's oil production typically range from 100,000 to 300,000 bbl/d, although they have reached as high as 500,000 bbl/d in the past. The methodology employed to measure disruptions can be different across sources and largely depends on production capacity estimates. EIA uses the concept of effective production capacity (which takes into account the amount of production that could come back to markets within a year) to measure Nigeria's unplanned outages. Effective capacity takes into account permanent and/or prolonged production loss as a result of the degradation of shut-in oil fields and damages to operational components that would take longer than a year to repair, which is dependent on financial, security, and political situations.

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## Crude oil and condensate exports

*Europe is the largest-regional importer of Nigerian crude oil. In 2014, Europe imported slightly more than 900,000 bbl/d of crude oil and condensate from Nigeria, accounting for 45% of exports.*

In 2014, Nigeria exported 2.05 million bbl/d of crude oil and condensate, according to an analysis of data from Lloyd's List Intelligence (APEX tanker data). The United States traditionally had been the largest importer of Nigerian oil until the last few years. The United States changed from being the largest importer of Nigerian oil in 2012 to the 10th largest in 2014. India is now the largest importer of Nigeria's oil, purchasing about 370,000 bbl/d or 18% of Nigeria's total crude exports in 2014. Europe continued to be the largest-regional importer of Nigerian oil, importing slightly more than 900,000 bbl/d or 45% of the exports in 2014.



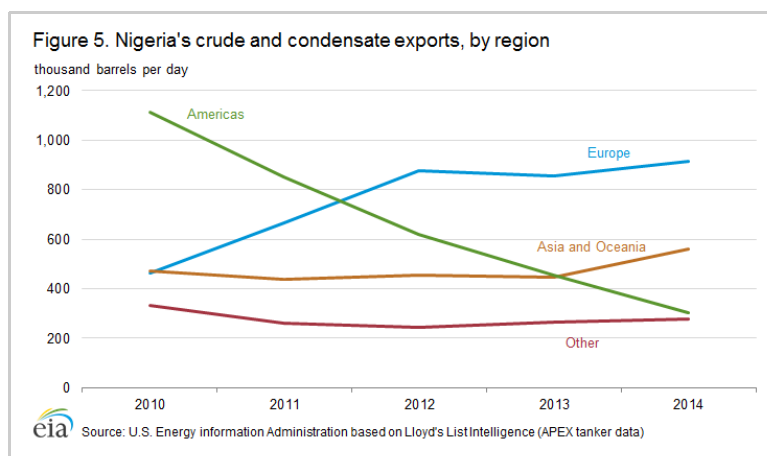
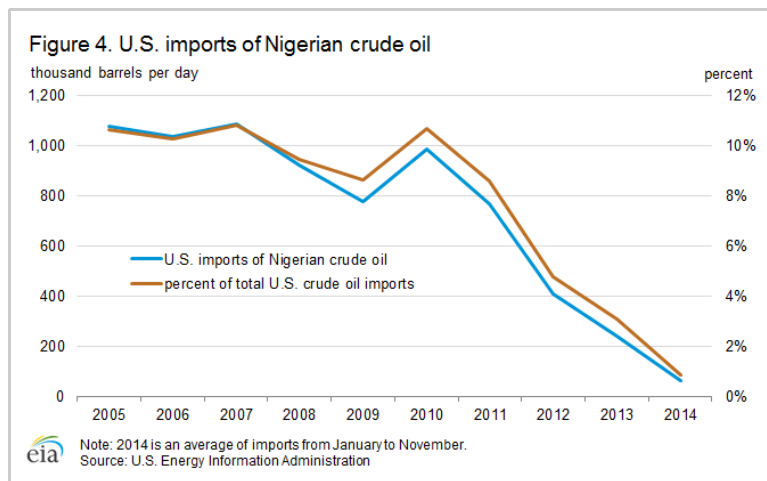
## Trade patterns

*The United States typically imported between 9% and 11% of its crude oil from Nigeria before 2012. However, this share has fallen, and in 2014, U.S. imports of Nigerian crude oil accounted for less than 1% of total U.S. crude oil imports.*

Nigeria in the past has been an important oil supplier to the United States, but the absolute volume and the share of U.S. imports from Nigeria have fallen substantially. The United States imported an average 60,000 bbl/d of crude oil from Nigeria for the first 11 months of 2014, the lowest amount since the United States started importing Nigerian crude in 1973 and more than a 90% drop from the average volume imported in 2010. As a result, Nigeria fell from being the 5th-largest foreign oil supplier to the United States in 2011 (accounting for 9% of U.S. crude imports) to the 10th in 2014 (accounting for less than 1% of U.S. crude imports). The growth in U.S. light, sweet crude oil production from the Bakken and Eagle Ford has resulted in a sizable decline in U.S. imports of crude grades of similar quality, such as Nigeria's crude oil.

