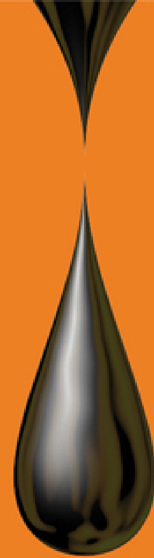

# Oil

GAVIN BRIDGE and PHILIPPE LE BILLON

2ND EDITION

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# Oil

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# Introduction

Oil pulses through our daily lives. It is the plastic we touch, the food we eat, and the way we move. Oil powers our cars, chainsaws, and tanks. Yet six generations back, oil was a bit player in an emerging lubricant market where it competed with the rendered bodies of whales, lizards, and fish. Oil's brief and startling career – from small-town hustler to global kingpin – is one of spectacular boom and bust, extremes of wealth and poverty, and environmental ills ranging from local spills to global climate change. During the twentieth century, this complex hydrocarbon has been pulled from the earth and spread far and wide. The worlds made by and through oil, however, are anything but uniform. The international oil trade links every country on earth, but only a handful of countries hold the lion's share of known reserves. Every minute, millions of dollars change hands through the oil markets as crude is bought and sold, but oil itself moves through pipelines and in tankers at a comparatively medieval pace. Oil provides an unprecedented freedom from geographical constraint for those who can access it, yet its record of pollution and distorted development cripples the lives of many others.

Creating wealth and power from oil is quite a trick. Crude hides below ground and must be hunted and captured. This raw oil is frequently in the wrong place – miles from markets, in places difficult to access or already used by others. Unlike the subterranean lakes of the imagination, crude inhabits tiny gaps in ancient sediments and often must be compelled to the surface. In the ground, oil takes on characteristics of time and place – local variations in viscosity and the content of metals and sulfur, for example – that must be erased by refineries if oil is to behave as required in engines, power stations, and production lines. In the search for value, refineries create fresh distinctions between grades of oil and different types of petrochemicals, producing a catalogue of products tailored for hundreds of specific uses. Most of these products are flammable, noxious, and difficult to contain, but must be transported, stored, and distributed widely if demand is to be created and sustained. Most oil is burnt to provide mobility via land, sea, and air, but the by-products of this combustion can be directly hazardous to health and livelihoods. Exchanges and final markets help lubricate the global movements of oil, yet speculation over oil's *future* price can disrupt existing patterns and rates of oil movement by driving wild swings in price. There is, then, a savvy to the business of making money from and through oil that extends beyond oil's *physical* properties to the economic and political structures that take shape around it. The popular fascination with oil's tycoons, barons, and sheiks – Getty, Rockefeller, Abramovich, or the Sultan of Brunei – acknowledges how oil's value can be captured to remarkable effect. Beyond the palaces, yachts, and gleaming towers, oil's many other landscapes also reveal how its value evades a large proportion of the population in many oil-rich countries.

If we think of oil at all, we tend to think of it as a gift of nature – a natural endowment bequeathed by geology and time. Oil is indeed a legacy from the past, an accumulation of carbohydrates and proteins from the bodies of algae and plankton that has been trapped and cooked underground. But to think of oil in this way is misleading, as it gives nature too much of a hand. Where, how, and when oil moves within modern economies has little to do with nature or geology. The way we use it, who can afford it, where it is extracted, and even how we know how much is in the ground are determined by the actions and interactions of some of the most powerful actors and institutions in the global economy. Because decisions about finding, moving, and using oil bring together groups of people with different interests and agendas, oil is unavoidably political. Oil may be drawn from the earth but it is a very social resource.

This point is important for understanding what we mean in this book by the "politics" of oil for two reasons. First, the political character of oil is a normal and continuous state of affairs and not an aberration or interrupting event. We aim in this book to show how the politics of oil is changing, rather than to suggest oil is now becoming political (it has always been so). Second, we take the politics of oil to mean more than a zero-sum game over a fixed and declining resource – a scramble at the end of the "Age of Plenty" for nature's unclaimed gifts. Instead, the politics of oil concerns the relationships of competition, conflict, and cooperation that define the social and geographical distribution of the various "goods" and "bads" that can be produced through oil. In the twentieth century, the politics of oil was about the management of abundance, state power, and market growth. The legacy of this "Age of Plenty" includes declining conventional oil reserves, volatile prices, climate change, and major political and economic distortions in most oil-rich countries. Our argument in this book is that a new geopolitics of oil is now emerging, centered on changes in the availability, accessibility, affordability, and acceptability of oil. The dynamics of competition, conflict, and cooperation associated with this new geopolitics point to the imperative for more effective global oil governance.

Our goal in the chapters that follow is to highlight the critical relationships – among states, firms, and society – that are key to understanding oil's geopolitics, and their relationship to changes in the availability, accessibility, affordability, and acceptability of oil. It is not the characteristics of individual actors that matter to us, but the dynamic relationships among them and what these relationships mean for the governance of oil. In chapter 1 – "The Nature of a Political Resource" – we explore the origin of oil's extraordinary utility and its potential for social conflict. We review the state of global oil reserves after more than a century of exploration and the shifting character of contemporary demand. Chapter 1 introduces six fundamental tensions that underpin the oil sector and that together make up the geopolitics of oil: these are then explored in chapters 2–7. In chapter 2 – "Capturing Oil" – we examine the structure, connections, and interactions between different parts of the production and consumption chain for oil. We move from a physical, metabolic process of refining crude to an understanding of the distribution of value along the chain. Chapter 3 – "Marketing Oil" – focuses on the politics of value creation, contrasting efforts to create new markets with contemporary attempts to reduce demand. In Chapter 4 – "Living With Oil" – we consider how working with oil and its products provides a livelihood for millions of people, and how the diversity and character of oil work influences the politics of labor in the sector. We examine too how the everyday experience of living with oil has profoundly shaped cultural practices and habits of mind, enabling deeply held cultural and political identities to take root within wider society. In chapter 5 – "Securing Oil" – we explore the political geography of oil's winners and losers, and ask for whom oil is secure. Chapter 6 – "Developing Through Oil" – examines the social and environmental challenges associated with oil dependence. Chapter 7 – "Governing Oil" – shows how oil is in need of global governance, explains why, and proposes reforms to existing institutions. Chapter 8 – "Better and Beyond: The Future of Oil" – summarizes the "new reality" of oil as an apparently intractable challenge: efforts to sustain supply in the face of rising demand appear to only further exacerbate the economic, social, and environmental ills associated with capturing, producing, and consuming oil. We conclude that there is an imperative for better oil governance, and identify four priorities for improving oil's economic, social, and environmental impacts and, in the longer term, moving beyond oil.

# CHAPTER ONE
# The Nature of a Political Resource

"Oil" is a catch-all term that covers a diversity of liquid hydrocarbons. The starting point for most of these is "conventional" crude oil, a form of oil sufficiently liquid to be pumped directly out of the ground and rich enough in carbon–hydrogen atomic linkages to be directly refined. Conventional crude fueled the remarkable expansion of oil production and consumption during the twentieth century but growth in the last decade has stalled, and is increasingly giving way to "unconventional" sources. These are mostly hydrogen-enriched synthetic crude recovered from sand and rock containing bitumen, and liquids associated with natural gas production; together these account for 10 percent of global oil production and could rise to 30 percent by 2035. The origins of oil and the chemistry of crude formation might seem of little relevance for understanding the politics of oil. However, the conditions under which oil forms are key to understanding both the extraordinary utility that modern societies have found in oil and fundamental questions of control. They determine the character of crude, the uneven distribution of oil resources at the global scale, and the costs and risks of turning raw resources into valuable products. Oil forms via the decomposition of organic (carbon-based) matter under conditions of heat and pressure – a process akin to "slow cooking," more properly known as "diagenesis." Most of the oil being extracted today was formed between 200 million and 2.5 million years ago. The processes that break down organic matter and lead to the formation of oil typically occur at temperatures between 75°C and 150°C, and in most settings these conditions are found 2–3.5 kilometers below the surface. This creates an "oil window": above it, temperatures are too low for oil to form; below it, the longer hydrocarbons are broken down into shorter chains, producing natural gas instead of oil. A particular combination of physical conditions is needed if these hydrocarbons are to concentrate together rather than simply disperse. Oil forming in an organic-rich source rock needs a porous "reservoir" rock (typically sands, sandstone, or limestone) into which it can migrate and accumulate, and an impermeable seal or cap that prevents oil from moving further. Because the conditions for the formation of oil are not found everywhere, crude oil is variable in its physical and chemical properties and unevenly distributed in the earth.[1]

Crude oil is primarily carbon, atoms of which are locked together with hydrogen in different arrangements to form "hydrocarbon" molecules. As with other "fossil" fuels, the carbon atoms in crude oil are an underground stock accumulated over millions of years via the global carbon cycle. Pumping, refining, and burning crude oil returns these carbon atoms to the surface – ultimately in the form of carbon dioxide emissions to the atmosphere. In this way, the global oil industry acts as a carbon conveyer, moving carbon stocks from below ground into the atmosphere. And because the rate at which carbon flows to the surface is much greater than the return flow – via the decomposition of organic matter or the deliberate capture and storage of carbon dioxide – the oil industry is deeply involved in the atmospheric accumulation of carbon dioxide and climate change.

The way in which carbon and hydrogen are combined varies, so that crude oil is made up of many different types of hydrocarbon molecules. The larger the number of carbon atoms that make up a molecule, the heavier the hydrocarbon: from gaseous methane and ethane with one and two carbon atoms respectively, through liquid gasoline with 7–10 carbon atoms per molecule, to highly viscous bitumen with more than 35. Crude oil also contains other materials, including sulfur, nitrogen, metals, and salts. Because it is a natural material that reflects the conditions of its formation, the quality of oil in underground reserves is highly variable. Among the most significant forms of variability are: density (oil with more hydrogen is lighter and has a lower specific gravity); sulfur content (a higher content characterizing "sour" from "sweet" crudes); viscosity (how readily it flows); and acidity and the presence of metals. Oil is a liquid hydrocarbon. The rather obvious fact that oil flows is significant, because – unlike gas or coal – it can be moved over distance with comparatively few energy and labor inputs. It can be pumped across continents, into storage tanks, and into engines. Underground, oil is a liquid that is often under pressure, and under the right conditions it travels to the surface without lifting. On the other hand, this flow character lends oil an unruliness – a capacity to flow beyond control – that requires capital, equipment, and skill to contain.

For thousands of years, societies have found utility in these physical and chemical properties of crude, including waterproofing for boats, as a mechanical lubricant and as a medical ointment. Today, crude's value lies in its role as a chemical feedstock and fuel. The diversity of hydrocarbon molecules – and the relative ease with which they may be split, combined, and re-engineered – provides a rich storehouse of potential petrochemical combinations with which to manufacture new materials, including plastics, synthetic fibers, and a range of chemicals. One of every 15 barrels of crude oil (i.e. 6 percent) is used in this way as a feedstock for the production of petrochemicals.

It is as a fuel, however, that most crude oil is used. Combining hydrocarbon molecules with oxygen – as in combustion – releases large amounts of energy as heat and light. Oil packs a greater energy punch than coal or natural gas: nearly twice as much as coal by weight, and around 50 percent more than liquefied natural gas by volume. The practical effect of this greater "energy density" is that oil has unrivaled capacities as a transportation fuel. The amount of oil required to move a ton or travel a thousand kilometers is less than for other fuels, allowing expanded mobility and geographical flexibility. The replacement of coal (through steam) by oil (diesel, gasoline, kerosene, and marine fuels) in transportation, which occurred for the most part in the first half of the twentieth century, reflected the greater energy services that oil could provide. The higher energy density of oil changed the economies of scale required for crossing space, allowing the size of vehicle units to fall – from the train and tram to the automobile – and an increase in the power output for a given size or weight of engine. Oil's energy density enabled the evolution of the *internal* combustion engine (where oxidation/combustion on a small scale released a sufficient amount of energy to enable the direct movement of a piston), as opposed to the much larger, *external* combustion engines associated with steam power. Oil was not the first fossil fuel to have significantly shrunk distance: the introduction of coal-fired steamships in the second half of the nineteenth century drove down shipping costs and further facilitated long-distance trade in bulk commodities like wheat and wool. But oil consolidated this process and drove it further: from cars and airplanes, to diesel and bunker fuels for ocean shipping. In the US today, three-quarters of all petroleum is used as transportation fuel. As a fuel, oil is burned in a variety of forms. These include gasoline and jet fuel at the lighter end of the spectrum; heavier diesel fuels, heating oils, and bunker fuels for shipping; and, heaviest of all, petroleum coke which is used as a fuel in steel smelting and cement production.

Oil's high energy density and liquid properties mean the "gap" between the amount of energy expended in gathering a barrel of oil and the amount of energy that the barrel can release can be very large. Harnessing this "energy surplus" has enabled large gains in labor productivity over the last hundred years, as oil-based machines replaced human labor and facilitated growing economies of scale. The energy surplus available through oil has enabled industrial economies to overcome declining resource quality and the exhaustion of local stocks, expanding in turn the output of food and raw materials. The average energy surplus available through oil has been declining, from around 100:1 down to 30:1 over the course of the twentieth century, with some deepwater crude and unconventional oil sources now as low as 5:1. This declining ratio demonstrates the gradual deterioration of "energy returns" as investment has increasingly become geared toward accessing harder-to-reach conventional oil deposits or hard-to-upgrade unconventional sources.[2]

## The condition of the resource: growing uncertainty, declining quality

Over the last 150 years around 1.5 trillion barrels of oil have been extracted from the earth, over half of it since around 1989 (see Figure 1.1). At the same time, global oil reserves have grown: world reserves grew by 51 percent between 1995 and 2015 and now stand at 1.7 trillion barrels. The clue to this apparent paradox is that reserves (unlike the total planetary resource) are not fixed, but are shaped by geological knowledge, technology, political factors, and the economics of production. As oil companies probe the earth, they produce not only oil at the top of the well but also new reserves at the bottom. For most of the twentieth century, exploration activity and investment in existing fields "produced" reserves faster than they were recovered, and most of the world's largest fields – the "supergiants" that continue to supply today's demand – were discovered between the 1930s and 1960s. While exploration and technological change continue to "produce" reserves, there are three significant changes.

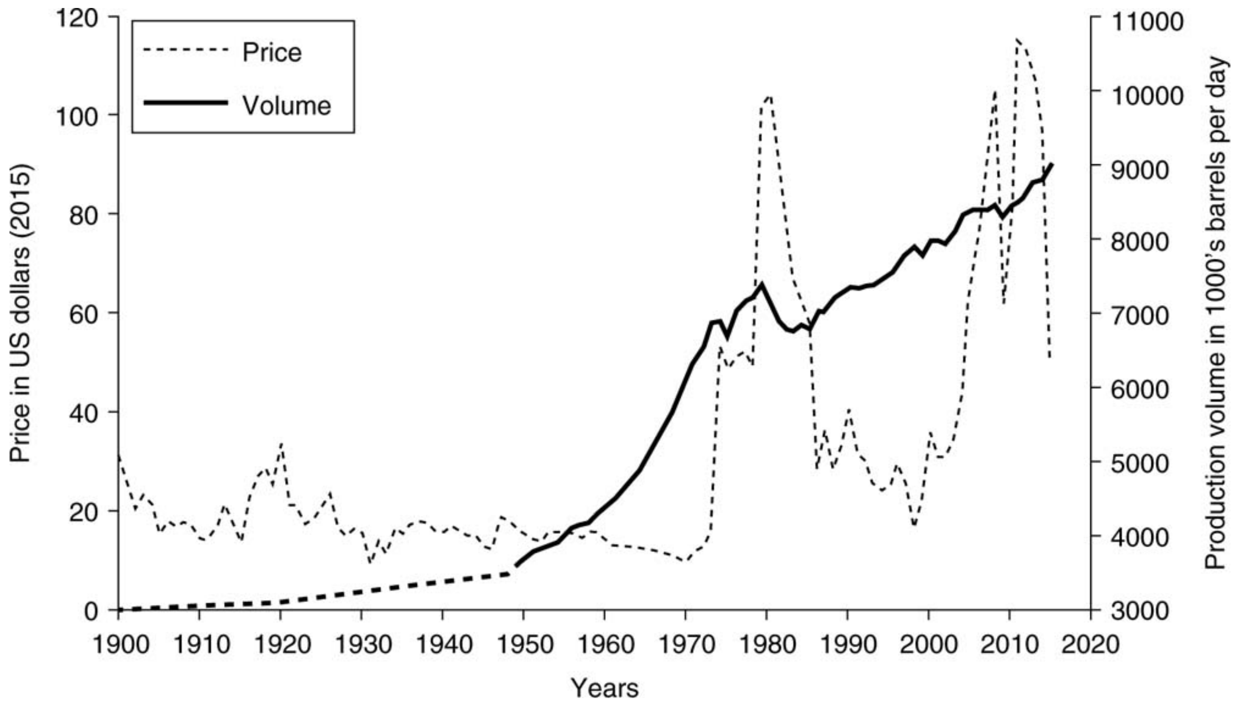


Figure 1.1 World oil production and price (1900–2015)

*Source:* Authors, based on data from BP Statistical Review 2016.

