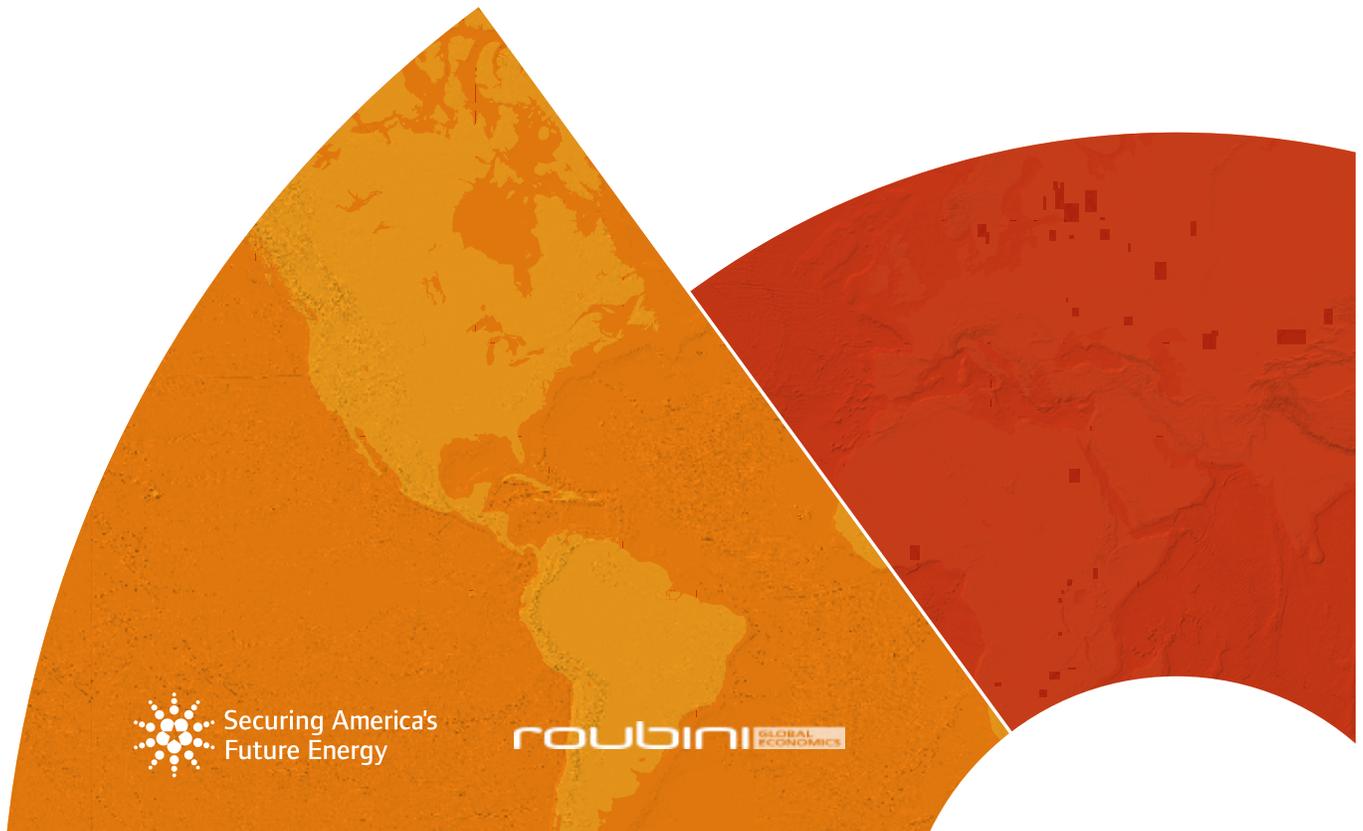


Oil Security Index

Quarterly Update



August 2015