As U.S. imports of Nigerian oil decreased over the past few years, European imports increased. European imports of Nigerian crude and condensate increased year-over-year

by more than 40% in 2011 and by 30% in 2012, making Europe the largest regional importer of Nigerian oil by far. The European embargo on Iranian crude imports and sporadic supply disruptions in Libya contributed to Europe's increased oil imports from Nigeria.



## Oil consumption and refining

*Nigeria has a crude oil distillation capacity of 445,000 bbl/d. Despite having a refinery nameplate capacity that exceeds domestic demand, the country must import petroleum because refinery utilization rates are low.*

Nigeria consumed 305,000 bbl/d of petroleum in 2014. The country has four oil refineries (Port Harcourt I and II, Warri, and Kaduna) with a combined crude oil distillation capacity of 445,000 bbl/d, according to OGJ.<sup>15</sup> The refineries chronically operate below full capacity because of operational failures, fires, and sabotage mainly on the crude pipelines feeding the refineries. The combined refinery utilization rate was 22% in 2013.<sup>16</sup> As a result, the country must import petroleum, although its refinery nameplate capacity exceeds domestic demand. Nigeria imported 164,000 bbl/d of petroleum products in 2013.<sup>17</sup>

For several years, the Nigerian government has planned the construction of new refineries,

but the lack of financing and government policies on fuel subsidies have caused delays. A Nigerian company, the Dangote Group, plans to construct a \$11 billion, 500,000 bbl/d refinery near Lagos, Nigeria's most populous city. Plans for the refinery complex include petrochemical and fertilizer plants. The refinery is expected to come online by mid-2018.<sup>18</sup> If the refinery is built, it will be the largest in Africa.

A controversial component of the draft PIB is the potential plan to privatize the refining sector and liberalize domestic fuel prices by removing subsidies. There was a proposal to the federal government to privatize the refining sector in late 2013, but the federal government did not approve it. The country's two main oil workers unions had threatened to go on strike if the refineries were sold.<sup>19</sup>

### **Fuel subsidies**

According to an article from [Brookings](#), Nigeria's fuel subsidies cost \$8 billion in 2011, accounting for 30% of the government's expenditure, about 4% of GDP, and 118% of the capital budget.<sup>20</sup>

On January 1, 2012, the Nigerian government removed the federal government fuel subsidy on the grounds that it caused market distortions, encumbered investment in the downstream sector, supported economic inequalities (as rich fuel-importing companies were the main beneficiaries), and created a nebulous channel for fraud. However, the government quickly reversed course about two weeks later and reinstated a partial subsidy as public outcry and massive strikes organized by oil and non-oil unions threatened to shut down oil production. Many Nigerians consider the fuel subsidy a key benefit of living in the oil-rich country.

Controversy over Nigeria's fuel subsidy program resurfaced shortly after the partial removal, and there have been government-led investigations into corruption and mismanagement. A report by a Presidential Commission put the revenue losses associated with embezzlement and mismanagement of the fuel subsidy program at about \$1.1 billion.<sup>21</sup> Tensions between Nigerian fuel importers and the government were also high because the government launched an investigation of the industry to mitigate subsidy mismanagement. The investigation led to the arrest of several marketers and the suspension of companies that were accused of siphoning funds and inflating prices.

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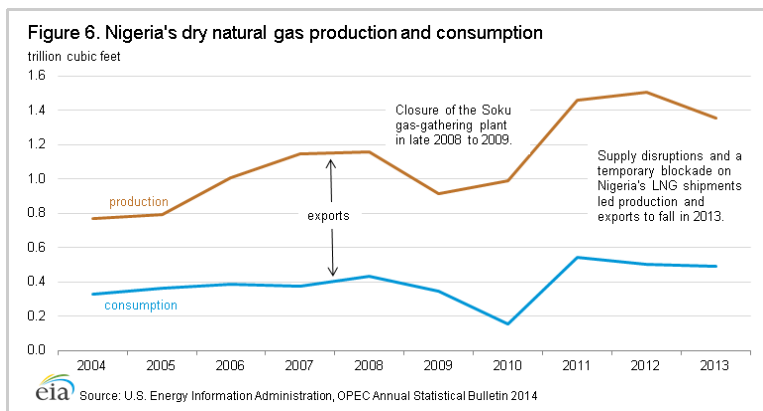
## **Natural gas**