First, finding new reserves of "conventional oil" – the type of crude oil that has underpinned twentieth-century growth – is proving increasingly difficult. There have been new discoveries in Africa and Central Asia, as well as re-evaluations of reserves in Iran and Iraq. However, overall reserve growth of conventional oil has slowed to a standstill outside the Organization of Petroleum Exporting Countries (OPEC), and there is increasing uncertainty over the ability to expand production from known reserves in the Middle East. The reserves/production ratio – which captures this dynamic of depletion and replacement – reached 45 years of production by the late 1980s, but then remained relatively flat until the inclusion of Canadian and Venezuelan unconventional sources from the mid-

2000s, despite a rise in the price of oil. A handful of countries control the lion's share of the gold-standard conventional crudes that have underpinned economic growth in the twentieth century (see Table 1.1). The center of gravity of global reserves of conventional oil continues to be the Middle East with 47 percent – 800 billion barrels – of proven reserves, although its dominance has been falling (see p. 18). The future of conventional oil will remain the Middle East, but it is clouded by uncertainties over the real volume of reserves, political factors, and rising domestic oil consumption. Saudi Arabia has continued to declare about 260 billion barrels of conventional crude oil reserves since 1989 while maintaining, at times with some difficulty, production of over 11 million barrels per day (mmbd) in recent years. At 155 billion barrels, Iran supposedly holds among the world's largest reserves and, despite doubts about many upward revisions, the recent lifting of major political constraints on production suggests much potential for growth. Iraq reassessed its reserves upward to 143 billion, assuming higher oil recovery rates. With major investments and despite a continuation of hostilities, Iraq doubled its production from 2 to about 4 mmbd between 2003 and 2015, still a far cry from the Iraqi government's initial target of 12 mmbd by 2017. The Persian Gulf is not only a major repository of oil, but it also enjoys some of the lowest production costs and is relatively close to major markets, with Europe, India, and China all within two weeks of tanker travel or less than 6000 km of pipelines. The reserve-holding states of this region – and their custody of a high proportion of the world's high-quality oil resources – are one of the distinctive features of the political economy of oil.[3]

Table 1.1 Reserves, production, and consumption, leading countries (2015)

*Source:* Data from BP Statistical Review 2016 (differences between consumption and production result from stock changes, non-petroleum additives and substitute fuels).

| *Oil reserves* | | | | *Oil Production* | | | | *Oil Consumption* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Country* | *Amount (billion barrels)* | *Cumulative percentage of global* | *Reserves/ production ratio (years)* | *Country* | *Amount (thousand barrels daily)* | *Cumulative percentage of global* | *Net exports as share of production* | *Country* | *Amount (thousand barrels daily)* | *Cumulative percentage of global* | *Net imports as share of consumption* |
| Venezuela | 301 | 18% | 313 | US | 12,704 | 13% | –37% | US | 19,396 | 20% | 35% |
| Saudi Arabia | 267 | 33% | 60 | Saudi Arabia | 12,014 | 26% | 68% | China | 11,968 | 33% | 64% |
| Canada | 172 | 44% | 108 | Russia | 10,980 | 38% | 74% | India | 4,159 | 37% | 79% |
| Iran | 158 | 53% | 110 | Canada | 4,385 | 43% | 58% | Japan | 4,150 | 41% | 100% |
| Iraq | 143 | 61% | 97 | China | 4,309 | 48% | – | Saudi Arabia | 3,895 | 45% | – |
| Russia | 102 | 67% | 25 | Iraq | 4,031 | 53% | 79% | Brazil | 3,157 | 49% | 20% |
| Kuwait | 102 | 73% | 90 | Iran | 3,920 | 57% | 50% | Russia | 3,113 | 52% | – |
| UAE | 98 | 79% | 69 | UAE | 3,902 | 61% | 77% | South Korea | 2,575 | 54% | 100% |
| US | 55 | 82% | 12 | Kuwait | 3,096 | 64% | 83% | Germany | 2,338 | 57% | 100% |
| Libya | 48 | 85% | 307 | Venezuela | 2,626 | 68% | 74% | Canada | 2,322 | 59% | – |
| World total | 1,698 | | | World total | 91,670 | | | World total | 95,008 | | |

Second, the quality of reserves is changing. As the highest-value light crudes are depleted, the physical and chemical profile of reserves is shifting toward heavier, poorer-quality oils that are more costly to extract and refine and which are associated with higher greenhouse gas (GHG) and other emissions. Within the broad category of conventional oil, average sulfur content is rising as poorer-quality crudes are brought into production, and there is a shift toward heavier crudes overall to match growing oil demand. There is also a significant turn toward so-called “unconventional” sources of crude (see Box 1.1). Although these do not have the premium characteristics of conventional crude, they are expected to account for around 30 percent of consumption by 2035. The growth of unconventional reserves challenges the primacy of Saudi Arabia in global reserves, with Canada, Venezuela, and Russia holding major reserves in heavy oil and bitumen, and the US, China and Russia in shale oil (see Table 1.2). Output of shale oil in the US, also known as “tight oil” because the shale rock hosting the oil is of low permeability and the oil must be driven from the formation via hydraulic fracturing techniques, has risen rapidly from 0.5 mmbd in

2008 to 4.5 mmbd in 2015. As a consequence, the US now leads global production of unconventional oil. Shale output has doubled US oil production between 2008 and 2015, transforming it into the world's largest oil producer (Table 1.1) and creating political conditions in which it became possible for the US Congress to lift a ban on crude oil exports introduced in 1975. ConocoPhillips and NuStar Energy shipped the first batches of crude, pumped from the Eagle Ford Shale in Texas, to Europe in January 2016 with oil producers and oil traders following suit. Tight oil production, however, can prove vulnerable to low oil prices due to high production costs and rapid well depletion associated with the very low porosity and permeability of reservoir rocks, and the need to use horizontal drilling and hydraulic fracturing ("fracking") techniques. Alberta's "tar sands" have witnessed similar growth in output, increasing from 1 mmbd in 2005 to 2.3 mmbd in 2015. However, given the capitalintensive character and high production costs of the sector, low prices have led to the suspension of many of the projects through which production was planned to grow to 4 mmbd by 2030. Venezuela's unconventional oil production has stagnated at 0.5 mmbd and seems unlikely to reach 2 mmbd even by 2025. Because unconventional "heavy" sources of oil are essentially "undercooked" or degraded forms of conventional oil – with their long hydrocarbon molecules not having been broken down into shorter ones, or shorter molecules having been altered by bacteria and oxidation – significant inputs of energy, hydrogen (in the form of natural gas), and water are needed to both extract and upgrade them. Unconventional oil reserves are very large but the energy demands and environmental burdens are high, and decried by opponents of shale oil projects and Alberta tar sands.

## Box 1.1 Conventional versus unconventional oil

Variation in the physical, chemical, and energy properties of crude oil means that some sorts are more highly prized than others. “Conventional oils” have lower densities than “unconventional” sources of oil, and thus flow more easily out of reservoirs. They also produce more of the highest-paying fractions of oil such as gasoline, with most oil refineries set up to handle conventional crude. This in turn has made conventional oils the target of exploration and the bulk of global supply. The gold standard is a light, “sweet” (low sulfur) crude, such as Bonny Light from Nigeria. At the other end of the conventional oil spectrum are the heavy, “sour” crudes like Arab Heavy from Saudi Arabia. Between light and heavy are so-called “benchmark” conventional crudes like West Texas Intermediate and Brent Blend.

The term “conventional” recognizes explicitly the boundaries of current practices and also points to the significance of recent changes. Sources once seen as “unconventional” are now an increasingly significant component of overall oil supply, enabling the production of liquids to continue to expand to meet rising demand and delaying the point of decline. These unconventional sources include, in order of decreasing ease of production, extra-heavy crudes (mobile at reservoir conditions, Venezuela’s Orinoco Delta), bitumen (mobile only if reservoirs heated, Canada’s Athabasca), and oil shale (non-mobile requiring mining or fracturing of source rock, US’s Green River Formation), and the use of coal-to-liquids technology. Unconventional oil production faces stiff public opposition, in response for example to groundwater contamination and potential seismic impacts associated with underground fracturing (or “fracking”) using toxic solvents and explosives. Pressed by international oil companies and industry organizations, the US Securities and Exchange Commission changed its accounting rules in 2008, allowing companies to book unconventional deposits as proven reserves. A more encompassing definition of “unconventional” oil considers not only the physical and chemical characteristics of oil, but also the broader geographical context. The political scientist Michael Klare, for example, refers to "extreme energy" to capture how the search for the sorts of oil to which we have been accustomed – and upon which current infrastructure and trade relations are premised – means oil producers are increasingly exploring and developing oil in unconventional operating environments.[4]

Table 1.2 Unconventional oil reserves

Value represents best estimates of ultimately recoverable resources (URR) in billion (or giga) barrels.

*Sources*: S. H. Mohr and G. M. Evans (2010), "Long-Term Prediction of Unconventional Oil Production," *Energy Policy* 38(1): 265–76; World Energy Council, *2010 Survey of Energy Resources*.

| | *Extra-heavy oil* | *Bitumen* | *Shale* | *Total* |
|---|---|---|---|---|
| US | – | 11 | 1086 | 1097 |
| Canada | – | 350 | 3 | 353 |
| Venezuela | 300 | – | – | 300 |
| Russia | – | 53 | 178 | 231 |
| China | 1 | 1 | 220 | 222 |
| DR Congo | – | – | 64 | 64 |
| Kazakhstan | – | 63 | – | 63 |
| Brazil | – | – | 53 | 53 |
| Australia | – | – | 34 | 34 |
| Morocco | – | – | 34 | 34 |
| EU | 2 | 2 | 28 | 32 |
| Rest | – | 11 | 35 | 46 |
| Total | 303 | 491 | 1735 | 2529 |

Third, in the search for new reserves, the "frontier" of extraction is changing. This includes the Arctic, the ultra-deepwater environments offshore (i.e. over approximately 1,500 meters of water depth), as well as areas with limited state capacity and where the governance systems and civil society are in a fledgling condition. These "unconventional" locations are increasingly a feature of the international political economy of oil. Production from ultra-deepwater environments in Brazil, the Gulf of Mexico, and the Gulf of Guinea has been growing over the last decade. The explosion on the *Deepwater Horizon* drilling rig in 2010, and the subsequent uncapped flow of crude from the Macondo oil field around 1,500 meters below the sea surface, indicate the risks and challenges of sourcing supply from unconventional environments.

The production of oil is necessarily linked to reserves, but the geographies of production and reserves do not neatly map onto one another. If the development of oil followed a strictly economic logic, in which the largest, low-cost reserves were exploited preferentially, then production would converge on the comparatively low-cost reserves of the Middle East where break-even costs are lower than US$10 per barrel. Production followed this trend between 1955 and 1975 as a result of attractive economic conditions and the introduction of supertankers that drove down the cost of moving crude oil to markets. However, the nationalization of production by large resourcing-holding states during the 1960s and 1970s – and dramatic spikes in the price of oil that these states achieved through coordinated action in the Organization of Petroleum Exporting Countries – drove new oil-field development in the UK, Norway, Alaska, Nigeria, the Gulf of Mexico, Angola, and Russia. This pattern of geographical diversification away from the Middle East has continued with the collapse of the Soviet Union, so that the geography of production is now significantly less concentrated than that of reserves. By 2015, the Middle East accounted for 47 percent of reserves but only 32 percent of production. The development of unconventional sources continues this trend of diversification away from the Middle East, such as the 2.3 mmbd (equivalent to Qatar) currently produced from bituminous sands in Canada, or the 1 mmbd (equivalent to Oman) from the Bakken shale in North Dakota. In 2011, the president and CEO of Saudi Aramco, Khalid al-Falih, acknowledged the "more balanced geographical distribution of unconventionals" was reducing demand for growth in conventional output from the Middle East. To protect their eroding market share, OPEC members (and Saudi Arabia in particular) have maintained production rates in the face of slowing demand growth. The effect has been to push down oil prices from the middle of 2014, below the level required to keep costlier unconventional production economically sustainable. Lower prices have knocked off some "tight oil" production and led to the suspension of new bitumen projects. They have also, however, hurt the budget of OPEC regimes. Unconventional oil production is itself spatially concentrated (partly due to the geography of the resource base but also to the massive infrastructure required to upgrade unconventional sources to liquids). The further development of unconventional oil sources – particularly oil shales which are widely distributed – could, however, see this degree of concentration decline.[5]

## The shape of demand: lighter, cleaner, Asian

Overlaid on the highly uneven geography of global oil reserves is a different pattern of industrial development and economic growth. Simply put, the centers of greatest demand for oil do not coincide with reserves. Demand varies widely among countries (and within them). The US consumes 20 percent of world production yet has only 3.2 percent of reserves and 4.4 percent of the population. Consumption is around 123 barrels per day per thousand people in Saudi Arabia, 60 in the US, 24 in the UK, 9 in China, and 0.7 in Bangladesh. For both individuals and countries, the price of oil can be an obstacle to participating in "demand." The discrepancy between these two different geographies, between where oil is found and where it is required, underpins several significant features of the global political economy of oil as outlined below.[6]

First, imbalances in consumption and production are the basis for international oil trade: close to 7 of every 10 barrels produced is exported and imported, a movement of more than 60 mmbd and the largest component of world trade (see Figure 1.2). There are net outflows of crude oil from the Middle East, North and West Africa, Latin America and Russia, and net inflows into East Asia, Europe, and the US. Layered on top of this trade in crude is an international trade in refined oil products such as diesel, gasoline, and liquefied petroleum gas (LPG), now equivalent in scale to around half the international movement of crude and increasingly characterized by "long-haul" flows to markets in Asia, Africa, and Latin America (Figure 1.3). The growing scale and geographical scope of the refined products trade reflect a number of significant economic shifts, including expansion of refinery capacity in the Middle East, increased availability of gasoline exports from the US following development of its unconventional shale resources, and rapid growth outside the OECD of consumer demand for fuels that has outstripped regional refinery capacity.