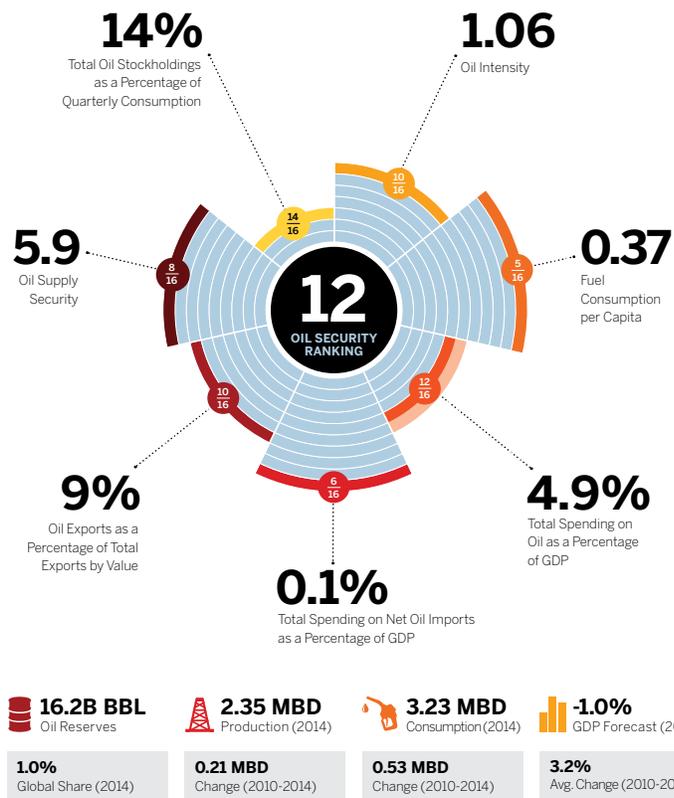
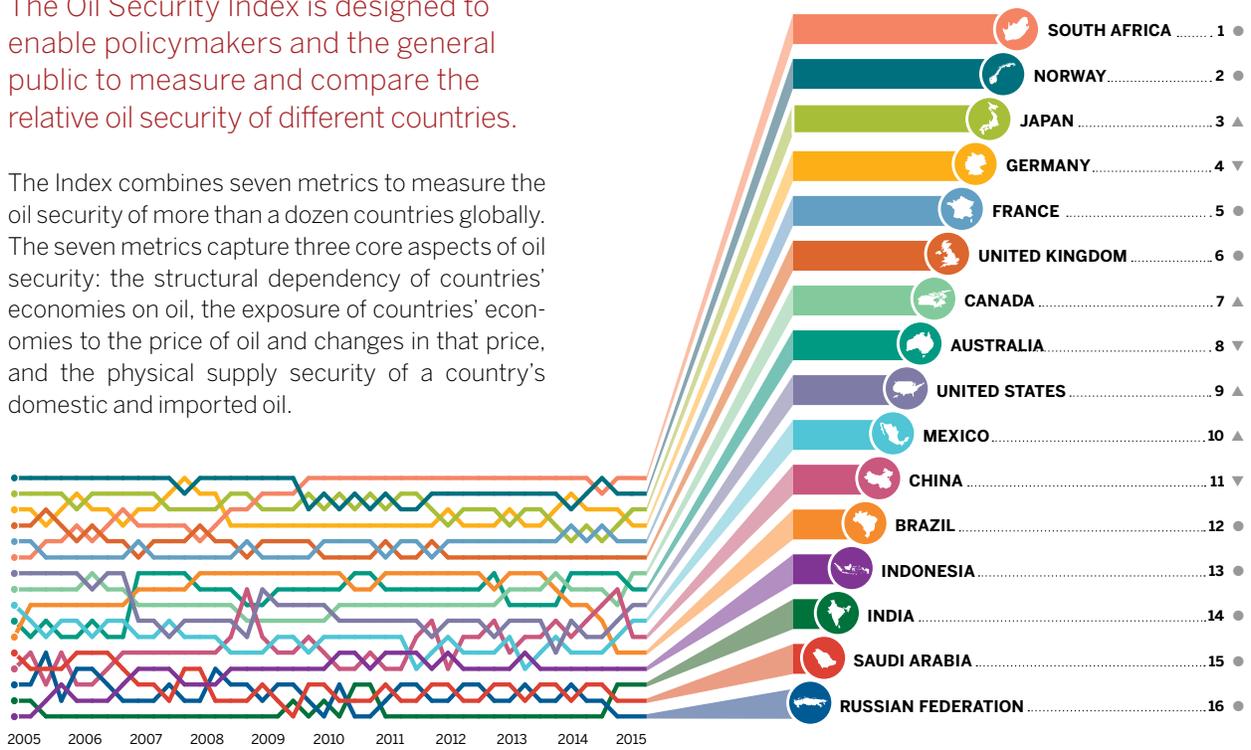
Securing America's
Future Energy