*Nigeria is the largest holder of proved natural gas reserves in Africa and the ninth-largest holder in the world. Nigeria produced 1.35 Tcf of dry natural gas in 2013, ranking among the world's top 30 largest natural gas producers. Natural gas production is constrained by the lack of infrastructure to monetize natural gas that is currently being flared.*

Nigeria had an estimated 180 trillion cubic feet (Tcf) of proved natural gas reserves as of January 2015, according to OGP, making Nigeria the ninth-largest natural gas reserve

holder in the world and the largest in Africa.<sup>22</sup> Despite holding a global top-10 position for proved natural gas reserves, Nigeria produced 1.35 Tcf of dry natural gas in 2013, ranking among the world's top 30 largest natural gas producers. Natural gas production is constrained by the lack of infrastructure to monetize natural gas that is currently being flared. Most natural gas reserves are located in the Niger Delta. The natural gas industry is also affected by the same security and regulatory issues that affect the oil industry.

Dry natural gas production in Nigeria grew for most of the past decade until Shell declared a force majeure on natural gas supplies to the Soku gas-gathering and condensate plant in November 2008. The Soku plant provides a substantial amount of feed gas to Nigeria's sole LNG facility. Shell shut down the plant to repair damages to a pipeline connected to the Soku plant that was sabotaged by local groups siphoning condensate. The plant reopened nearly five months later, but it was shut down again for most of 2009 for operational reasons. As a result, the plant's closure led to a reduction in Nigeria's natural gas production, particularly from Shell's fields in the Niger Delta, and a decline in LNG exports in 2009. Natural gas production gradually grew after 2009, and it reached its highest level of 1.5 Tcf in 2012. In 2013, production fell by 10% to 1.35 Tcf because of supply disruptions and a temporary blockade on Nigeria's LNG shipments, which also led to a corresponding fall in exports and, to a lesser extent, domestic consumption. Nigeria consumed 490 billion cubic feet (Bcf) of dry natural gas in 2013, about 36% of its production.



## Natural gas flaring

*Natural gas flared in Nigeria accounted for 10% of the total amount flared globally in 2011. Gas flaring in Nigeria has decreased in recent years, from 540 Bcf in 2010 to 428 Bcf in 2013. There are a number of recently developed and upcoming natural gas projects that are focused on monetizing the natural gas that is currently flared.*

A significant amount of Nigeria's gross natural gas production is flared (burned off) because some of Nigeria's oil fields lack the infrastructure needed to capture the natural gas produced with oil, known as associated gas. In 2013, Nigeria flared 428 Bcf of its associated gas production, or 15% of its gross production.<sup>23</sup> According to the U.S. National Oceanic and Atmospheric Administration (NOAA), natural gas flared in Nigeria accounted for 10% of the total amount flared globally in 2011.<sup>24</sup>

The amount of gas flared in Nigeria has decreased in recent years, from 540 Bcf in 2010 to 428 Bcf in 2013. According to Shell, one of the largest gas producers in the country, the impediments to decreasing gas flaring have been the security situation in Niger Delta and the lack of partner funding that has slowed progress on projects to capture associated gas. The company recently reported that it was able to reduce the amount of gas it flared in 2012 because of improved security in some Niger Delta areas and stable co-funding from partners, which allowed Shell to install new gas-gathering facilities and repair existing facilities damaged during the militant crisis of 2006 to 2009. Shell also plans to develop the Forcado Yokri Integrated Project and the Southern Swamp Associated Gas Gathering Project to reduce gas flaring.<sup>25</sup>

The Nigerian government has been working to end gas flaring for several years, but the deadline to implement the policies and fine oil companies has been repeatedly postponed, with the most recent deadline being December 2012. In 2008, the Nigerian government developed a Gas Master Plan that promoted investment in pipeline infrastructure and new gas-fired power plants to help reduce gas flaring and provide more gas to fuel much-needed electricity generation. However, progress is still limited because security risks in the Niger Delta have made it difficult for IOCs to construct infrastructure that would support gas monetization.