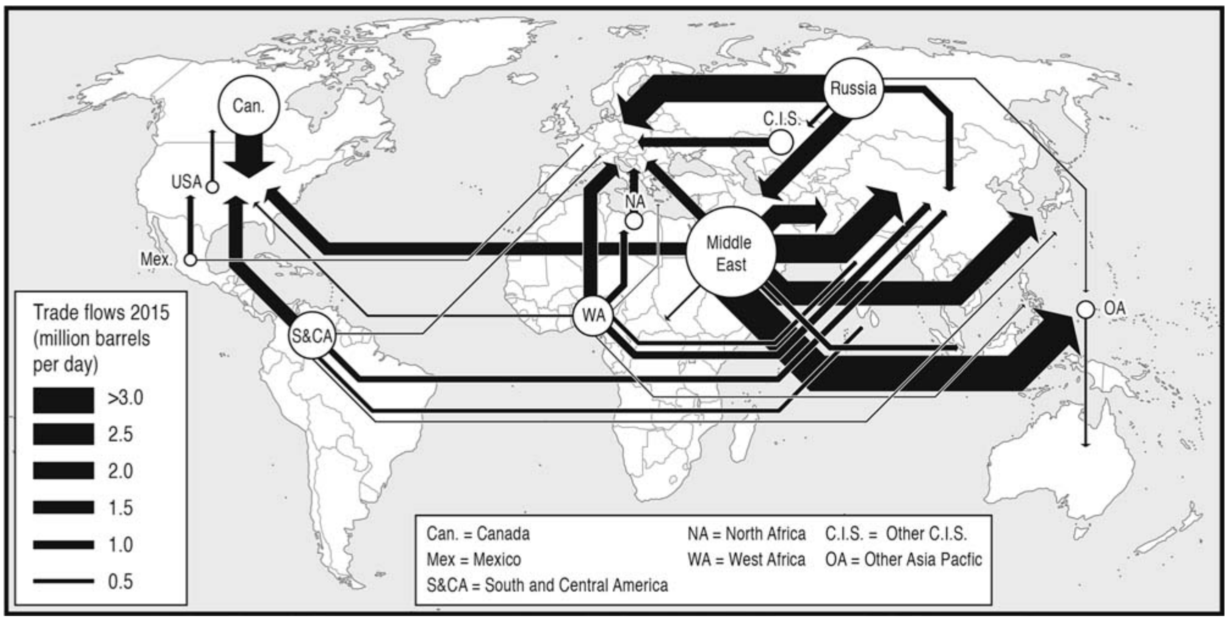


Figure 1.2 Major international trade flows, crude oil

*Source:* Authors, based on data from BP Statistical Review 2016

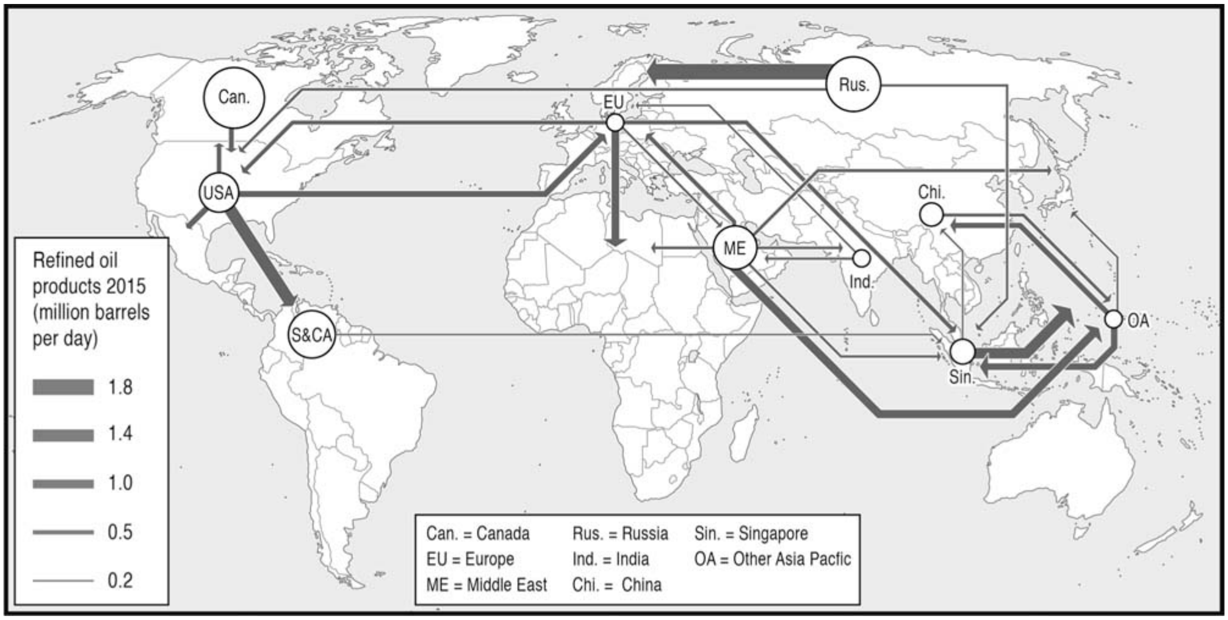


Figure 1.3 Major international trade flows, refined oil products (2015)

*Source:* Authors, based on data from BP Statistical Review 2016

Second, the number of consuming countries is much larger than those holding reserves – every country consumes oil to some degree while there are many without significant reserves – and consumption is less concentrated on a country basis (see Table 1.1). As a consequence, the market power of consuming countries is weak in relation to the small number of countries that control reserves and there is significant competition among importing states for access to supply. This underscores the need for countries with limited reserves but large and/or growing demand to reduce the risk associated with this relatively weak market position. The strategies available indicate the political choices at stake. Supply risk can be reduced through an increase in the intensity of domestic drilling, as pursued in the US through the rapid development of "tight oil"; by diversifying the locations from which oil is imported; by strategic investment partnerships with oil exporters to "lock in" supply outside of the market; by the use of direct military or paramilitary force to control production and supply routes; or via domestic policies that reduce demand and facilitate a transition away from oil.

Third, at the global scale, demand for oil continues to rise. Oil consumption has grown faster than population, increasing by an average of 1.44 percent per year between 2001 and 2015, despite high prices and an economic crisis in the period following 2008, compared to a slowing population growth rate of 1.18 percent. But global growth obscures a significant geographical shift in *where* oil is being consumed. As the world economy's center of gravity shifts away from North America and Europe toward Asia and the Pacific, so market growth – and overall demand – has tilted decisively to the East. In China, for example, consumption grew 6.4 percent per year over that period, peaking at over 16 percent in 2004. In contrast, annual consumption in France dropped by an average of 1.5 per cent. Some of this shift in oil demand is the result of Organisation for Economic Co-operation and Development (OECD) countries outsourcing manufacturing to take advantage of lower production costs. Many of the products manufactured in these lower-wage economies are ultimately consumed back in OECD countries, although the GHG emissions associated with their production are attributed to the place of manufacture. This problem of "embedded carbon" is substantial – the carbon embedded in China's exports is estimated to be twice as large as the UK's carbon emissions – and an important factor in assessing responsibility for oil-related GHG emissions. An increasing proportion of Asian oil demand, however, is associated with domestic consumer spending (cars, furniture, plastic products) linked to the region's growing middle class rather than industrial production. Consumer demand is expected to power oil consumption growth in India, China and many other countries in the region over the next couple of decades: Asia currently accounts for less than a third of the global middle class, but this is projected to grow to around two-thirds by 2030.

China's demand for oil outstripped its domestic capacity in 1993 and since then it has been a significant importer and an increasingly assertive presence in the search for access to new reserves. The shift in the center of gravity for oil demand is associated with a shift in bargaining power among importing states – notably between the US and China – and with the development of new strategies by importing states for the acquisition and/or control of nondomestic sources of oil. Within former oil-exporting states like Indonesia, domestic growth and the development of a middle class has absorbed production and changed the direction of flow: since 2005, Indonesia has imported more than it exports. Consumption is also rising in other large producing and exporting states: Saudi internal demand doubled between 2004 and 2015. By contrast, in Europe oil demand peaked prior to the recession and is expected to continue to fall as a result of slow economic growth, climate regulation, and comparatively high taxes on fuels. Oil demand in non-OECD economies has steadily risen and passed that of the OECD in 2013. The result is that “rich countries are not setting the rules on either the demand or the supply side of the equation anymore.”[7]

Fourth, there is also a shift in the nature of demand toward the lighter fractions available from the refining of crude oil that are used as transportation fuels (diesel, gasoline, jet fuel) and away from heavier heating oils. Within growing markets, this is associated with an emerging middle class, growing car ownership, and air travel. Within mature markets, the shift reflects a substitution by natural gas in heating and power sectors and increasing regulation of air quality. The changing nature of demand is creating a growing “quality gap” between the direction of the market for petroleum products and the increasingly “hard-to-get” and, in the case of unconventional resources like bituminous sands, lower-quality raw materials available to the oil industry. The gap can only be met by “upgrading” the resource, implying greater inputs of energy and rising costs (often despite efficiency gains). In addition, the shift of oil into transportation and out of the power sector decreases the ease with which emissions from the burning of oil and petroleum products can be captured, ensuring a collision between “car culture” and climate change.

Fifth, the models of development that embedded oil within industrialized economies in the postwar period, later replicated in most parts of the world, took little account of the “externalities” of gathering and processing oil, turning it into durable plastics and emitting carbon dioxide and other pollutants during the combustion phase. Environmental regulation and an increasing awareness of both climate change and the wider consequences of oil development now influence the accessibility of oil reserves (e.g. environmental considerations), the price and demand for oil (e.g. via “green” taxation of fuels and carbon accounting), and the acceptability of current practices of oil extraction and use. Peak demand – rather than supply – is a reality in the OECD, while “demand destruction” is increasingly a policy objective as part of broader efforts to decarbonize economies as a response to climate change. The mismatched geographies of oil production and consumption (Figure 1.4) also raise challenging questions about responsibility for the carbon dioxide emissions associated with oil. Current approaches point to the responsibility that consumers have at the end of the carbon chain (via the regulation of emissions) rather than to the countries or companies that separate carbon from underground stocks and dispatch it into the economy. However, frameworks like the European Union (EU) Emissions Trading Scheme exclude transportation (the EU ETS has included aviation since 2012 but does not include road or diesel-powered rail transport) and so leave many of the emissions associated with oil untouched. Further, international regulation, via the UN Framework Convention on Climate Change (UNFCCC), emphasizes the historic responsibilities of countries that have been major markets for oil in the twentieth century but where demand is now in decline (the 43 industrial countries and transition economies listed in Annex 1 of the UNFCCC). The approaches currently adopted for dealing with climate change, then, are insufficient for addressing the carbon responsibilities of the oil production chain.

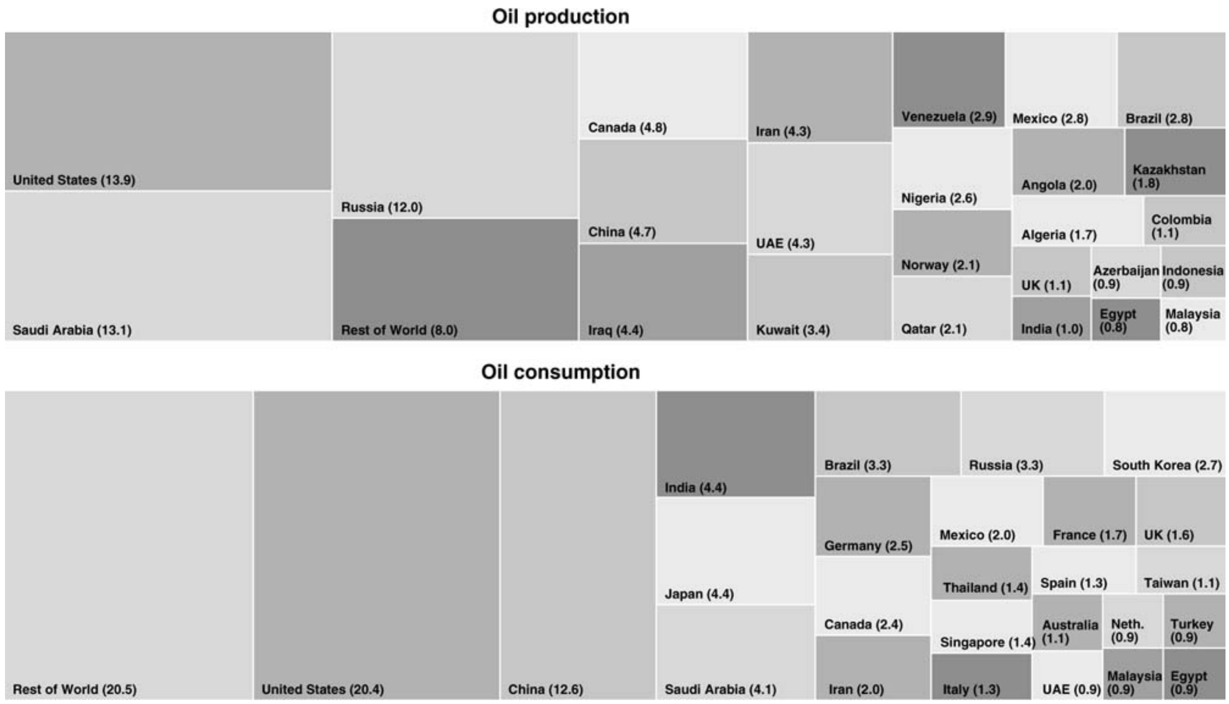


Figure 1.4 Oil production and consumption (2015), showing largest 25 countries (with percentages) plus rest of world

*Source:* Authors, based on data from BP Statistical Review 2016

## Actors: states, firms, and civil society

The landscape of actors in and around oil is complex, and we examine this in more detail in chapter 2. Key actors are states, firms, and civil society organizations. Here we highlight the way these are involved with oil and point to significant emerging issues.

Oil resources are embedded – literally – in the territorial framework of states. In most jurisdictions (although not all, such as non-federal lands in many US states) oil resources are owned by national governments. Physically, legally, and culturally, oil is frequently understood as part of the “body” of the nation, so that national interests can play a decisive role in decisions about the production of oil. For states that host large oil reserves, oil can be seen as a route to modernization and development. The record on this is remarkably mixed and the state’s ownership of resources can be a means for those in power, or close to government, to capture public wealth for private gain. Many states holding large reserves have also sought to capitalize on their ownership position and become drillers, refiners, and marketers of oil via the formation of national oil companies.

The consumption of oil is also closely tied to state-level policies. Tax revenues from fuel sales, the sensitivity of economic growth to oil prices, and the geopolitics of energy security ensure that national governments have a keen interest in the accessibility and affordability of oil. High taxes on oil consumption allow some importing states to get more revenues from oil than exporting ones. National security and the ability to project “hard power” are also significant concerns for import-dependent states, as military flexibility and muscle are premised on a suite of petroleum products. National military institutions are concerned about the stalling of conventional supply and increasing competition for reserves. States also play a significant regulatory role in occupational health, safety, and the environment. National governments, then, play a larger role in oil than in many other resource sectors. An important distinction is between states that are net importers of oil and those that export. These two groups face each other on different sides of the oil market, although there is also a mutual dependency around price as higher prices for oil (which benefit exporters) can erode markets as importers reduce demand and substitute other energy sources. Tensions over price and the security of supply historically led these two groups of states to form their own “clubs” to protect their interests, in the form of the Organization of Petroleum Exporting Countries (OPEC, created in 1960) and the International Energy Agency (IEA, created in 1974).

States may own most of the world’s oil, but it is companies that search for, develop, refine, and market it. The international, vertically integrated oil firm – headquartered in the US or Europe and with extractive and marketing arms around the world – is the iconic actor, its capacity to regulate the flow from reserves to markets giving it historically a dominant position. Firms like Standard Oil and Shell defined the shape of the industry from its beginnings and into the postwar years and for this reason have become known as “the majors” or, more prosaically, “international oil companies” (IOCs). Today, “the majors” is something of an anachronism. IOCs remain among the ranks of the leading producers, but the nationalization of their crude oil assets by many reserve-holding states in the 1950s and 1960s removed their control over supply. ExxonMobil, for example, holds the most reserves of any IOC yet ranks only fourteenth worldwide, with 1 percent of global reserves. State-owned, national oil companies (NOCs), headquartered in some of the most significant oil-exporting states, decisively entered the field in the 1960s and 1970s. Building on their ownership of low-cost reserves, many of these firms have developed extensive, vertically integrated networks of distribution to markets in Europe, the Americas, and Asia. NOCs produce close to three-quarters of the oil extracted each year. Saudi Aramco, the world's largest integrated oil company in terms of annual output, produces around 10 percent of the world's crude and NOCs head the world rankings of oil companies by operational (as opposed to financial) criteria.