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Oil Security Index Rankings

The Oil Security Index is designed to enable policymakers and the general public to measure and compare the relative oil security of different countries.

The Index combines seven metrics to measure the oil security of more than a dozen countries globally. The seven metrics capture three core aspects of oil security: the structural dependency of countries' economies on oil, the exposure of countries' economies to the price of oil and changes in that price, and the physical supply security of a country's domestic and imported oil.



Spotlight on Brazil

Brazil continues to be a producer and consumer of oil, although prospects of becoming a major net exporter have dimmed with the scandals surrounding Petrobras, the national oil company.

Despite the scandals and the oil price crash, Brazilian oil production remains near record highs at 2.4 mbd, nearly double its 1.27 mbd in 2000. Implicit Petrobras fuel price controls have helped push consumption to peak levels of 3.2 mbd in 2014, up 57 percent since 2000, even though oil intensity is down 68 percent since 2002. The scandals and low prices have damaged Brazil's prospects of becoming a major oil exporter, as Petrobras has reduced investments to cut debt, thereby lowering production forecasts. Brazil's ability to supply its domestic markets, coupled with lower oil intensity, has helped insulate the country, preventing its oil security from falling to the back of the pack.

Q1 2015 Global Highlights

Changes in oil demand and supply in different countries around the world impact both those countries' oil security and the global oil market.



- A North America posts breakneck production growth.** The United States and Canada posted quarterly production gains despite the fall in oil prices on the back of locked-in investments and commitments. Year-over-year growth for the U.S. was at 13.41 percent while Canadian production grew by 6.8 percent y-o-y. Growth between Q4 and Q1 was more modest, adding 0.6 percent to U.S. supply and 2.3 percent for Canada. The countries added 1.8 mbd to the market over the year.
- B Protests and disputes plague production in Libya, Nigeria, and the Saudi-Kuwaiti shared production zone.** Following strikes and protests at oil fields, Libyan production dropped by nearly half to 0.4 mbd between Q4 2014 and Q1 2015. Similarly, protests in Nigeria caused unexpected disruptions of nearly 4 percent of Q4 production levels, taking 0.07 mbd off the market. A contract dispute in the Saudi-Kuwait shared production zone decreased production by 4.8 percent between the quarters, summing to a 62 percent y-o-y decrease that lowered supply by 0.3 mbd. Together, these disruptions decreased supply by 0.8 mbd over the quarter.
- C Brazilian production continues its growth.** Brazilian investments in pre-salt oil production began to pay off in 2014 as oil production grew by 16.5 percent y-o-y, continuing an upward trend over the prior year.
- D Sustained production growth throughout core OPEC countries.** Core OPEC countries continued with their market share strategy, realizing large production gains. Between Q4 2014 and Q1 2015, Saudi Arabia increased production by 2.5 percent, while UAE and Kuwait increased supply by 3.2 percent and 1.1 percent respectively. Angolan production rose by nearly 3 percent. In total, these countries brought online an extra 0.4 mbd of supply.
- E Japanese oil demand continues to decline.** While Japanese demand for oil grew by 6.7 percent between Q4 2014 and Q1 2015, the nation posted the largest y-o-y demand decline among major economies, dropping 0.3 mbd versus Q1 2014, a decline of 5.8 percent.
- F Mexico continues decline in production, with consumption also down sharply.** Mexican oil output continues its decade-long decline, compounded by poor weather in Q1 2015. It remains to be seen if the nation's new auctions of oilfields, which began with sales below expectations in July, will help reverse this trend. The country posted a fall of 5.6 percent or 0.1 mbd between Q4 and Q1. Oil production is down 4.1 percent y-o-y. Meanwhile, affected in part by lower than expected economic growth, oil consumption fell by 4.1 percent y-o-y.