**Table 2. Planned natural gas projects in Nigeria**

<b>Project name</b>	<b>Operator</b>	<b>Plateau natural gas production (MMcf/d)<sup>1</sup></b>	<b>Final investment decision?</b>	<b>Est. start</b>
Sonam Field Development	Chevron	215	yes	2016
Forcados Yokri Integrated Project <sup>2</sup>	Shell	65	yes	2017
Southern Swamp Associated Gas <sup>2</sup>	Shell	45	yes	2017
Gbaran-Ubie Phase Two Project	Shell	800	yes	2017
Bonga Southwest and Aparo	Shell	15	no	2020+
Bonga North	Shell	60	no	2020+
Bosi	ExxonMobil	260	no	2020+
Uge	ExxonMobil	20	no	2020+

<sup>1</sup>MMcf/d is million cubic feet per day.

<sup>2</sup>Units are in barrels of oil equivalent per day (boe/d) for the Forcados and Southern Swamp projects.

Source: U.S. Energy Information Administration based on reports from Chevron Corporation, ExxonMobil, and Royal Dutch Shell

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## Gas-to-liquids (TL)

A Chevron-operated Escravos GTL project is currently underway, albeit about a decade behind schedule. Chevron (75%) and NNPC (25%) are jointly developing the \$10 billion facility. Sasol Chevron, a joint venture between South Africa's Sasol and Chevron, provided technical expertise to design and develop the GTL plant. The project started small-scale production in mid-2014, but full production is expected to start in mid-2015.<sup>26</sup> The project will convert 325 MMcf/d of natural gas into 33,200 bbl/d of liquids, principally synthetic diesel for cars and trucks.<sup>27</sup>

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## LNG and pipeline exports

*Nigeria exported about 800 Bcf of LNG in 2013, accounting for about 7% of globally traded LNG and ranking Nigeria among the world's top five LNG exporters. Japan is the largest importer of Nigerian LNG and received 23% of the total in 2013.*

Nigeria exports the vast majority of its natural gas in the form of LNG, and a small amount is exported via the West African Gas Pipeline (WAGP) to nearby countries. The pipeline was shut down from August 2012 to July 2013 for repairs after it had been severed by a ship's anchor in the Togolese waters. As a result, natural gas exports via WAGP fell from 29 Bcf in 2011 to 14 Bcf in 2012, but recovered to 21 Bcf in 2013, according to Cedigaz data.<sup>28</sup> The WAGP operates at about one-third of its capacity.

Nigeria exported about 800 Bcf of LNG in 2013, ranking Nigeria among the world's top five LNG exporters, along with [Qatar](#), [Malaysia](#), [Australia](#), and [Indonesia](#).<sup>29</sup> Estimates of Nigeria's LNG exports vary among sources, with the BP 2014 Statistical Review of World Energy placing it at almost 800 Bcf in 2013 and the OPEC Annual Statistical Bulletin estimating it at 866 Bcf in 2013. Nigeria's LNG exports accounted for about 7% of globally traded LNG. [Japan](#) is the largest importer of Nigerian LNG and imported 23% of the total in 2013, followed by [South Korea](#) (17%) and Spain (14%).

Trade patterns for Nigerian LNG have changed over the past few years. Most notably, Nigeria's LNG exports to Europe have decreased significantly. In 2010, Europe imported about 67% of total Nigerian LNG exports, but in 2013, that share dropped to 31%. Nigeria has increased its LNG exports to Asia, namely Japan, following the Fukushima nuclear incident in March 2011. Japan's imports of Nigerian LNG were six times the 2010 level by 2013.<sup>30</sup>



U.S. LNG imports from Nigeria have declined substantially, similar to the trend in U.S. crude oil imports. U.S. imports from Nigeria peaked at 57 Bcf in 2006 and fell to 2 Bcf in 2011, mostly as a result of growing U.S. natural gas production. In 2012, the United States did not import LNG from Nigeria for the first time since 1999. In 2013, the U.S. resumed imports from Nigeria, receiving 2.5 Bcf of LNG.