This distinction between IOCs and NOCs has historically been important for understanding competition over access to resources and markets. IOCs have been understood as "resource seeking" (in order to supply their downstream refineries and "home" markets) while NOCs have been seen as "market seeking" (looking for external markets to absorb their exports). However, this dichotomy is increasingly insufficient for grasping the global political economy of oil, for four reasons. First, the distinction typically highlighted the way NOCs operated to a national political logic rather than commercial objectives. But NOCs are an increasingly diverse group: for many state-owned firms, the level of state ownership has been reduced over time via public offering with the state retaining a controlling share, and a few have technical and commercial capabilities on a par with the IOCs. Second, IOCs and the large reserve-holding NOCs are increasingly in cooperation with one another in the development of the more challenging fields. Third – and most significantly – a number of NOCs have emerged from Asian economies that are not market seeking but resource seeking. Firms like the Korea National Oil Company, the Oil and Natural Gas Corporation (India) (ONGC), China National Offshore Oil Corporation (CNOOC), and PetroChina are state-owned firms: as important as their "national" ownership, however, is their strategy of transnationalization and their competition with the IOCs for access to resources. Fourth, with slowing rates of growth and declining margins in the historically large markets of Europe and North

America, many of the IOCs are engaged in “market-seeking” activity. This includes shifting their assets to sell into the growing Asian markets while also moving more heavily into growing segments of the US and European markets such as natural gas.

Civil society, a collective term for the nongovernmental and noncorporate organizations and institutions that have come to play an increasingly significant role in public advocacy, has emerged as an important actor in the political economy of oil. Working through the medium of information and harnessing public concern to bring pressure on corporations and governments, civil society organizations have turned a spotlight on oil. Organizations like Global Witness, Oil Watch, PLATFORM, Publish What You Pay, and the Natural Resource Governance Institute draw attention to the unsavory political bargains created in and around oil and the need for greater transparency and accountability. Other groups emphasize the *development challenge* of oil. The strong association between oil extraction and persistent poverty (the “resource curse”) in parts of Africa, Latin America, and the former Soviet Union has sharpened the question of who benefits from oil and how oil extraction may be harnessed for sustainable forms of economic and social development. Still other civil society organizations highlight oil’s environmental deficits, from groundwater pollution and habitat loss to climate change. In short, civil society organizations have not only identified and publicized many of the negative externalities of oil production and consumption but have also *contested* them. Their argument, in effect, is that oil is failing in significant ways to meet broad social goals. The ways in which we access, process, and use oil, they claim, are unacceptable and something must be done.

## *Summary*

As a result of a prodigious growth in the production and consumption of oil over the course of the twentieth century, the resource base is changing. The quality of crudes is declining: the oil added to new reserves is generally “dirtier” (in terms of energy needs and carbon contribution), more costly to extract, and located in environments that push the envelope of design and implementation. There are also uncertainties over the size of available reserves, creating concerns that the historic pattern of supply growing to match demand may no longer hold. Against this background, world demand continues to grow, driving prices and speculation about future supplies. Growing domestic demand in Asia is behind the emergence of new, state-controlled transnational firms seeking resources beyond domestic territory to supply home markets. And growing domestic demand in major oil-exporting countries suggests that their “surplus” for export will be increasingly squeezed. The 1.5 trillion barrels of oil produced to date has not only driven growth and productivity in industrial economies but has contributed to the accumulation of carbon dioxide in the atmosphere, generated water and air pollution, and conspicuously failed to create a basis for social development in many oil-producing economies. This, then, is the context that defines the contemporary politics of oil.

## The geopolitics of the hydrocarbon chain

The geopolitics of oil is the struggle to define who wins and who loses as oil moves from underground reserves to the point of consumption. We refer to this as “*geo*politics” for two reasons. First, the “hydrocarbon chains” that ferry oil from its underground reserves into the engines of cars, cargo ships, planes, and tanks, and that transform crude into carbon dioxide, are fundamentally geographical. Oil moves across space and at key points is claimed in different ways by national governments and other interests – as a resource, as a traded good, as a source of tax revenue, as a set of development possibilities, and as environmental burdens to be allocated and addressed. Second, power and control in the oil sector are, by and large, about the control of particular spaces: the dominance of the Middle East over conventional oil reserves; the ability to exclude “foreign” firms from domestic markets; the emerging capacity of governments to regulate access to the atmosphere as a dumping ground for greenhouse gases; or the capacity to close a key pipeline or tanker route. Struggles over oil often revolve around particular sites, although their outcomes can influence the entire oil sector.

Distributional questions – who wins, who loses – are at the heart of the geopolitics of oil. Importantly, these extend beyond the traditional question of oil supply to encompass issues of resource access, value creation, price, revenue distribution, and the allocation of responsibility for pollution. In each of these cases, the things that people struggle over – the object of politics – are different: what unites them, however, is a common set of distributional concerns that center on the management and performance of the hydrocarbon commodity chain. Schematically, then, we can think of these different distributional questions as five sequential "cuts" through the hydrocarbon chain, each associated with a distinctive phase in the chain (see Figure 1.5). We expand briefly below on each of these cuts and the geopolitical issues associated with them.

### *Laying claim to other people's oil: resource acquisition*

Because most oil resources are owned by governments, negotiations over resource access are typically between the host state and a company seeking resources. The relationship arises because of a mutual dependence: for resource holders, the value of the resource is dependent on it being extracted and sold; and firms without access to their own resources depend on gaining access to resources owned by others. The object of politics is typically the terms of access, and the arrangements for sharing the revenues and rents that result from oil development. These tensions are seldom resolved in any final way: indeed, the agreements made between investing firms and resource-holding states have been characterized as an "obsolescing bargain" because of the way in which, when oil begins to flow, there is pressure from resource holders to renegotiate terms agreed at the outset of oil development. More generally, the historical pattern is that periods of relatively liberal resource development – in which the balance of power tilts in favor of the investing firm – are followed by periods of resource nationalism in which the resource-holding state seeks to assert its authority and wrest back some of the value that had previously been awarded to the firm. The struggle to locate oil reserves and secure exclusive control provides much of the drama in the history of oil development. From the colonial "concession" to production-sharing agreements (PSAs) and service contracts, rights of access take a variety of forms. Today, transnational state-owned firms – like PetroChina and Petrobras – are in competition with the IOCs that produce much of the world's oil but which control a relatively small proportion of world reserves. For both IOCs and the transnationalizing NOCs, access to “other people’s oil” is an imperative. Both sets of companies call on the political resources of “home” states for support, so that a landlord–developer relationship evolves into a relationship between states. We examine the geopolitics of “capturing” resources in more detail in chapter 2.

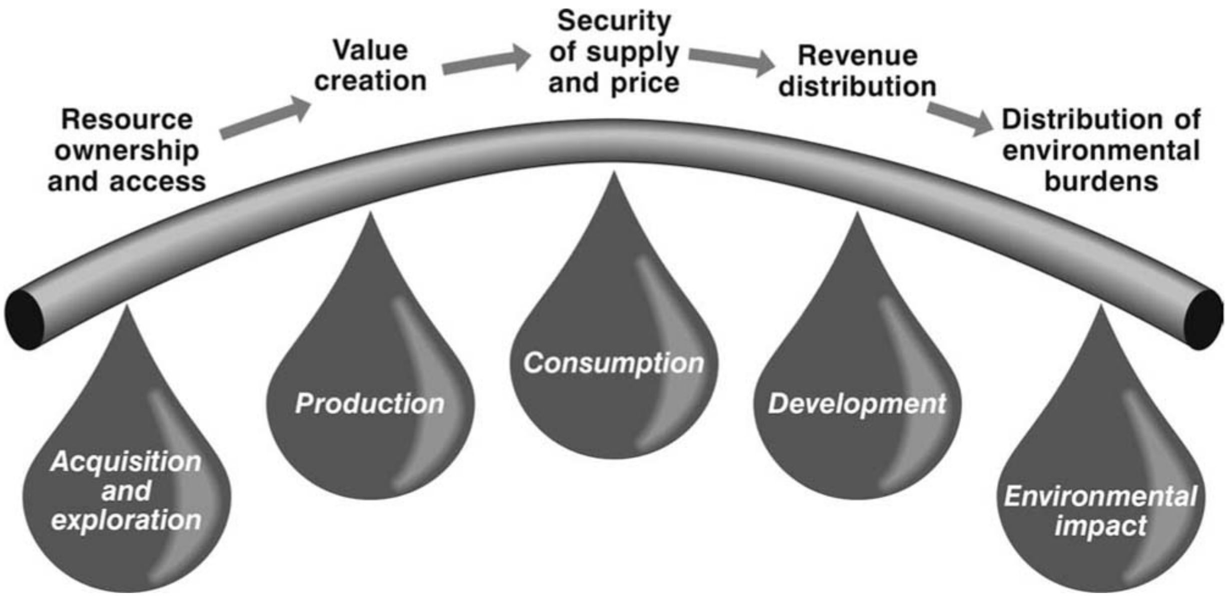


Figure 1.5 The politics of the hydrocarbon chain

## *Getting a cut: value distribution*

Once oil has been captured through an access agreement, the next step in the hydrocarbon chain is production. In physical terms, this is the transformation of crude into a series of products for sale to market. However, the object of politics is the way economic value is distributed along the various parts of the production chain during this conversion of crude into different petroleum products. There are many elements to this, but five – concerning companies, workers, consumers, governments, and investors – are particularly significant. First, the logic of capturing value across the production process underlies the vertically integrated character of both IOC and NOC firms, which allows the capture of profits in both the upstream and downstream reaches. Nationalizations by reserve holders in the 1950s and 1960s challenged the capture of value by IOCs and sought instead to retain it within the framework of NOCs. A further issue over the distribution of value concerns efforts by oil exporters to "upgrade" their part of the hydrocarbon chain by moving into downstream processing. Second, the creation of value in the hydrocarbon commodity chain rests on the labor of millions of people. A complex and diverse range of livelihoods manipulate oil's flows – from oil-field workers and gas pump attendants, to white-collar energy traders and illegal fuel runners. Oil work can be influential, from the capacity of refinery workers to strike, to the lobbying and philanthropic power of oil magnates. Oil work is also gendered, raced, and made synonymous with national identity in certain contexts. These and other factors influence the differential ability of workers to secure value from their labor along the hydrocarbon commodity chain, whether in the form of livelihoods that are economically secure, or conditions and rhythms of work compatible with other life activities (e.g. family, leisure time). Third, the distribution of value to end consumers versus producers revolves around the crude oil price. If producers can secure control over a significant proportion of supply, they are able to exert an upward effect on prices. Rises in price erode value for consumers but, as long as production costs do not also rise, they increase value for producers. The erosion of value can be particularly acute for *poor* importing states, and high oil prices have significant implications for their development. OPEC's actions in the 1970s demonstrated the ability of producers to club together to control supply for short periods of time, although this was undermined by diversification of supply and competition within OPEC for market share. Fourth, consuming governments also siphon value from the hydrocarbon chain via the taxation of fuels. In Europe, this "tax wedge" is large and has become a target for political protests from road users. Fifth, the ownership of "paper oil" – the trading of oil futures without the intention of taking physical delivery – allows financial managers to capture value from, and create, shifts in price. Against a background of anticipated supply shortages and growing Asian demand, the role of speculation in driving price is now a major concern for oil importers and consumers. We examine the question of how value is distributed in chapter 3, with a particular focus on price, and chapter 4 which centers on labor.

## *No surprises: securing flow*

A third "cut" across the hydrocarbon chain highlights the question of securing the flow of oil between *net exporters* of oil, countries that produce more than they consume, and *oil importers* that do not produce any or enough oil for domestic demand. This is a relationship based on the physical movement of oil via trade and a reciprocal flow of revenue, and the mutual needs of importing and exporting states for reliable trading partners. The object of this relationship is the security of supply. The vulnerabilities and strategic opportunities created by flows of oil and money are at the core of international geopolitics, and structure the domestic politics of large exporting and importing states alike. Both the US and China, for example, are major producers of oil but these countries consume over twice the amount available from domestic supply. The consistent shortfall in domestic production relative to domestic demand in these countries exerts a significant influence on their foreign policy: whether via oil diplomacy, development-for-oil deals, or the projection of military force, the need of large oil-importing states to secure sufficient extraterritorial supplies of oil is a key feature of the global economy. On the other side of the coin, Russia is also one of the world's major oil consumers – it ranks fifth in the world in terms of its annual consumption of oil – but it produces around three times as much oil as it consumes and so is a leading exporter. Large exporters are also concerned about energy security, which for them means a concern about the loss of markets to new entrants, via the corrosive effect of high prices on demand or regulation of carbon. We examine this dynamic of securing supplies and markets in chapter 5.

### *Avoiding the curse: modernization and development*

A fourth cut illuminates the question of how oil contributes to economic and social development. It centers on the relationship between the national and regional governments of oil-producing and -exporting states and their peoples, and the extractive firms that pump, refine, and export crude. Oil often fuels dreams of development, yet the reality of modernization through oil frequently falls short. Tensions revolve around the management, or squandering, of oil revenues, the creation of oil dependency, and the challenges of the so-called "resource curse" – that countries with abundant natural resources tend to have worse development outcomes than those with limited endowments. At a national scale, it is useful to distinguish between so-called *high absorbing* states that do better at incorporating oil revenues into their economies; and *low absorbing* states where governmental authorities lack the capacity to handle the large and volatile revenue streams associated with oil exports.

A critical question is how revenues are distributed geographically and across different social classes and ethnic groups. The issue here is the extent to which communities that host oil wealth are compensated for its extraction and the social, economic, and environmental dislocations this can cause. Tensions frequently arise between a central government (the owner of oil underground) and regional governments that administer lands and other resources in the area of oil development.

### Accounting for nature: pollution

The fifth and final cut relates to the politics of emissions from the hydrocarbon chain. These occur all along the chain in the form, for example, of local groundwater contamination, ocean pollution, habitat loss, urban smog, and global climate change. Critical questions are the distribution of these pollutants – where they go and whom they affect – and the allocation of responsibility for addressing them. A growing alliance of civil society organizations and some governments are calling oil companies to account by demanding they address historic responsibilities for pollution (e.g. Chevron in Ecuador). Others seek moratoria or bans on drilling in sensitive environmental settings such as the Arctic. Increasingly, however, it is around the role of the hydrocarbon chain as a carbon conveyor – transforming fossil stocks of carbon into atmospheric carbon dioxide – that the politics of pollution revolves. The question of responsibility here is particularly significant. Conventional approaches highlight carbon emissions rather than the throughput of fossil fuels in the economy. An alternative approach, however, is one that seeks ways to prevent oil from being extracted in the first place by generating revenue streams from the protection of habitat or forgone carbon emissions. We explore the politics of development and environment in chapter 6.

# Conclusion

In the twentieth century, oil politics centered on the management of abundance, state power, and market growth. The remarkable energy surplus made available through oil transformed the experience of space and time for many of the world's population during that period; for many others, it fostered dreams of economic and social transformation. Today, the legacies of this "Age of Plenty" include volatile prices, dwindling conventional oil reserves, climate change, and enduring poverty in many oil-rich countries. Our goals in this chapter have been to identify those characteristics of the contemporary oil sector that differentiate it from the "Age of Plenty"; establish how these are linked to previous waves and historic practices of oil-fueled development; and indicate how these conditions add up to a new geopolitics of oil. Deteriorating resource quality and growing uncertainties over reserves, the rise of consumerism in Asia, the internationalization of state oil firms, and the tentative emergence of nonfossil alternatives to oil are signs of an industry being reordered by a range of powerful forces. The following chapters are organized around five critical tensions that are currently shaping the sector: the geopolitics of resource access; the volatility of oil prices; security of supply; the possibilities of development through oil; and the environmental consequences of oil production and consumption. The future of oil will be determined through the ways these conflicts are addressed. In the pages that follow, we show how this new geopolitics is bringing into question commonplace assumptions about the governance of oil, while also raising fundamental questions about who now governs oil and for whom.

# Notes

1. A largely disproven abiogenic (or abiotic) theory argues that petroleum comes from inorganic carbon. Another, the deep biotic theory, argues that some oil could come from the life cycle of deep bacteria. M. Tucker, *Sedimentary Petrology: An Introduction to the Origin of Sedimentary Rocks* (Blackwell Science, 1991).

2. For work on energy surplus, see J. Martinez-Alier, *Ecological Economics: Energy, Environment and Society* (Blackwell, 1987); C. Hall et al., "Peak Oil, EROI, Investment and the Economy in an Uncertain Future," in *Biofuels, Solar and Wind as Renewable Energy Systems*, ed. D. Pimentel (Springer, 2008), pp. 109–32; C. A. S. Hall et al., "Hydrocarbons and the Evolution of Human Culture," *Nature* 426(6964) (2003): 318–22; H. Haberl, "The Global Socioeconomic Energetic Metabolism as a Sustainability Problem," *Energy* 31(1) (2006): 87–99. G. Bridge, "Beyond Peak Oil: Political Economy of Energy Crises," in *Global Political Ecology*, ed. R. Peet et al. (Routledge, 2011).