Norway: Limiting the Risks of Being an Exporter

BACKGROUND

One of the countries newly added to the Oil Security Index in April 2015, Norway presents a different profile from any other nation in the dataset: despite being a net exporter heavily dependent on oil revenue, it has taken steps to reduce its vulnerability to shocks in the global oil market by encouraging more efficient consumption at home and lowering the relative importance of oil to its trade balance. Diversification and prudent planning have contributed to Norway’s second-place ranking in the Index while the other major oil exporters, Russia and Saudi Arabia, rank last and second-to-last respectively. Norway does still face the structural economic issues of sectorial distortion that haunt oil exporters, and low global oil prices not only slash the income from its biggest export but also threaten the investment that may be needed to reverse its long-term production decline. Despite these challenges, Norway stands out as a positive example for oil exporters seeking to improve their oil security.

CURRENT STATUS OF PRODUCTION, INVESTMENT

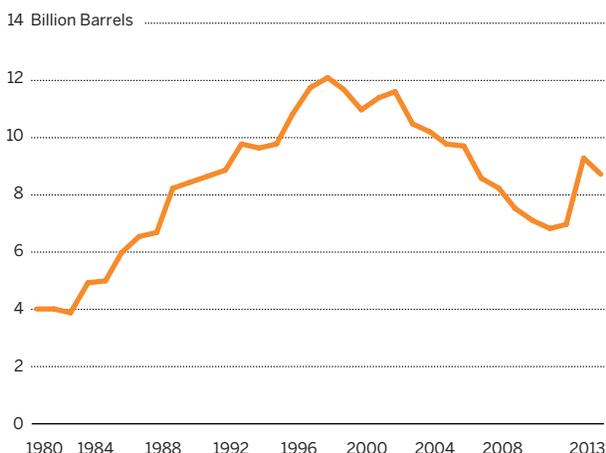
Oil wealth came to Norway relatively recently, with its North Sea reserves only discovered in the late 1960s and first exploited in the early 1970s. While still far and away the biggest oil producer in Western Europe, Norway’s production has fallen significantly from its peak levels above 3 mbd in the early 2000s, with total output in 2014 averaging 1.9 mbd.¹ In part, this has been due to rising labor and capital costs locally (a product

of the economic growth oil has brought to Norway) as well as aging easily accessible fields in the North Sea. However, the decline in oil prices since mid-2014 has added further strain on efforts to develop Norway’s oil fields, with offshore resources in the North Sea and, especially, the Arctic region, costly to exploit. Statoil—the country’s largest oil and gas company (two-thirds of which is owned by the state)—has postponed making a plan to develop the giant Johan Castberg field off Norway’s Arctic shore until at least 2016, along with plans to expand its Snorre field in the North Sea,² and cut its 2015 capital expenditure budget by 10 percent.³ There have been positive signs for renewed production growth despite the price slide, however, most notably in the form of the massive Johan Sverdrup field, discovered in shallow water in 2010 with recoverable reserves of between 1.7 and 3.0 billion barrels.⁴ In February, Statoil announced the beginning of a \$31 billion development plan for the field, which it expects to come online in 2019 and provide around 0.6 mbd at its peak, contributing to estimates of Norwegian oil production of around 2.4 mbd in the middle of next decade. Not only does the IEA now project Norwegian supply to remain essentially unchanged in 2015 versus 2014, at approximately 1.90 mbd,⁵ and supported by such new projects as the