### **Bonny LNG facility**

The Nigeria's LNG facility on Bonny Island is Nigeria's only operating LNG plant. It is operated by Nigeria LNG Limited (NLNG) and its partners include NNPC (49%), Shell (25.6%), Total (15%), and Eni (10.4%).<sup>31</sup> NLNG currently has six liquefaction trains with a production capacity of 22 million tons per year (1,056 Bcf/y) of LNG and 4 million tons per year (80,000 bbl/d) of liquefied petroleum gas. A seventh train is planned to increase the facility's LNG capacity to more than 30 million tons per year (1,440 Bcf/y).<sup>32</sup>

### **Planned: Brass LNG facility**

Brass LNG Limited, a consortium made up of NNPC, Total, and Eni, is developing the Brass LNG Liquefaction Complex. ConocoPhillips was a partner in the consortium but divested from the project in mid-2014 and transferred its shareholder interest to the other members.<sup>33</sup> The LNG facility is expected to have two liquefaction trains with a total capacity of 10 million tons per year (480 Bcf/y). The project is in the early engineering phase and is running several years behind schedule.<sup>34</sup>

### **West African Gas Pipeline**

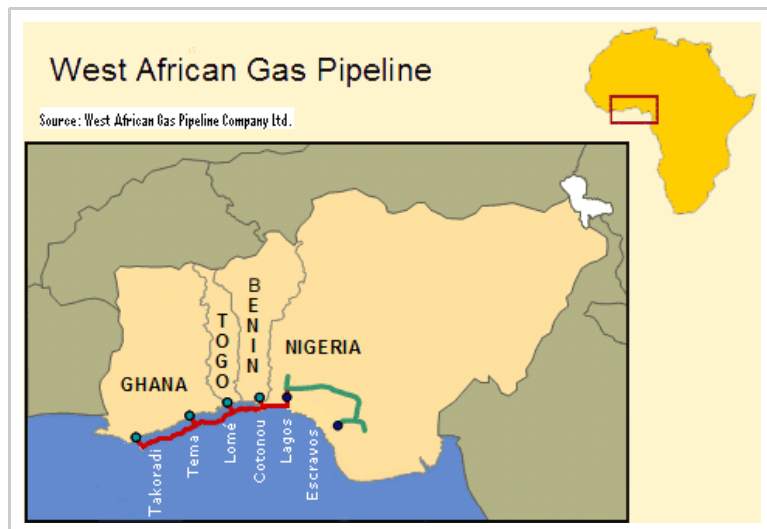
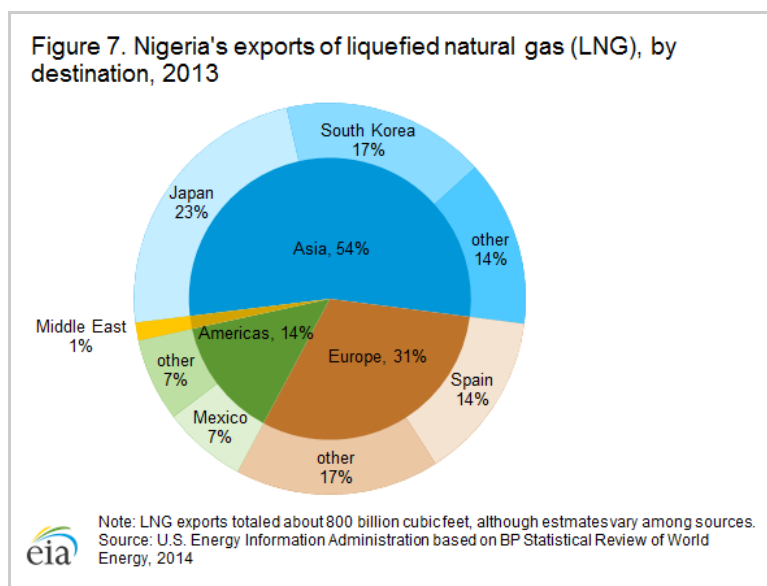
Nigeria exports a small amount of its natural gas via the [West African Gas Pipeline \(WAGP\)](#), which began commercial operations in 2011. The pipeline is operated by the West African Gas Pipeline Company Limited (WAPCo), which is owned by Chevron West African Gas Pipeline Limited (36.9%), NNPC (24.9%), Shell Overseas Holdings Limited (17.9%), Takoradi Power Company Limited (16.3%), Societe Togolaise de Gaz (2%), and Societe BenGaz S.A. (2%).<sup>35</sup>

The 421-mile pipeline carries natural gas from Nigeria's Escravos region to Togo, Benin, and Ghana, where it is mostly used for power generation. WAGP links into the existing Escravos-Lagos pipeline and moves offshore at an average water depth of 35 meters. The pipeline has the nameplate capacity to export 170 MMcf/d (62 Bcf/y) of natural gas,<sup>36</sup> although its actual throughput is about one-third of its capacity. In 2013, Nigeria exported 21 Bcf through the WAGP, according to Cedigaz.<sup>37</sup>