3. On the risk of Saudi oil production collapse, see M. Simmons, *Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy* (Wiley, 2005).

4. For example, M. Klare, "The era of xtreme energy: life after the age of oil," www.tomdispatch.com/post/175127 (2009); see also M. Klare, *The Race for What's Left: The Global Scramble for the World's Last Resources* (Metropolitan Books, 2012).

5. Although geographically diversified by historical standards, global production remains dominated by huge formations in Saudi Arabia, other parts of the Middle East, Nigeria, and Russia. One in every 12–13 barrels produced worldwide comes from just two fields, the Burgan field in Kuwait and Saudi Arabia's mammoth Ghawar field. For a commentary on historic shifts in the geography of oil production and consumption, see P. Odell, "The Global Oil Industry: The Location of Production – Middle East Domination or Regionalisation?" *Regional Studies* 31(3) (1997): 311–22; Reuters, November 21, 2011 "Saudi Sees Threat of Shale Oil Revolution." On future unconventional oil production, see S. H. Mohr and G. M. Evans, "Long-term Prediction of Unconventional Oil Production," *Energy Policy* 38(1) (2010): 265–76.

6. Figures on oil consumption per capita are from the US CIA *World Factbook*. They need to be treated with caution, however, as they do not adjust for consumption in petrochemical refining and re-export: the equivalent figures for Singapore and the US Virgin

Islands, for example, are 190 and 845, both of which host major oil refinery complexes.

7. T. Wang and J. Watson, “China’s Carbon Emissions and International Trade: Implications for Post-2012 Policy,” *Climate Policy* 8 (2008): 577–87. “Indonesia Becomes Net Oil Importer,” *Alexander’s Gas and Oil Connections*, August 9, 2005; quote is from J. Rubin, “Demand Shift,” in *Carbon Shift: How the Twin Crises of Oil Depletion and Climate Change Will Define the Future*, ed. T. Homer-Dixon (Random House, 2009), pp. 133–51.

# CHAPTER TWO
# Capturing Oil

Oil is a resource both familiar and strange. To fill up at the local gas station is also to become entangled in concerns about national security, drill rig safety, Arctic sea ice, financial speculation, and indigenous rights. Oil brings together worlds that appear normally quite separate and mixes them up, so that establishing where oil begins and ends has become increasingly difficult. This churning together of different issues is a feature of contemporary oil politics and, in particular, of the efforts by companies, governments, and NGOs to allocate responsibility along the production chain – for transportation choices, greenhouse gas emissions, long-term energy supplies, or the promotion of development and human rights in oil-producing countries. To begin to untangle the contemporary politics of oil, this chapter introduces the "global production network" of firms and states through which oil is located, extracted, refined, and distributed. We outline how economic relationships at the heart of this network are structured by the politics of competition and cooperation. We focus on "classic" actors – oil companies and national governments – and questions of resource sovereignty and access that defined much of the politics of oil in the twentieth century. But we also identify other actors – like the financiers that bankroll oil exploration – which are increasingly scrutinizing (and being scrutinized for) their involvement in carbon-intensive and socially disruptive activities. A key feature of the contemporary politics of oil, we argue, is the way actors and spaces that conventionally have lain outside of oil are now drawn within it.

As a first step, Figure 2.1 illustrates a generalized global production network for oil. The foundation of this network is the flow of crude oil. Crude is "captured" from the environment via the "upstream" phases of exploration and production at the top of the diagram; it moves through the so-called "midstream" phases of crude oil storage and transportation to the "downstream" phases of refining, distribution, and consumption of oil products at the bottom of the diagram. We also add a fourth phase – which we coin "backstream" –

to refer to the return flow of waste products and emissions to the environment. These backstream flows occur all along the production network but, for clarity, only those associated with the post-consumption phase are shown in Figure 2.1. They include waste plastics, GHG emissions to the atmosphere from combustion and – potentially – deliberate strategies of carbon capture (via sequestration in plants or carbon capture and storage) that aim to “close the loop” and return carbon to the ground.

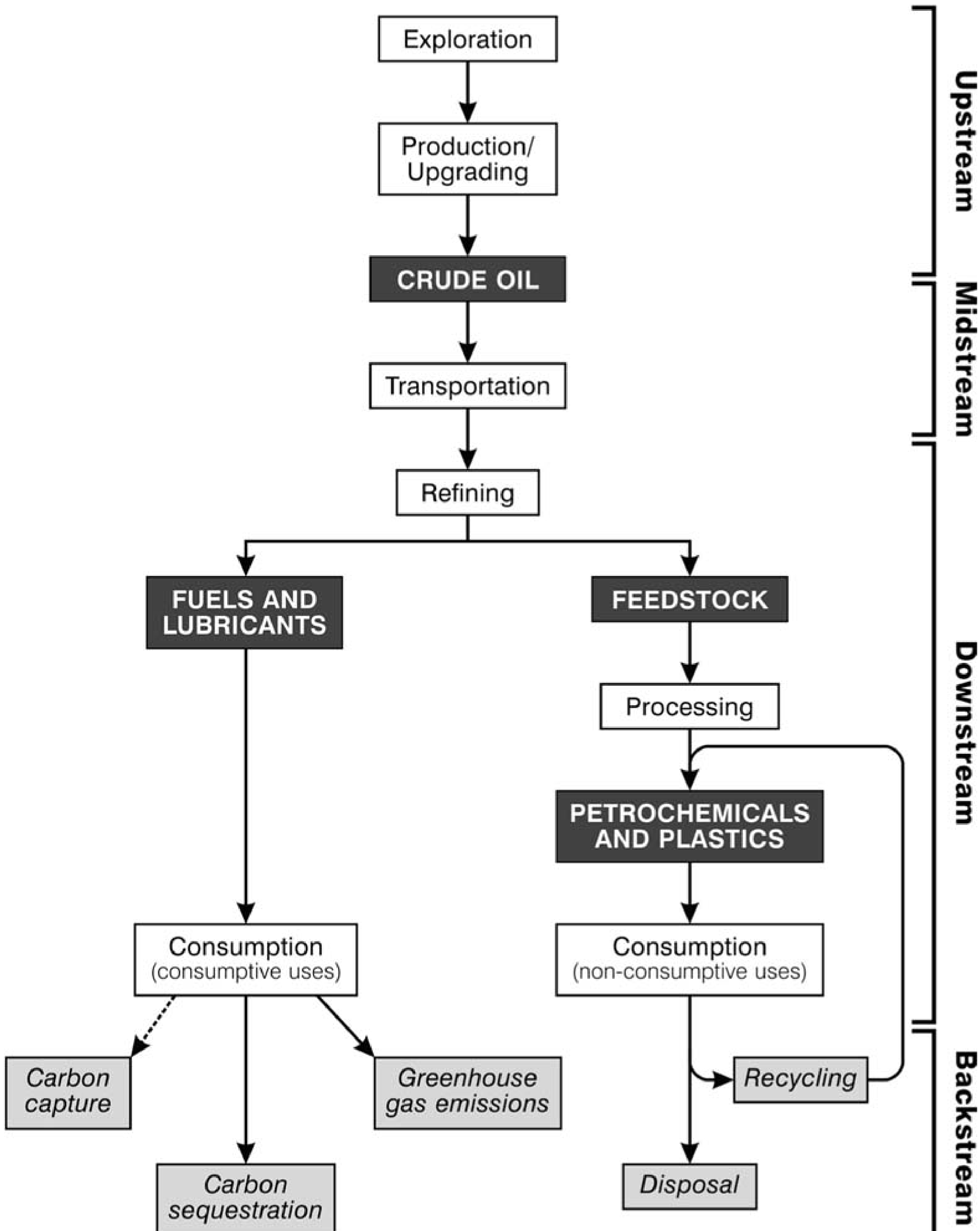


Figure 2.1 A generalized oil-production network

States and firms dominate this network, and relations among them produce tensions critical to the geopolitics of oil. The most significant are the tensions among major oil-importing states (such as the US, China, and the EU) over crude oil supplies; competition for production volumes and market access among leading oil-exporting states (such as Saudi Arabia, Russia, and Iran); rivalry among oil firms over project opportunities, and between resource-seeking companies and reserve-holding states over conditions of access; and the tension between oil exporters and oil importers over the volume, price, and reliability of supply.

## States: oil landlords, national champions, and regulators

National governments play a significant role in the production network for oil, as landlords, national champions, and regulators.

### *Oil landlords*

Around the world, it is mainly governments that own oil resources: private landowners or communities may own the surface, but oil underground belongs to the state. The state has an interest in generating economic rent from its resources and, in pursuit of this objective, allows firms to develop them under particular conditions. For example, in the UK, oil and gas resources are owned by the national government ("the Crown") under the Petroleum Act of 1934, with the Crown dispensing licenses to firms to search for and produce oil and gas on land and under the sea. The US constitutes a rare exception: an entrenched ideology of private property and a history of early oil-field development at a time of economic liberalism have ensured oil resources are not reserved to the government except on federal lands.

Because oil resources are typically state owned, national political considerations play a critical role in governing who can have access to them (domestic versus foreign firms), which resources are available for extraction and where (subject, for example, to environmental and resource conservation criteria), and the financial and other conditions attached to access (royalty payments, requirements on domestic employment or downstream processing). The principle of state sovereignty over oil resources developed gradually during the twentieth century. In many instances the nationalization of oil resources has been part of a broader struggle for economic and political self-determination. In Mexico, for example, the post-revolution Constitution of 1917 vested ownership of mineral resources in the national state and subsequently provided a foundation for the expropriation of international oil company assets by the Cardenas government in 1938. The principle that states should have sovereignty over natural resources within their territory became an international political claim in the 1950s in the context of decolonization and the ambition of newly independent states for self-determination and protection against "economic colonization" by western states or companies. In oil-exporting countries with a long history of involvement by foreign-owned oil companies – such as Mexico, Venezuela, and Iran – there is a potent collective memory of the historical struggle to wrest control of "national" oil resources out of foreign hands. A consequence is that oil reserves around the world are legally and culturally embedded within national territories and subject to national political considerations. From the perspective of oil-importing states (and investing firms), this means that a good deal of the oil they seek is subject to foreign control.[1]

## *National champions – exporting states*

States are major players in the global oil industry via their equity participation – in whole or in part – in NOCs, within which the state combines its role of landlord with that of an investor. Where it has responsibility for production decisions (either on its own or as part of a joint venture), the NOC also acts as the operator. Of the top 50 oil and gas companies by volume of production, over half are majority state-owned. National oil companies control 60 percent of world oil reserves and 88 percent of reserves among the top twenty reserve-holding companies (see Table 2.1). This dominance of state-owned firms in reserves and production is all the more striking, given the general retreat of the state from the economy in many countries since the 1980s, including the privatization of many state-owned natural resource companies. Not all state-owned oil firms are alike, however, and it is useful to draw a distinction between the

NOCs of countries that hold large oil reserves and which are significant oil exporters (such as Saudi Aramco, Venezuela's PdVSA, the National Iranian Oil Company, Kuwait Petroleum Corporation or Libya's National Oil Corporation) and state-owned firms from countries that are significant oil importers (such as PetroChina, India's ONGC, or the Korea National Oil Company).

Table 2.1 Top 20 integrated oil companies (2015)

| *Reserves (billion barrels oil equivalent)* | | *Production (million barrels oil equiv. per day)* | | *Revenue (billion US dollars)* | | *Market capitalization (billion US dollars)* | |
|---|---|---|---|---|---|---|---|
| PdVSA | 298 | Saudi Aramco | 12 | Saudi Aramco | 318 | Aramco | 1500 |
| Saudi Aramco | 260 | Gazprom | 8.3 | Sinopec | 284 | ExxonMobil | 363 |
| National Iranian Oil Co. | 156 | National Iranian Oil Co. | 6 | PetroChina | 275 | Royal Dutch Shell | 210 |
| Abu Dhabi Nat'l Oil Co. | 137 | ExxonMobil | 4.7 | Royal Dutch Shell | 265 | PetroChina | 204 |
| Kuwait Petroleum Corp. | 111 | Rosneft | 4.7 | ExxonMobil | 237 | Chevron | 192 |
| Rosneft | 34 | PetroChina | 4 | BP | 219 | Total | 122 |
| Petroleos Mexicanos | 31 | BP | 3.7 | Total | 143 | BP | 99 |
| ExxonMobil | 13 | Royal Dutch Shell | 3.7 | Chevron | 130 | Sinopec | 90 |
| CNPC/PetroChina | 11 | Petroleos Mexicanos | 3.6 | Kuwait Petroleum | 118 | ConocoPhillips | 59 |
| Total | 11 | Kuwait Petroleum | 3.4 | Gazprom | 102 | CNOOC | 58 |
| Petrobras | 11 | Chevron | 3.3 | Petrobras | 96 | Occidental Petroleum | 58 |
| BP | 10 | Abu Dhabi Nat'l Oil Co. | 3.1 | LukOil | 90 | Eni | 58 |
| ENI | 7 | Total | 2.5 | PdVSA | 89 | Gazprom | 57 |
| Chevron | 6.3 | Petrobras | 2.4 | Valero Energy | 88 | Statoil | 54 |
| Statoil | 5.4 | Qatar Petroleum | 2.4 | Eni | 87 | Rosneft | 51 |
| Shell | 5.3 | LukOil | 2.3 | Phillips 66 | 85 | Reliance Industries | 51 |
| ConocoPhillips | 4.8 | Sonatrach | 2.2 | Rosneft | 81 | Phillips 66 | 46 |
| Suncor Energy | 4.4 | Iraq Ministry of Oil | 2 | JX Holdings | 76 | Suncor | 45 |
| Canadian Natural Resources | 3.5 | PdVSA | 2 | Abu Dhabi Nat'l Oil Co. | 51 | EOG Resources | 44 |
| Sinopec | 3 | ConocoPhillips | 2 | Iraq Ministry of Oil | 49 | Petrobras | 42 |

For countries holding large oil reserves, taking an ownership stake in the production of oil has typically been a political response to perceived exploitation by the international oil companies that have historically controlled production in these countries. Mexico was the first major producer and oil exporter to nationalize production when, in 1938, it expropriated the assets of Standard Oil of New Jersey and Shell and established the national oil company, Petroleos Mexicanos

(Pemex). National governments in the Middle East first became equity participants (as opposed to simply acting as landlords and concessionaires) as a result of competition among the international companies for access to their reserves, with national shares in concessions established as part of the access bargain. An influential deal in 1957 between the Italian company ENI and the National Iranian Oil Company created an exploration and production company that was jointly owned and managed by ENI and the Iranian government.

Nationalization hit a high watermark in the 1970s. Iraq nationalized the Iraq Petroleum Company in 1972, while in the same year OPEC required that all operations in Kuwait, Qatar, UAE, and Saudi Arabia have a 25 percent government share which would then rise over time – Saudi Aramco increased its share to 60 percent in 1974 and 100 percent in 1980. Malaysia set up the state oil company Petronas in 1974, replacing lease agreements with Shell and ExxonMobil with production-sharing contracts in which the state company had majority control; and Venezuela nationalized oil production in 1976 with the creation of PdVSA. The UK, Canada, and Norway also established national petroleum corporations in the 1970s following sharp price rises. Canada's PetroCanada was set up by the Trudeau government in 1975 to address federal concerns that oil development in the province of Alberta was governed by American interests and was not capturing sufficient benefits for Canadians, but it was gradually privatized between 1991 and 2004. To capture value from the newly developing North Sea fields and ensure supply, the UK and Norway created national oil companies – the British National Oil Corporation (BNOC) and Statoil – in the early 1970s. BNOC was abolished by the Thatcher government in 1985. The French government long participated in the capital of its "national" oil companies – Elf (50%) and Total (30%) – but sold its shares in the early 1990s and now receives very little revenue. In contrast, the Norwegian government maintains a 67% share in Statoil, which is listed on the Oslo and New York stock exchanges. The Norwegian government puts its share of Statoil dividends and revenues from Norwegian oil fields into a national pension fund that was worth US$885 billion in 2016, the largest sovereign wealth fund in the world.