1 BP plc, Statistical Review of World Energy 2015

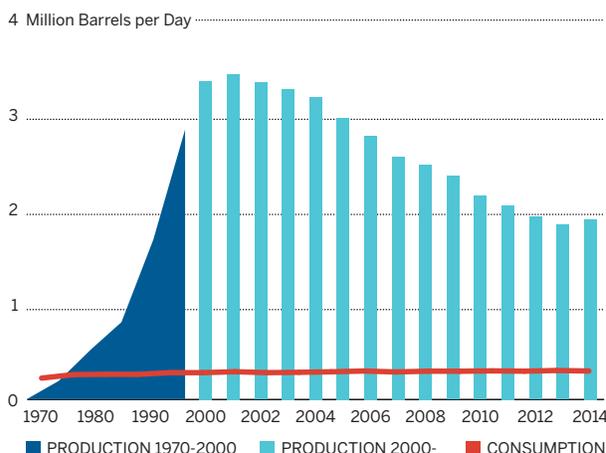
2 Reuters, “Statoil delays Castberg, Snorre projects to cut costs,” March 6, 2015
 3 Financial Times, “Statoil to cut spending after oil price collapse,” February 6, 2015
 4 Statoil, “Submitting the development plan for Johan Svedrup,” February 13, 2015
 5 IEA, OMR May 2015

FIGURE 1
Norwegian Proved Reserves



Source: BP Statistical Review 2015

FIGURE 2
Norwegian Oil Production and Consumption



Source: BP Statistical Review 2015

Structural Dependency

Definition: A country's structural dependence on oil due to capital stock and other economic factors. The structural dependency metrics typically change slowly over time, providing relatively consistent measures of vulnerability, regardless of prevailing price conditions.

Oil Intensity captures the volume of oil consumed per unit of GDP (in this case, per \$1,000 of GDP). As such, oil intensity is a direct measure of the structural importance of oil in a country's economy and is perhaps the most meaningful measure of "oil dependence." Oil intensity changes little over short time periods and is almost entirely determined by oil-use efficiency levels, fuel diversity, and economic growth.

Fuel Consumption per Capita uses the size of a country's population, as opposed to the size of its economy, to contextualize oil consumption. This measure can be useful in comparing the different levels of oil consumption in countries with vastly different population sizes or GDPs. Fuel consumption per capita can give insight into a country's level of oil efficiency or its future demand growth potential.

Economic Exposure

Definition: A country's direct economic exposure to oil price volatility. Economic exposure is a function of structural dependency, but it is also more heavily driven by exogenous changes in global oil prices, and therefore variable over time. Economic exposure is measured by spending on oil across typical indicators like GDP and the current account.

Total Spending on Oil as a Percentage of GDP is the most straightforward measurement of a country's economic exposure to oil. Changes in oil prices have direct effects on the ability of governments, businesses, and consumers to effectively plan, budget, and make expenditures. Transportation can be particularly sensitive to changes in oil prices, as oil is the predominant fuel in the sector and there are few substitutes (demand is therefore highly inelastic).

Total Spending on Net Oil Imports as a Percentage of GDP shows the extent to which countries rely on imported oil. This indicator provides a measurement of revenue either earned or spent through the oil trade and, therefore, oil's effect on a country's current account balance.

Oil Exports as a Percentage of Total Exports by Value highlights the degree to which the economies of oil-producing countries are dependent on oil revenues for economic growth. In other words, "oil dependence" should be evaluated not only in terms of an economy's consumption requirements, but also its production and export requirements. Just as oil price spikes are devastating for many consumers, oil price collapses are highly problematic for non-diversified producers.

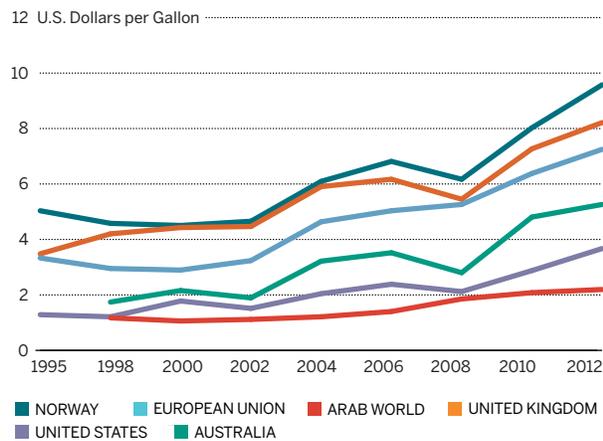
Supply Security

Definition: A country's vulnerability to physical supply disruptions and its response capabilities. While supply disruptions are typically addressed by price changes, the adjustment period can be highly damaging for import-dependent countries, especially if adequate and appropriate emergency inventories are unavailable.