### **Proposed: Trans-Saharan Gas Pipeline**

Nigeria and Algeria have proposed plans to construct the Trans-Saharan Gas Pipeline (TSGP). The 2,500-mile pipeline would carry natural gas from oil fields in Nigeria's Delta region to Algeria's Beni Saf export terminal on the Mediterranean Sea and is designed to supply gas to Europe. In 2009, NNPC signed a memorandum of understanding (MoU) with Sonatrach, the Algerian national oil company, to proceed with plans to develop the pipeline. Several national and international companies have shown interest in the project, including Total and Gazprom. Security concerns along the entire pipeline route, increasing costs, and

ongoing regulatory and political uncertainty in Nigeria have continued to delay this project.



## Electricity

*Nigeria has one of the lowest rates of net electricity generation per capita in the world. Electricity generation falls short of demand, resulting in load shedding, blackouts, and a reliance on private generators.*

Nigeria's generation capacity was 6,090 megawatts (MW) in 2012, of which 3,960 MW (65%) was from fossil fuel sources, 2,040 MW (33%) was from hydro sources, 88 MW from biomass and waste (1%), and 2 MW (<1%) from wind. Net electricity generation falls well below capacity and was 27 billion kilowatt-hours (3,080 MW) in 2012, or nearly half of capacity. Nigeria's power sector suffers from poor maintenance of electricity facilities, natural gas supply shortages, and an inadequate transmission and distribution network.

Only 41% of Nigerians have access to electricity and actual electricity demand in Nigeria is estimated at 10,000 MW.<sup>38</sup>

Nigeria has one of the lowest rates of net electricity generation per capita in the world. Those with access to electricity face load shedding, blackouts, and a reliance on private generators. According to a [2010 Harvard paper](#), more than 30% of electricity is produced by inefficient private generators.<sup>39</sup> Businesses often purchase costly generators to use as back-up power supply during outages. Most Nigerians use off-grid traditional biomass and waste, such as wood, charcoal, and animal dung, to fulfill household energy needs, such as cooking and heating.

On November 1, 2013, Nigeria's federal government officially sold almost all of its successor electricity generation companies (GenCos) and distribution companies (DisCos) to private owners. The privatization was part of a power sector reform initiated by the 2005 Electric Power Sector Reform Act, which called for the unbundling of the state-owned Power Holding Company of Nigeria (PHCN), which oversaw the GenCos and DisCos. The private companies that purchased the GenCos and DisCos took physical ownership of the generation and distribution infrastructure and the responsibility of improving/repairing the system. Five of six GenCos and ten of eleven DisCos sold, while the remaining two successor companies will go under Nigeria's state-owned Transmission Company, which will remain under the federal government's control.

The federal government is in the process of selling 10 natural gas-fired power plants that are a part of the National Integrated Power Projects (NIPP). NIPP was established in 2004 by the Nigerian government as a plan to construct multiple natural gas-fired power plants using natural gas that was flared. However, there is a shortage of natural gas supply for power generation in Nigeria because it competes with exports, and it is more profitable for producers to export the gas rather than selling it to the domestic market for a lower price. This has affected the state's ability to sell the NIPP plants.

Nigeria has set ambitious goals to increase generation capacity. Nigeria plans to increase generation from fossil-fuel sources to more than 20,000 MW by 2020. Nigeria plans to increase hydroelectricity generation capacity to 5,690 MW by 2020, almost tripling the capacity from the 2012 level. The country plans to upgrade current hydroelectricity plants and construct new plants: Gurara II (360 MW), Zungeru (700 MW), and Mambilla (3,050 MW).<sup>40</sup> In late 2013, the Nigerian government announced a \$1.3 billion deal with China to build the 700-MW Zungeru hydropower project. The Export-Import Bank of China will cover 75% of the cost, and the Nigerian government will finance the remaining amount. The project was initially scheduled to be completed in 2017, but that date has been pushed back because of legal challenges that have delayed construction work.<sup>41</sup>

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## Notes

- Data presented in the text are the most recent available as of February 27, 2015.
- Data are EIA estimates unless otherwise noted.

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## Endnotes

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Figure 1. Nigeria's total primary energy consumption, 2012. Traditional solid biomass and waste data: International Energy Agency, *World Energy Statistics*.

Figure 3. Nigeria's crude oil and condensate exports, by destination, 2014 and Table 5. Nigeria's crude and condensate exports, by region: Lloyd's List Intelligence, [APEX tanker data](#), accessed February 2015.

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