The relative power of large reserve-holding NOCs within the oil production network is closely linked to their "spare capacity" – the ability to crank production up in the face of rising demand to restore market balance. Since the 1970s, Saudi Arabia (and OPEC more generally) has held a critical role in regard to this "capacity cushion." In the 1970s, for example, Saudi Arabia expanded production threefold – from 3 mmbd to over 10 mmbd in 1981 – establishing the country's dominance as the world's primary exporter and its key role as a "swing producer." OECD countries (and the US in particular) have frequently appealed to Saudi Arabia to expand production when markets are especially tight, such as in mid-2008 when the US begged the Kingdom to increase production as prices reached US$140 per barrel; or in early 2012 when importers of Iranian oil, most importantly China, gained reassurances from the Saudi regime that it could make up for the loss of Iranian exports under a western embargo. However, some oil analysts have expressed concern about the erosion of OPEC's spare capacity (from a high of 14 mmbd in 1985 or 23 percent of global demand to only 0.5 mmbd or less than 1 percent of global demand in 2004) and cast doubt on the ability of Saudi Arabia to extend production above 11 mmbd, despite investment in new projects. These uncertainties suggest to some oil analysts the possible eclipse of Saudi Arabia as a swing producer and that control of supply has passed out of the hands of OPEC. While Russia, the world's largest producer, has publicly toyed with the idea of becoming the world's new swing producer, there are both technical and political challenges to the country taking on this role. However, in the last few years Saudi Arabia has demonstrated the continuing capacity of the national oil company, Saudi Aramco, to flex oil output upwards, topping 12 mmbd for the first time in 2015 (although oil consumption in the Kingdom has continued to grow much faster than production). Meanwhile, the US has surpassed Saudi Arabia to become the world's largest producer (12.7 mmbd in 2015), initiated oil exports for the first time in 40 years and, on the strength of surging unconventional production, been tipped to be a net oil exporter by 2030. The reassertion of spare capacity by Saudi Arabia (and national oil companies within OPEC more broadly), then, can be interpreted as a bid to recapture market share.[2]

## *National champions – importing states*

Although NOCs are most closely associated with oil-exporting countries – as "agents of the landlord states" – a handful of state-owned oil companies headquartered in *oil-importing* states in Asia have become a key feature of the contemporary political economy of oil. Over the last decade, state-owned companies from China, India, and South Korea have made equity investments overseas in upstream oil projects with the aim of securing access to new oil reserves, mirroring a strategy adopted by Japan's National Oil Company in the 1970s. Chinese state firms have participated in overseas energy ventures since 1993, reflecting the country's low reserves/ production ratios and the apparent peaking of domestic production at a time when consumption of oil has been rising dramatically as a result of rates of economic growth of up to 10 percent per year (see Box 2.1). In what the Chinese refer

### Box 2.1 China's national oil companies

China has three state-owned national oil companies. The largest one, China National Petroleum Company (CNPC), emerged from the Ministry of Petroleum in the late 1980s. Since 1998, it has been organized as a fully integrated oil company, and by 2011 was involved in 60 projects in around 25 countries. CNPC's biggest subsidiary – PetroChina – is the largest producer of oil and gas in China, has been active in upstream ventures overseas since 1993, and publicly traded in New York and Hong Kong since 2000. PetroChina tripled in value following its flotation on the Shanghai stock market in 2007 and became the world's first trillion-dollar company. Holding equity positions in overseas projects, CNPC also undertakes service contracts, including in Iran and Iraq (with BP to develop the Rumaila oil field and with Total and Petronas to develop the Halfaya field).

Sinopec is the second largest NOC in China and, like CNPC/Petrochina, is also an integrated producer. Historically a refining and marketing company, Sinopec continues to dominate China's downstream sector but has also been active internationally in upstream projects since 2002. Sinopec is now involved in 36 projects in 20 countries including Saudi Arabia, Iran, Kazakhstan, and Nigeria. CNOOC is the third largest NOC in China and specializes in offshore exploration and production, where most of China's conventional oil growth potential lies, but has now over 20 percent of its reserves overseas thanks mostly to mergers and acquisitions. These three Chinese NOCs account for about 10 percent of China's oil imports in the form of "equity oil" produced from their overseas operations. The amount of "equity oil" produced by Chinese NOCs overseas is rising fast, but it is not clear whether it is politically controlled (via a quota that NOCs must send back to the Chinese market) or subject to commercial considerations (sold into the most profitable markets). The IEA suggests equity oil is relatively independent of political control and finds, for example, that oil produced by Chinese NOCs in the Americas is sold into local markets rather than being channeled back to China. Chinese national oil companies have a number of competitive advantages over IOCs when it comes to securing access, including lower reputational risk from working in countries with poor human rights records, access to preferential credit from state banks, and ability to offer "oil-for-infrastructure" barter deals.[3] to as the "going out" strategy, Asian NOCs have increasingly targeted international resources and, with access to cash, have been able to purchase new properties and acquire equity stakes. Chinese NOCs alone spent US$30 billion in mergers and acquisitions in 2010, with half of this in Latin America (including Sinopec's acquisition of a 40 percent stake in Repsol-YPF's operations in Brazil), while the Korea National Oil Company, for example, purchased Dana Petroleum, which has upstream operations in the North Sea and Africa, for US$3.7 billion. Overseas equity participation has emerged as a core strategy for Chinese NOCs, which now have equity shares in oil and gas production in 20 countries (the majority concentrated in Kazakhstan, Sudan, Venezuela, and Angola).[4]

These deals are significant for several reasons. First, they highlight the inadequacy of the "NOC versus IOC" dichotomy that has been used to characterize the politics of oil since the 1970s. These state-owned firms are acting more like the international oil companies than conventional NOCs in that they are "resource seeking" rather than resource holding. Second, the emergence of transnational state-owned oil producers changes the dynamics of competition among traditional IOCs (and raises the price) for access to oil reserves. Third, as highlighted by the struggle between Chevron and the Chinese National Offshore Oil Company (CNOOC) for Unocal in 2005 – CNOOC trumped Chevron's bid with a US$18.5 billion offer for Unocal but withdrew in the face of US political pressure – the emergence of well-funded NOCs from "rising powers" intensifies competition among oil-importing states. Finally, these new resource-seeking NOCs also highlight the lack of an equivalent "national champion" among OECD countries and the limits of an energy security strategy predicated on markets alone. The question of whether the United States should develop a national oil company to address energy security concerns has been raised (not as a serious proposal, but as a way of querying whether the investment strategies of US-based international oil companies still serve national energy security interests). It is increasingly clear that the traditionally dominant markets of the OECD have lost control over *both* oil supply and demand: whereas the former slipped away in the 1960s and 1970s with the nationalization of resource-holding states and the formation of OPEC, the growth of Asian demand and the emergence of resource-seeking, state-owned firms from Asian economies are steadily ensuring the latter.[5]

## *Regulators*

States impose a series of conditions on the production and consumption of oil through their role as regulators and taxation authorities. Governments have responsibilities for the protection of worker safety and the environment, for example, via their accession to international commitments (e.g. the UN Framework Convention on Climate Change) and through the passage and implementation of national laws. The *Deepwater Horizon* spill in 2010 highlighted the role of a US federal government agency, the Minerals Management Service (MMS), in setting the conditions for oil exploration and production in the Gulf of Mexico and revealed the thin line that separates an enabling regulatory environment from lax safety and environmental legislation. The MMS combined responsibility for both regulating the oil industry and collecting royalties on behalf of the government. Reorganization of the MMS in 2010 sought to address this conflict of interest by separating safety oversight from royalty collection.

Some of the fiercest political battles around oil are fought over whether oil companies should have access to wilderness or other protected lands and over the location of oil-related infrastructure (refineries, pipelines, terminals). Rising concerns about energy security have increased the domestic political pressure on national governments in net oil-importing states to open up acreage for development and diversify sources of supply. In the US, for example – where the slogan "drill, baby, drill" was mobilized by Republicans in debates over energy security during the 2008 election campaign – domestic access issues include coastal drilling in California and Florida and in the Beaufort and Chukchi Seas in the Arctic and continuing calls to open up federal lands in western states for oil exploration. In many countries – including developing economies seeking to harness national resources for development – sustained high oil prices are creating powerful incentives to modify previous commitments on the conservation of forest and marine environments and the rights of indigenous peoples and to encourage new exploration.

Governments, then, exert a key influence on where companies can explore for oil, the conditions under which they may do so, as well as the broader balance of incentives for transitioning away from oil or acceding to its incumbency. In addition, national political objectives may lead governments to impose restrictions on where companies can operate overseas and the practices that are acceptable when they do. The US, for example, imposed sanctions on Libya over the country's suspected terror links from the 1980s until 2004, requiring US companies to suspend operations in the country and sever all direct contacts. The US government has also prohibited all US persons from dealing with Sudan's oil sector since 1997, including Southern Sudan, on grounds of its link to terrorism and human rights abuses. Sanctions were also imposed on Iran in 1995, blocking direct access for US oil service companies to Iran's oil sector. The US government extended sanctions in 2010 to penalize any company selling gasoline to Iran or investing in the country's refining capacity, and both the US and the EU deepened the sanctions regime further in 2012, before most of them were lifted in 2016. National variations in anticorruption legislation and standards of corporate transparency also exert an influence on where and how companies can operate. The US Foreign Corrupt Practices Act, for example, makes it a crime for companies to bribe foreign officials, and there are a number of cases of oil companies being charged under this act. National legal codes can also provide leverage for groups concerned about the environmental and human rights implications of oil development. Since the late 1990s, church organizations, NGOs, and public interest groups have used the extraterritorial reach of the US Alien Tort Claims Act to challenge oil companies through US courts for human rights violations in Nigeria, Sudan, and Myanmar.[6]

States also condition the rate of oil consumption through taxes on fuel sales and subsidies to oil producers and consumers. Although crude oil is a globally traded commodity with prices quoted internationally, the price of petroleum fuels to final consumers varies greatly from one country to another. These differences are due primarily to different degrees of taxation by national governments. We examine this significant question of taxation and subsidy in more detail in chapter 5.

## Firms: integration, independents, and the precariousness of "Big Oil"

Large, vertically integrated companies operating in multiple geographical locations have a major role in the global oil production network. Although there are no technical reasons to combine the upstream, midstream, and downstream phases within one organization, integration reduces the exposure of upstream and downstream operations to supply disruption and the volatility of oil prices. Integration enables firms to achieve economies of scale and geographic diversification simultaneously: this is why the production network for oil is both geographically extensive (many different oil fields, broad geographic spread of consumers) and, at the same time, organizationally concentrated.

The established multinational giants – such as ExxonMobil, Shell, BP, Chevron, and Total – have a major market presence through their branded products and are among the world's largest companies by market capitalization (see Table 2.1). Up until the 1960s, the control of these firms over both the world's major oil resources and downstream markets gave them a commanding position within the oil network and a powerful influence over price, underpinning their designation as "the majors" and, more derisively, the "Seven Sisters" (see Box 2.2). The nationalization of upstream assets, however, reduced their control over supply while the growth of so-called independents (non-integrated oil firms) and the entry of Soviet oil into western markets further reduced their degree of control. Mergers and acquisitions in the 1980s and 1990s, however, mean that these firms have grown substantially in size. Today, seven "supermajors" (ExxonMobil, BP, Shell, Chevron, ConocoPhillips, Total, and ENI) continue to be among the largest and most profitable oil producers, although their holdings of global oil reserves are comparatively small.

**Box 2.2 From the "Seven Sisters" to "Big Oil"**

The dynamic of collaboration and competition is neatly captured in the now obsolete designation Seven Sisters, which came to define the major international oil companies in the 1950s that mostly originated from the break-up of Standard Oil. Enrico Mattei, public administrator of the Italian state oil company ENI, coined the term to deride the cartel of western oil companies that kept at bay emerging competitors and maintained pressure on Third World producing countries. ENI was excluded from the cartel, which controlled eight of every ten barrels produced outside the communist world and North America. At a time when the US State Department sought to upturn the nationalization of western oil companies in Iran by boycotting Iranian oil output, Mattei successfully broke the Seven Sisters' control over Middle East concessions by agreeing to a deal more favorable to Iran – 75/25 rather than the standard 50/50 – and thereby contributing to the growing assertiveness of resource holders toward international oil companies. In the 1990s, Big Oil came to replace Seven Sisters as a shorthand for western corporate oil power, but the term misrepresents an industry now dominated by national oil companies holding the world's largest reserves. Nonetheless, Big Oil continues to capture something of the consumer's experience of the industry, as well as that of communities living in proximity to oil infrastructures, and to suggest that the actions of oil companies (on pricing, access to reserves, labor regulation, and environmental legislation, for example) are guided more by common cause than by competition.[7]

The majors no longer have a monopoly on vertical integration. Today, the largest oil companies in the world are integrated, state-owned companies. The top six companies in 2015 – based on a combination of reserves, production, and revenues – are Saudi Aramco, the National Iranian Oil Company, ExxonMobil, PetroChina, Shell and Venezuela's PdVSA (see Table 2.1). The number of vertically integrated, globally operating firms also increased through the growth of China's Sinopec, Repsol-YPF of Spain, OMV of Austria, and Russia's Lukoil.

The "midstream" segment of transportation and storage is less concentrated than either production or refining. There are a great many firms in this part of the production network, and their tankers, terminals, pipelines, and storage farms are critical links in the oil network. Revolutionary changes in shipping technologies have enabled the progressive expansion of crude oil trade. Oil is now one of the most significant commodities in world trade, with three of every five barrels of oil produced being exported. The very large crude carrier and ultra-large crude carrier were developed in the 1960s and 1970s respectively to ship oil from the Middle East to Japan and the US: the latter are the largest vessels in the world, with a capacity of up to 550,000 dwt, and can carry around 2 million barrels of oil roughly equivalent to daily oil demand in Mexico, and close to that in Germany.

The geography of trunk routes and chokepoints associated with tanker traffic and pipelines affords tremendous opportunities for control while, at the same time, creating vulnerabilities (see also chapter 5). Exports from Kuwait, Iraq, Saudi Arabia, the UAE, and Iran mean that over 15 mmbd flow through the Strait of Hormuz, around a third of all seaborne oil trade. A similar amount flows through the Strait of Malacca between the Indian and Pacific Oceans and is a critical chokepoint in the trade of oil to Asia: over three-quarters of China's oil imports (5 mmbd) flow through the Malacca Strait. Meanwhile in the Turkish Strait or Bosphorus, difficult navigation and heavy traffic raise additional environmental and safety issues that affect the flow of oil from the Caspian Basin to western and southern Europe. The concentration of flows through these chokepoints means that the prospect of interruption is a major concern for oil-importing states and a critical influence on oil prices.

In comparison to the midstream sector, the downstream refining sector has few actors and ownership is much more concentrated. Refining is the gateway for crude oil to end markets and a major bottleneck in the production chain. Because refineries tend to be located closer to markets than to sources of supply, they exert a critical influence on market access. Refineries are also vast, complicated pieces of equipment which each day transform a stunningly large quantity of concentrated energy and chemical diversity. Refineries sit astride the flow of oil and face both ways: they are, in effect, caught in a "squeeze" between the availability and quality of crude (chapter 1) and the balance of demand for different petroleum products. The availability of sweet (i.e. low sulfur) crude is declining worldwide, but the trend downstream is for greater regulation of product quality (a reduction in allowable sulfur in fuels, ethanol blending, addition of oxygenates, and removal of lead) and for an increasing proportion of refinery output to be geared toward transportation fuels. As a result of this squeeze, the highest margins are made by refineries with sophisticated technology that can handle heavy, sour crudes and produce a full range of product outputs.