Oil Supply Security is a proxy for the risk of disruption to a country's oil supply in both the short term (e.g. political instability and terrorism) and long term (e.g. tax and regulatory schemes). This metric accounts for the different levels of risk in the sources of supply that a country relies upon to meet its needs (in some instances, both domestic production and imports from a selection of other countries).

Total Oil Stockholdings as a Percentage of Consumption indicates how prepared a country is to meet its own short-term needs in the event of a physical disruption to oil supplies. Total stockholdings include commercial inventories (held by companies) and public reserves (held by governments).

FIGURE 3
Pump Price of Gasoline



Source: World Bank Development Indicators

Edvard Grieg field,⁶ but the Norwegian government now projects investment levels to stabilize and begin growing again in 2016.⁷

With domestic consumption limited, more than 80 percent of production is sent abroad, and more than 90 percent of Norway's exports go to developed markets in Europe.⁸ If production increases as expected over the next decade and EU demand remains flat or declines, Oslo may need to find new markets.

Despite the continued importance of oil, the government has sought to diversify Norway's economy. While this is to some extent due to decreasing production, oil has dropped from 53 percent of the nation's exports in 2000 and has hovered between 35 and 40 percent since 2008.⁹

Part of Norway's strategy for lessening the dominant influence of oil in its economy has been its Government Pension Fund, which dates back to 1990, and currently manages over \$900 billion in assets,¹⁰ a colossal amount given Norway's population of only 5 million. The fund is the destination for all the government's oil revenue, including taxes on petroleum industry activity and emissions, direct proceeds and royalties from production, and dividends from Statoil, among other sources.¹¹ By law, no more than 4 percent of its value—a

conservative expected return on investment—can be spent by the government in a given year. This is aimed at achieving dual goals of energy security: keeping the fund consistently growing so that today's oil income will be able to pay government pensions for future generations, and limiting the distorting effects of introducing too much oil income into the domestic economy, such as upward pressure on the Norwegian krone, which could harm other industries like the fisheries that earn \$8 billion¹² in export income a year. While over 95 percent of the fund's assets are invested outside of Norway, it still has an impact in supporting a diversified group of companies inside and outside of the oil and gas sector, as it owns more than 5 percent of the capitalization of the Oslo Stock Exchange.¹³

REDUCING CONSUMPTION

Norway's oil consumption has remained relatively flat since the early 2000s despite a growing population. Transportation accounts for half of the nation's oil use,¹⁴ but Oslo has made concerted efforts, unrivaled in their intensity by nearly any country, to encourage consumers to switch from petroleum-fueled vehicles to electric vehicles (EVs). These vehicles also nearly eliminate carbon emissions, given that nearly 98 percent of Norway's power comes from renewable energy in the form of hydroelectric plants, and to a far lesser extent, wind.¹⁵ Incentives include an exemption from value added taxes (which normally can double or triple vehicle prices),¹⁶ an exemption from road-license fees, preferential transit lane access, and government-supported parking and charging;¹⁷ the financial incentives alone total what one government statistician has estimated to be \$8,000 in support per year for each owner of the Nissan LEAF, the top-selling EV in the country.¹⁸ The measures have led to Norway being the leading adopter of electric cars in Europe despite its small population (accounting for one-third of EV sales in Europe last year),¹⁹ with EVs making up nearly one in five new vehicle sales.²⁰ Norway's EV charging network includes 6,747 public charging points as of June,²¹ and in May, having met the target of 50,000 EVs sold two years before its deadline, the Norwegian parliament voted to sunset its incentives beginning in 2018.