Worldwide, there are about 700 refineries with a total capacity of around 102 mmbd. Refinery capacity has been growing and shifting eastwards, with most investment taking place in growing Asian markets. The trend has been for average refinery size to rise over time and for investment to be made in complex cracking and hydrocracking technology, rather than the simpler hydro-skimming technology. The average refinery size in the US, for example, has grown threefold since the late 1960s (from 42,000 bpd in 1969 to 137,000 bpd in 2015) and over half the country's refineries have closed in the last 35 years, leaving 140 in 2015. In established, mature markets, such as Europe and North America, there is overcapacity in refineries, and pressure on margins is particularly tight. There is little investment in new refineries, although capacity expansions have occurred at existing sites, and refinery owners have been seeking ways to divest non-core capacities, including partial shutdowns and the conversion of refineries to storage depots (in part, to defer expensive closure costs). These refineries in core markets can be attractive assets for upstream producers outside the region with "equity crude." In 2010, for example, PetroChina bought into the refining business of UK-based INEOS, while in 2011 Shell sold the UK's second-largest refinery (Stanlow) to Essar Energy, an India-based integrated oil and gas producer.

### *Upstream independents*

Oil producers that do not own downstream assets are referred to as "independents." Independent producers have had a substantial international presence for many years: US foreign policy actively encouraged the entry of independents into Saudi Arabia in the 1950s to work alongside Aramco (a consortium of four US majors) where they contributed to the declining control of the majors over world oil output. Today, independent upstream producers are key actors in the development of new oil basins around the world, with many active in several "frontier" oil provinces, at the same time following the liberalization of investment regimes in the 1990s. For example, in 2004 Oslo-based DNO began operations in Iraqi Kurdistan, which was both more secure and open to business with foreign oil companies than the rest of Iraq, while in 2012 Vancouver-based Africa Oil conducted exploration drilling in Puntland, Somalia. Often the "first movers" into new or high-risk areas, the practices of independent oil firms in acquiring access to land and establishing a precedent for oil-field development are frequently the focus of social concern. The Canadian-headquartered Talisman Energy, for example, came under sustained criticism from NGOs and human rights campaigners following its purchase of assets in Sudan in the late 1990s, which it subsequently sold to India's ONGC in 2003.

Independents are in competition with integrated firms for access to resources and are an important part of the more general "squeeze" of the once-dominant majors. There are also synergies between them and integrated firms, as a spate of mergers and acquisitions among the "majors" over the last 20 years has left the largest integrated firms now very large indeed. To replace the amount of oil these firms extract each year requires searching for – and finding – substantial reserves. This has created an opportunity for independent firms to focus on finding and producing from smaller targets that, while still large in an absolute sense, are not on the radar screens of the majors. Companies like Tullow Oil and Cairn Energy, the two largest UK-based independents, have carved out positions by focusing on assets the majors overlooked. Tullow Oil was set up in 1985 to work over oil and gas fields left behind by the majors in Africa and is now the largest independent oil company operating in Africa. Cairn Energy has grown over the last 25 years on the back of discoveries it made in Rajasthan, where it followed unsuccessful work by Shell. The company's efforts to develop acreage in the offshore waters of Greenland over the last decade put it at the center of an "Arctic battle" over the conditions under which this region might be opened up for oil development. In the context of mixed results, falling oil prices, and concerted opposition to Arctic oil drilling, Cairn has more recently turned its attention to the Atlantic waters offshore from Senegal. Independents are also involved as partners with integrated firms and the upstream assets of independents have been key targets for acquisition by Asian state-owned, integrated firms.

### *The independent oil traders*

About 20 percent of global demand for oil is traded by six big trading houses, the rest being mostly traded by the internal trading branches of international and state oil companies. Among the largest independent oil traders, Dutch-founded Vitol supplies about 6 million barrels per day – enough to cover the combined German, French and Italian demand – and made US$2.3 billion in profits in 2009. Generally discreet, these commodity trading companies specialize in finding lucrative deals between producers and consumers, but they also possess extensive trading infrastructure and oil-refining assets, provide oil-backed loans to governments and companies, and seek to profit from price fluctuations through storage. Nimble, well-capitalized and highly opportunistic, oil-trading houses have been denounced for cutting deals with warlords and regimes under United Nations sanctions, most notably with that of Saddam Hussein under the Oil-for-Food program. With access to bank financing, trading infrastructure, and a wide range of clients, independent trading houses such as Trafigura and Vitol have been particularly effective in arranging pre-paid deals for companies in politically troubled countries, such as Libya's national oil company, Rosneft in EU-sanctioned Russia, or firms working with the Kurdistan Regional Government. Not unlike other types of oil firms, independent oil traders have pursued aggressive tax optimization schemes, and while some – such as Glencore – became publicly listed in part to increase capitalization, others remain privately owned and do not disclose financial results, like Vitol. Oil-trading houses often thrive when prices are volatile and distressed producers seek to off-load their supplies, a situation characterizing the large fall in oil prices post-2014. Independent traders, however, are facing greater competition, most notably the Chinese oil-trading companies and subsidiaries, such as Chinaoil and Unipec, which dominate China's 14 million barrels per day oil-refining market.

## *The precariousness of Big Oil*

For all their swagger – both real and attributed – the supermajors are in a surprisingly precarious position. The essence of the problem, and one of the defining elements of the contemporary political economy of oil, is threefold: these giant firms which dominated the oil sector for much of the twentieth century are now shut out from the world's largest and lowest-cost conventional oil reserves and, as a consequence, are finding it increasingly hard to replace upstream assets; their downstream assets in refining and marketing are in the wrong place as the center of demand shifts to Asia; and the monopoly they once held on the technological and managerial capacities required to bring challenging reserves into production has ebbed away, given the role of oil service companies (like Schlumberger, Halliburton, and Baker Hughes) in the sector and the demonstrated ability of some national oil companies to handle difficult projects.

For integrated and independent producers alike, an important measure of commercial health is the ability to locate new oil reserves to replace the oil extracted during production. Reserves replacement is a key element of corporate strategy in the upstream sector and translates directly into corporate financial performance. For international oil companies, reserves replacement has become an increasingly challenging task. Replacement of reserves has lagged behind production since the mid-1990s. In the ten years to 2006, the top five supermajors replaced only 82 percent of production on average and lagged behind a group of 20 smaller US-headquartered companies. The reasons for this underperformance in reserves replacement are complex, as the size of a company's reserves are influenced by oil prices, levels of expenditure on exploration and development, and the formal definition of "reserves" as laid down by, for example, the US Securities and Exchange Commission. However, a critical factor is that 80 percent of the world's conventional oil resources lie outside the control of these firms. The reassertion of national ownership and restrictions on equity participation by foreign firms mean that the ability of international oil companies to access and control these sources is severely constrained. On top of these national controls, domestic political restrictions – on participation in Iran and Sudan, for example – hamper the ability to access relatively low-cost crude from these significant conventional reserves. Table 2.2 shows how the supermajors lost control of about 83 percent of their market share over concessions, reserves, production, and refining markets worldwide since the 1950s.[8]

## Negotiating access: resource-holding states versus resource-seeking firms

Resource-seeking NOCs, independents, and majors face a fundamental challenge: the oil they seek belongs to someone else. As they do not own resources on their own account, these companies need to negotiate terms of access with national governments. The politics of resource access centers on the relative power of the resource holder and the operating firm, as these influence the acreage available to resource-seeking firms and the terms under which access can be acquired. At the center of this struggle is the division of rent. Here the balance of power changes with ups and downs in the price of oil, whether projects are exploring for oil or in production, and in response to broader shifts in approaches to economic development and role of the state. As a consequence, the politics of access are never settled (even when they are formally agreed) and are among the most contentious aspects of the oil production network.

Table 2.2 The supermajors' dwindling control over world oil

*Source:* Reproduced from Bridge and Wood, 2010; data from Nitzan and Bichler (2002, p. 219); citing Jacoby (1974); data for 2006 compiled from Petroleum Intelligence (2007), PFC Energy (2007), and Jaffe and Soligo (2007)

| *Control by "Seven Sisters" (%)* | *1953* | *1972* | *2006* | *Overall loss (%)* |
|---|---|---|---|---|
| Concession areas | 64 | 24 | 7 | 89 |
| Proven reserves | 92 | 67 | 5 | 95 |
| Production | 87 | 71 | 15 | 83 |
| Refining capacity | 73 | 49 | 26 | 65 |

A critical issue that has thrown resource-seeking NOCs and majors into direct competition is that the bulk of the world's low-cost, conventional oil reserves is in the hands of resource-holding national oil companies which restrict equity participation by foreign firms. The "ultimate prize" is the Middle East, which holds the bulk of the world's remaining conventional oil with around 800 billion barrels or 47 percent of the world's proven reserves. Figure 2.2 illustrates how the Middle East and North Africa enjoy some of the lowest production costs: the region's conventional oil resources are located at the bottom of the international cost curve, with production costs of between US$10 and US$25 per barrel. Furthermore, the region is in a relatively central position vis-à-vis the major European and Asian markets, and it has well-developed if vulnerable pipeline and shipping transportation infrastructure. Yet, since nationalization in the 1960s and 1970s, foreign companies have been restricted from taking equity positions in developing the fields of the region's largest reserve holders (Saudi Arabia, Iran, Iraq, and Kuwait). Oil companies currently work with these national champions as service providers – via technical service contracts – but it is on a fee-for-service basis which excludes them from sharing in the revenue from oil production.[9]

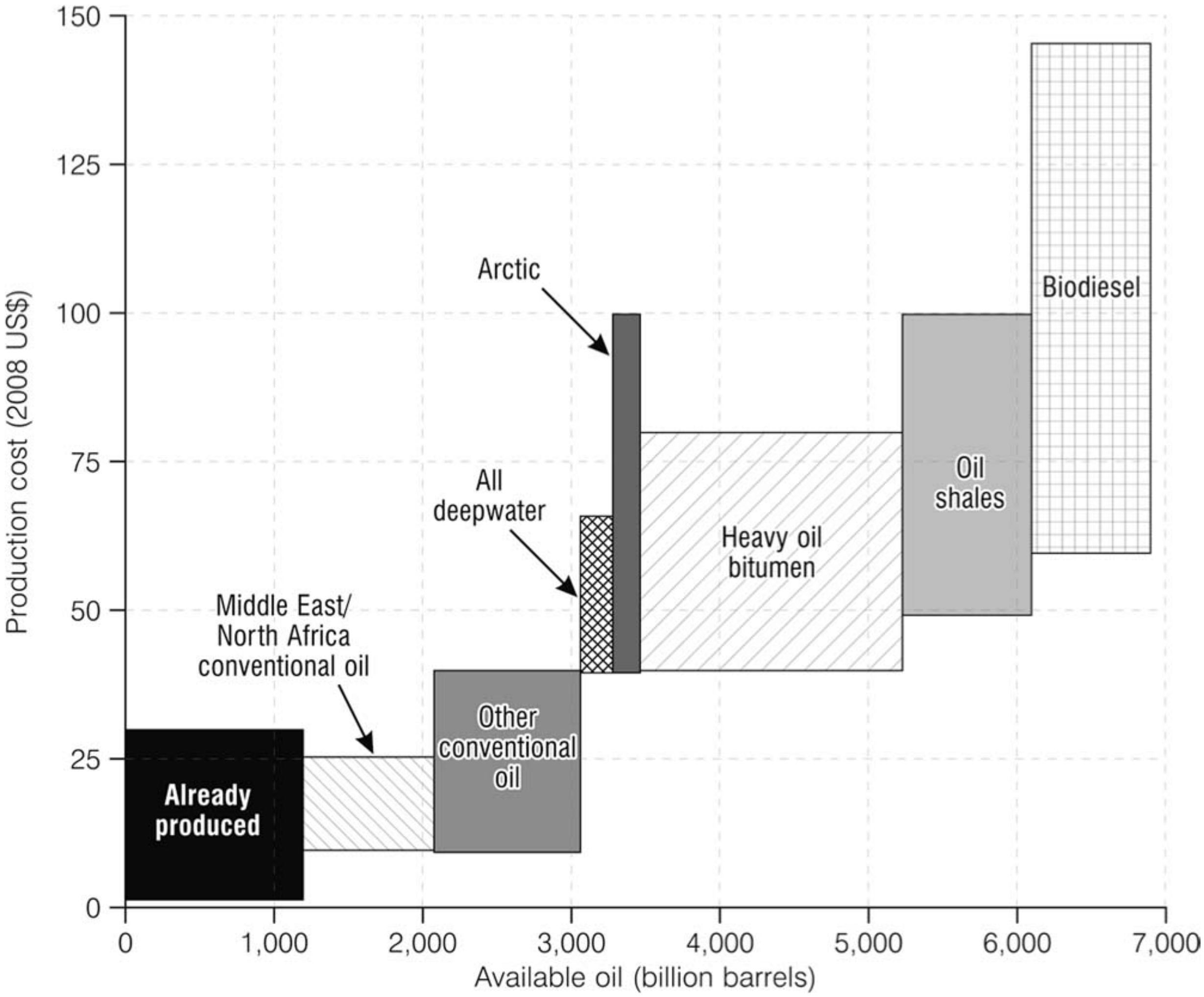


Figure 2.2 Variation in production costs by type of oil source

*Source:* Modified from International Energy Agency (2012), Resources to Reserves 2012.

## *Diversification and liberalization*

After nationalization evicted the multinationals from their historic concessions in the Middle East, resource-seeking firms took up equity positions elsewhere. This diversification opened up new petroleum provinces like the North Sea and the Alaskan North Slope outside of OPEC, while oil companies also worked with national producers in OPEC countries, like Indonesia and Nigeria, through joint venture agreements. In Nigeria, for example, Shell and Chevron operate onshore in the Delta through joint venture agreements concluded with the Nigerian National Petroleum Corporation in the wake of Nigeria's nationalization of oil in the 1970s. From 1986 onward, low oil prices – and the adoption of neoliberal economic policies in many developing and transition economies – created a new set of political conditions in which the relative power of oil-importing countries and resource-seeking firms increased at the expense of resource-holding states. In a number of significant resource-holding states (including OPEC producers such as Venezuela and Nigeria), terms of access were redesigned to attract new investment in the context of heightened competition among resource-holding states for access to capital and technology.

Agreements on access did not return to the freewheeling days of the concession era, but did give much greater control to investing firms and provided a greater share of revenue and profits. In Venezuela, which holds the largest reserves in the western hemisphere, the government embarked on the Apertura Petrolera ("oil opening") in the 1990s, a process of opening up access for foreign companies to carry out exploration and development activity. From 1992 onward, the state company PdVSA concluded a series of "operating agreements" with foreign firms to reactivate old fields, undertake exploration, and establish "strategic associations" with companies like ExxonMobil and ConocoPhillips for the development of the unconventional "heavy oil" resources of the Orinoco Delta. These agreements were a special form of service contract that shared profits with investing firms and, as described by the then president of PdVSA, were a step toward the privatization of the state company's upstream and downstream operations. In Russia and the Caspian basin, governments encouraged foreign investment in oil and gas through production-sharing agreements that allowed 100 percent foreign ownership (see Box 2.3). In sub-Saharan Africa, the 1990s and early 2000s saw a ramping up of production as the majors, independents, and resource-seeking NOCs concluded similar production-sharing agreements with governments in Angola, Guinea, Chad, Sudan, Nigeria, and São Tomé. When Shell moved offshore to develop deepwater resources in Nigeria in the 1990s, for example, it was not through a joint venture agreement with the state producer, but via a production-sharing contract that gave the company 100 percent equity participation.[10]

### *Resource nationalization and the new squeeze on access*

The situation has changed considerably over the last decade. Rising oil prices between 2001 and 2014 emboldened reserve-holding states to set new conditions of equity participation and renegotiate the terms of existing projects, pushing IOCs toward more marginal, costly, and environmentally risky projects. In countries like Russia, Kazakhstan, Ecuador, and Venezuela that once were regarded as bright spots for investment by international oil companies, the "access bargain" has come under strain. In Africa, Russia, Central Asia, and Latin America, governments have reasserted their position as resource-owners, increasing their equity participation and renegotiating the terms of existing projects with the result that a number of firms have left the field. In Venezuela, for example, the Chávez administration amended the Hydrocarbon Law in 2002 to increase state control and reduce private participation to a minority stake within the structure of a joint venture. This transformed the agreements signed under the *Apertura* and has led to PdVSA taking full control of the strategic associations in the Orinoco.