12 Norwegian Ministry of Trade, fisheries.no

13 Folketrygdfondet, Ownership Report 2014

14 IEA, Energy Supply Security 2014

15 SAFE analysis based on data from Statistics Norway

16 All Things Considered, "Norway Takes the Lead in Electric Cars (With Generous Subsidies)," March 11, 2014

17 Transport Evolved, "Norway's Generous Electric Car Incentives to Ramp Down by 2020," May 11, 2015

18 All Things Considered, supra

19 Reuters, "Norway to review electric car subsidies as sales soar," April 20, 2015

20 Transport Evolved, supra

21 Grønn Bil, Gronnbil.no

6 Offshore Technology, "Norway gives final approval for Lundin's \$4bn development of Edvard Grieg field," June 12, 2015

7 Statistics Norway, "Oil and gas activities, investments, Q2 2015," June 12, 2015 <https://ssb.no/en/energi-og-industri/statistikker/oljeinv>

8 IEA, Energy Supply Security 2014

9 SAFE analysis based on data from RGE

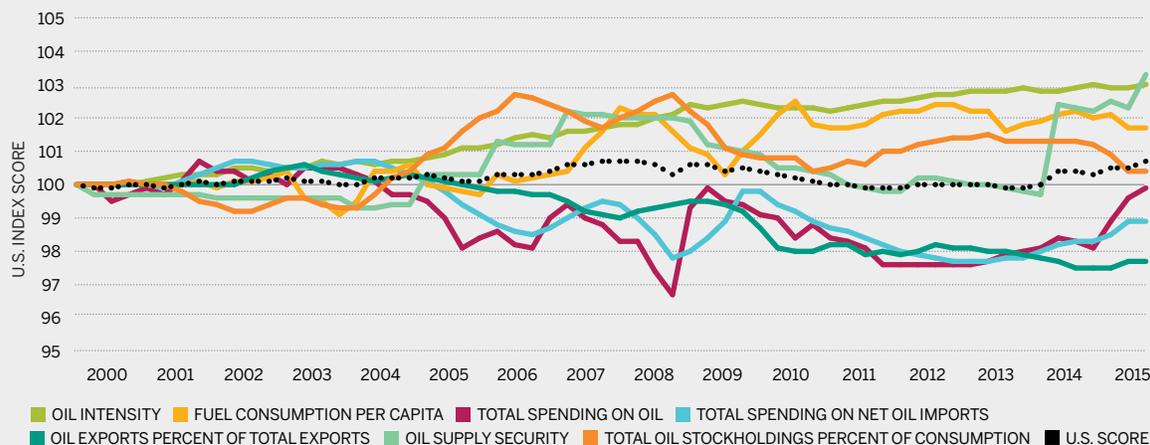
10 Norges Bank Investment Management, Government Pension Fund Global, 1Q 2015 Quarterly Report

11 Norway, Government Pension Fund Act (2005)

Oil Security in the United States

Spending on oil as a percentage of GDP continued to improve, dropping to 1.5 percent from 2.1 percent, a level not seen since 2003. While the fall in the price of oil played a large role in the decline, the U.S. economy also continues to gradually become less oil intensive. The metric sits at 1 barrel per \$1,000 of GDP in Q1, a 44 percent improvement since 2000.

FIGURE 4
U.S. Index Score and All Metric Scores Q1 2000 to Q1 2015



Source: SAFE/RGE analysis

Net oil imports ticked upward between the quarters to 6.8 mbd, although net imports of crude oil and products as a percentage of GDP went down slightly to 1.0 percent as a result of across-the-board price decreases. The increase in imports has primarily come from Canada, at the expense of West Africa, the Middle East, and the Former Soviet Union.¹ Domestic oil production rose by nearly 400,000 barrels per day between Q4 and Q1 to 9.4 mbd, the highest level in decades and a remarkable change from under 5 mbd as recently as Q4 2008. The increases in production helped push down crude oil imports to 7.3 mbd by the end of Q1 2015, the lowest level since 2000, and a steep drop from a high of 10.5 mbd in 2005. Despite a 50 percent decrease in rig counts between October 2014 and the end of Q1 2015,² hedging and the leveraged structure of many U.S. shale drillers has kept oil flowing in order to generate cash flow. Fuel consumption per capita (rolling four-quarter average) stayed unchanged from Q4 at 1.6 gallons per capita, but, buoyed by lower prices, Q1 saw the quarterly

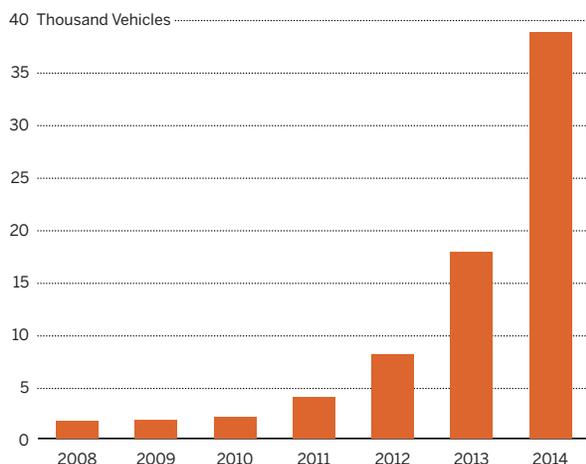
metric rise by 3 percent y-o-y, the first such increase after more than a year of constant y-o-y declines. The changes in oil intensity and fuel consumption per capita were not sufficient to change the U.S. oil security ranking relative to other countries examined.

The United States is increasingly orienting away from energy-intensive manufacturing to a knowledge-based service economy and boosting the efficiency of vehicles on the road. These trends, moving slowly and steadily in the direction of decreased oil consumption, are now concurrent with a domestic oil boom that has contributed to a collapse in the global price of oil since last summer. The combination of declining oil intensity and reliance on oil imports, particularly from less stable regions, is having a positive effect on U.S. oil security.

1 BP plc, Statistical Review of World Energy, 2014 and 2015

2 Baker Hughes Rig Count Data

FIGURE 4
Private Electric Vehicles in Norway



Source: Statistics Norway

NORWAY AS A MODEL

Limiting oil consumption through increased efficiency as the nation's GDP has grown has also contributed to Norway's impressive decline in the oil intensity of its

economy, for which it ranks second in the Index, while the other major oil exporters in the Index, Russia and Saudi Arabia, rank near bottom. This brings up the natural question of whether Norway can serve as a model of secure development for oil-exporting countries both inside and outside the Oil Security Index. Examining the other nations in the Index, Norway has the luxury of having a far smaller population than Russia, and while Saudi Arabia could find more efficient forms of power generation than burning up to 1.0 mbd of crude oil in its power plants,²² it is certainly not blessed with the hydropower that Norway holds. Nonetheless, no major oil exporter has achieved the efficiency and financial stability that Norway has been able to realize through extensive planning and careful execution. While each nation is different, significant oil exports need not distort an economy and cripple the non-oil sector. By focusing on saving oil income, limiting the financial influx of oil money into the economy, and putting policies in place to reduce oil consumption at home, Norway has shown how to limit the curse that comes with the blessing of oil resources.

²² EIA, "Today in Energy: Saudi Arabia uses largest amount of crude oil for power generation since 2010," September 24, 2014

Methodology Changes

In this update, SAFE and RGE have introduced two changes to the Oil Security Index. First, to better highlight recent oil security trends, nations' scoring thresholds for the Index metrics are now calculated based on ten-year rolling averages rather than historical averages. Second, the Oil Supply Security metric is now calculated using a more specific set of disruption risk metrics for oil-supplying nations calculated by RGE—specifically, terrorism risk, political institution strength, ease of trade, and property rights strength. These changes have been applied retroactively to the historical rankings in this update and on OilSecurityIndex.org.



The Oil Security Index is an analytical tool developed by Securing America's Future Energy in partnership with Roubini Global Economics. The Index is designed to enable policymakers and the general public to measure and compare the relative oil security of more than a dozen countries around the world.

Learn more at OilSecurityIndex.org



1111 19th Street, NW, Suite 406
Washington, DC 20036
(202) 461-2360
SecureEnergy.org



120 Broadway, Suite 2740
New York, NY 10271
(212) 645-0010
Roubini.com