### Box 2.3 The rise and fall of production-sharing agreements

Production-sharing agreements (PSAs) are contractual arrangements between host governments and investing firms. PSAs originated in Indonesia in the 1960s, but their application expanded greatly during the low price environment of the 1990s where they were the tool of choice for governments in transition and developing economies to attract capital and technology to the petroleum sector. By one estimate, "nearly half of the countries with petroleum potential" had concluded PSAs by 1994. In seeking to encourage investment, PSAs are underpinned by a view of oil as "just another commodity" that should be subject to contractual arrangements around investment rather than as a special type of exhaustible asset for which the landowner should receive compensation. PSAs enable 100 percent foreign ownership and exemplify a "non-proprietorial" type of access regime as it is the profitability of investment – rather than the "government take" – that is the overriding consideration. In this regard, they have been seen by critics as a "return" to the concession era. Under a PSA, investing companies carry the risk of exploration and project development. As the name suggests, production is shared between the company and host state, with the company first recovering its costs through the sale of oil, and then sharing in subsequent profits. The calculation of costs is critical as budget revisions during project development can translate into significant delays before the host country receives revenues.

PSAs have been renegotiated as part of a growing "resource nationalism" on the part of reserve-holding states. In 1997, the Kazakhstan government signed a PSA with a consortium of nine international oil firms led by ENI for the development of the Kashagan oil field in the Caspian. In 2005, with oil prices at a much higher level and a change in national strategy, the government changed its PSA legislation to require 50 percent equity participation by the state oil and gas producer in new projects, and since 2007 it has sought to renegotiate the terms of the PSA. The Russian government signed its first PSA in 1994 for the Sakhalin-2 project, giving 100 percent ownership to the three project partners, Shell, Mitsui, and Mitsubishi. After a series of interventions by the Russian government, the state-producer Gazprom took a majority stake in the project in 2006. At about the same time, the Russian government also rewrote its law on the subsoil in a way that increased government control over foreign participation in oil projects.[11]

The reassertion of "resource nationalism" is squeezing resource-seeking firms and comes at a time when conventional oil production in non-OPEC countries appears to have peaked and when many of the conventional reserves that have been among the majors' core assets – in the North Sea, Alaska, and the Gulf of Mexico, for example – are experiencing decline. For the majors and independents, competition to secure "equity oil" and to gain a toehold in the Middle East (via service contracts) has increased with the entry since the 1990s of resource-seeking NOCs. State-owned and well resourced, these new transnational NOCs are encumbered by fewer "home country" restrictions on access (to Sudan and Iran, for example) and are able to cut bilateral deals with governments on infrastructure and economic development that the majors and independents cannot.

The result of this squeeze is a new geography of investment. Shut out of the lowest-cost reserves in the Middle East and with governments changing the terms of access to other key reserves of conventional oil, firms increasingly are seeking to access conventional oil in unconventional locations. These include deepwater offshore environments where the costs of producing a barrel of oil are in the range of US$40–65, such as in Brazil, the Gulf of Mexico, the Gulf of Guinea, and the South China Sea. They also include the Arctic regions of Norway, Greenland, and North America, as well as the similarly challenging environments of the South Atlantic where costs can range from US$40 to US$100 per barrel (see Figure 2.2). At the same time, firms are turning to unconventional resources in accessible and relatively stable jurisdictions, such as the bituminous sands and oil shales of North America, which have similar production costs to the deepwater and Arctic but where potentially recoverable reserves are larger. Firms have lobbied hard to have unconventional oil resources counted as bookable reserves, and they make up an increasingly significant proportion of corporate reserves: between 2005 and 2009, ExxonMobil, Shell, Total, and ConocoPhillips gained between 26% and 71% of their liquid additions to reserves from bituminous sands. Companies have also significantly increased the percentage of gas in their portfolio. ExxonMobil's US$41 billion purchase of the unconventional gas producer XTO in 2009 enabled it to post a 200% replacement ratio that year when, without the deal, the company's reserve replacement rate would have been only 45%. There is mounting concern among environmental and human rights NGOs and some financial institutions that the squeeze on reserves is pushing oil companies into "marginal" fields and toward lower-quality resources that have much higher environmental and financial risks.[12]

## Extending the network

The production network we have outlined so far captures some of the most significant relations among states and firms. A critical aspect of the current political economy of oil, however, is the way the boundaries of this network are being challenged. The business of producing oil has become increasingly entangled with broader social issues like climate change, human rights, and financial speculation. NGOs and some governments are requiring oil companies to account for their contribution to social goals which extends well beyond producing, refining, and marketing oil. Increasingly, shareholder value is tied to a company's performance on environmental and social grounds: the BP *Deepwater Horizon* explosion, for example, decreased the market valuation of BP by US$100 billion. More generally, oil companies' records on the environment and working with communities can influence their ability to acquire licenses to operate in new areas. BP is reported to have lost out in bidding rounds for the Greenland offshore in 2010 because of its record in the Gulf of Mexico.

At the same time, the identity of established actors is being renegotiated – and, along with it, a sense of their responsibilities and accountability. Some oil companies, for example, are reinventing themselves as "energy companies" as the role of oil in their portfolios declines. As BP has found, however, moving "beyond petroleum" is exceedingly tricky, as the resource base moves from conventional oil to heavier hydrocarbons, and exploration and production take place in more environmentally sensitive, politically troubled, and technologically challenging places. For companies like BP, Shell, and ExxonMobil, diversification beyond conventional oil has involved decisive moves into unconventional fossil fuels (such as bituminous sands and shale gas) and other forms of high-cost "extreme energy" (deepwater, Arctic) that dwarf their investments in lower-carbon alternatives. For every dollar the oil industry invested worldwide between 2006 and 2010 in renewable fuel development (corn ethanol, sugar cane ethanol and other biofuels: total US$3.9 billion), it spent nearly US$50 developing bituminous sands (US$190 billion), and US$500 on oil exploration and production overall (total US$2,090 billion).

The identity of "national" oil companies is also increasingly fluid, as many turn to transnational investment strategies to develop their upstream and/or downstream assets or adopt part-privatization programs. As they outgrow the geographical scale by which they have conventionally been defined, transnational state-owned corporations are sharpening the question of how and for whom petroleum development is governed. At the same time, commercial banks and international financial institutions (IFIs) are becoming more entangled in conflicts over the environmental, developmental, and human rights performance of the oil production network. Many projects demand multibillion dollar investments that are beyond the capacity of even oil majors to finance via the balance sheet. Construction of the Baku–Tbilisi–Ceyhan pipeline, for example, involved 15 commercial banks, seven export credit guarantee agencies, and three IFIs which together provided loans worth 70 percent of the US$4 billion project cost. The business opportunities presented by new oil projects led banks like the Royal Bank of Scotland to specialize in the sector, which has in turn exposed it to significant criticism from environmental and human rights groups (see Box 2.4). In response to such pressure, IFIs like the World Bank and the European Bank for Reconstruction and Development (EBRD) have adopted procedures for assessing the environmental and social impact of project financing. A growing number of commercial banks have adopted the Equator Principles which, like the IFI procedures, require an evaluation and benchmarking of environmental and social impacts. The development of these environmental and social standards by banks has provided NGOs with a degree of leverage over oil development projects that they may not have via national political channels or the oil companies themselves. A sustained campaign by environmental groups over the social, environmental, and developmental impacts of Shell's Sakhalin-2 project in Russia, for example, targeted a loan decision by the EBRD as a way to influence aspects of project development. Funded by state banks and without having recourse to IFIs, NOC investments typically lack an analogous point of leverage for NGOs.[13]

The "politics of oil," then, increasingly revolves around the relationships between firms and states and entities *outside* the formal production network, and the way these new relationships have begun to transform the identity of core actors. Nowhere is this clearer – and the implications for responsibility and accountability potentially greater – than in the effort by NGOs (and some governments) to reframe the production and consumption of oil as part of the global carbon cycle.

## Box 2.4 Royal Bank of Scotland: "the oil and gas bank"

RBS has been among the largest lenders to the fossil fuel industry and, until recently, the primary UK bank financing the extraction of coal, oil, and gas. While all major banks are involved in oil and gas to some extent, RBS styled itself publicly as the "oil and gas bank" from 2000 and sought to become a leader in the sector through its involvement in structuring loan agreements and providing credit across the production network, from upstream extraction to downstream refining and distribution. Projects involving the bank have included bituminous sands in Canada and Madagascar, oil development in Peru and Uganda, and frontier projects in Greenland. In 2007, RBS dropped its slogan after a concerted effort by NGOs to make the connection between hydrocarbon extraction and climate change. Between 2001 and 2006, RBS agreed 30 oil and gas project finance details, provided over US$10 billion in oil and gas loans, and was adviser to or otherwise involved in projects worth over US$30 billion. Fossil fuel projects financed by RBS were estimated in 2005 to account for nearly 37 million tonnes of $CO_2$, equivalent to a quarter of UK emissions. RBS was bailed out by the UK taxpayer in 2008 to the tune of £48 billion. NGOs have continued to pressure the bank, arguing that the public character of the bank's ownership (73 percent is currently owned by the taxpayer) requires a higher standard of operation. In 2010, the NGOs World Development Movement, Platform, and People and Planet launched a legal challenge (which was rejected) to the bank's lending to oil, gas, and coal projects, arguing that the UK Treasury had not properly assessed the environmental consequences of injecting public money into the bank. However, the bank may now be changing direction as part of a strategic recentering of its activity in the United Kingdom. It has largely withdrawn from the Asian and North American markets (including its role in financing tar sands projects) and has significantly reduced its exposure to oil and coal over the last couple of years.[14]

## *Carbon conveyer*

The business of extracting, processing, and consuming oil is part of a much broader global carbon cycle. From this perspective, the oil production network (see Figure 2.1) is a highly effective carbon conveyer, transferring "fossil" carbon from one site of long-term storage (underground) to another (the atmosphere). The problem, of course, is that the rate at which oil production and consumption mobilizes carbon stores that have accumulated underground over millions of years far exceeds the rate of the "return flow," by which carbon dioxide is sequestered and stored by photosynthesis and/or carbon burial. The contemporary politics of oil increasingly centers on oil's contribution to the atmospheric accumulation of carbon dioxide. Global climate change means carbon abundance – rather than oil scarcity – is emerging as the critical constraint on the oil production network: mobilizing the amount of carbon locked up in proven oil reserves would push the world well beyond the 450ppm $CO_2$ threshold accepted by the UNFCC as a tipping point for dangerous climate change. Potential emissions from the world's proven oil reserves are estimated to be around 620 $GtCo_2$, while the entire carbon budget (including coal and gas) for the period 2011–2050 has been calculated at 565 $GtCo_2$ if the world is to avoid a 2°C rise in temperature. From this perspective, much of the carbon locked up in proven reserves – and on the balance sheets of publicly listed oil companies – is "unburnable." Even if one accepts a one in two chance of staying below a 2°C rise in global temperature, a third of oil reserves, half of gas reserves and 85 percent of coal reserves should stay in the ground.[15]

There are two important points here. First, the "free" services of the atmosphere in absorbing carbon and other by-products from the combustion of oil are integral to the way the production network functions. The current organization of the network, the rate at which oil flows within it, and the distribution of power along it are predicated on the availability and accessibility of the atmosphere as a carbon dump. The politics of oil, then, is increasingly bound up with the politics of pollution and climate change, as traditional concerns about depletion and energy security become paired with new concerns about greenhouse gas emissions and regulation targeting critical threshold concentrations of carbon dioxide in the atmosphere.

Second, concerns about climate change – and the contribution of oil to aspirations for sustainable development more generally – incorporate a number of new actors into the production network. These include a wide range of NGOs and civil society organizations, as well as international governance bodies like the UNFCCC, so that the production network for oil is entangled with, and increasingly shaped by, concerns over its implications for the environment and development. At the same time, carbon credits, carbon trading, and physical carbon capture and storage are also introducing nontraditional corporate actors and spaces (such as carbon sinks) into the global oil production network. Parallel to the processes of oil discovery and enclosure which mark the upstream end of the oil network, the identification and enclosure of downstream carbon "sinks" create significant new opportunities for value capture. For oil producers, for example, serious efforts to stem the accumulation of atmospheric carbon raise the interesting prospect of them becoming stewards of underground carbon stocks rather than extractors of oil (see chapter 7). For oil-exporting governments – and companies holding marginal, high-cost reserves – concerted moves toward a low-carbon energy future may leave them holding assets of *declining* value.[16]

Carbon trading shifts the accumulation of value further downstream toward a new class of "end user," those actors who own or control carbon sinks. Interaction between the "old" (fossil fuel) and "new" (trading and offsetting) carbon economies is producing a longer and more complex production chain for oil/carbon whose implications for development are currently unclear. One indication of what may be in store is the way some "old carbon" producers are experimenting with ways to protect the value of their oil assets by, for example, bundling carbon and carbon offsets together in their wholesale operations, providing the infrastructure for retail consumers to offset their emissions, or highlighting the potential for retooling reservoirs and infrastructure of depleted oil fields for carbon capture and storage. The largest regional development effects, however, are likely to be associated with the transfer of value toward those actors (states, firms) that own or control carbon sinks.

Depending on the price for carbon, the value of these transfers could rival those associated with massive transfer of value from oil-consuming economies to oil-producing economies following the price rises of 1973 and 1979 (estimated at 3 percent of global GDP). The economic geographies to which exchanges of carbon credits and carbon finance give rise are still emerging. Like the OPEC revolution, however, opportunities for accumulation via the enclosure and trade of carbon sinks are likely to produce a new global geography of uneven development associated with the role of the oil production network as a carbon conveyer.

## Conclusion

This chapter has illustrated how, while global and uneven in its distribution, oil is a highly *integrated* industry. We introduced the notion of a global production network to demonstrate how components of the oil sector are connected and the relations of power among them. Although the sector has been operating for well over a hundred years and, by many measures, is a mature industry, it is also highly dynamic. Organizational shifts in the global production network for oil mean that some of the categories used to describe/define the industry and its geopolitics are now of limited utility. The politics of oil continues to center on the dynamics of competition (for access to both reserves and markets), concentration of ownership and control, and the distribution of value within the production network. Importantly, however, they increasingly encompass actors and institutions beyond the conventional network of production, refining, and marketing and extend to the implications of the production network for development, the environment, and social justice.

## Notes

1. On the UN's role in the evolution of natural resource sovereignty, see N. Schrijver, *Sovereignty over Natural Resources: Balancing Rights and Duties* (Cambridge University Press, 1997). On the environmental and social history of oil in Veracruz in the early twentieth century and its role in Mexico's nationalization of

American and Anglo-Dutch oil firms, see M. Santiago, *The Ecology of Oil: Environment, Labor and the Mexican Revolution, 1900–1938* (Cambridge University Press, 2007).

2. E. Palazuelos, "Current Oil (Dis)Order: Players, Scenarios, and Mechanisms," *Review of International Studies* 38(2) (2011): 301–19; conditions in Siberia do not allow for a simple "shutting in" of production: see "Russia tells OPEC eyes swing producer role," Reuters, www.reuters.com/article/2008/10/22/us-opec-russia-idUSTRE49L20S20081022 (2010); "New oil war in Asia: Saudi Arabia vs. Russia," Al Arabiya News, www.alarabiya.net/articles/2011/06/29/155373.html. On oil and US–Middle East relations, see J. Nitzan and S. Bichler's explanation of a "weapondollar/petrodollar" coalition in *The Global Political Economy of Israel* (Pluto Press, 2002); figures on the erosion of spare capacity from J. Jesse and C. van der Linde, *Oil Turbulence in the Next Decade* (Clingendael International Energy Programme, 2008).

3. Eurasia Group, *China's Overseas Investments in Oil and Gas Production*, US–China Economic and Security Review Commission (2006); and X. Xu, *Chinese NOCs' Overseas Strategies: Background, Comparison and Remarks*, James A. Baker III Institute for Public Policy, Rice University (2007). On human rights and Chinese companies in Sudan and Myanmar, see M. Chen, "Chinese National Oil Companies and Human Rights," *Orbis* 51(1) (2007): 41–54. "PetroChina makes its debut as world's first trillion-dollar firm," *Guardian*, November 6, 2007; J. Jiang and J. Sinton, *Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts*, International Energy Agency (2011).

4. "Agents" quote is from B. Mommer, *Global Oil and the Nation State* (Oxford University Press, 2002). China's oil imports quintupled between 2000 and 2015, making China the largest importer just ahead of the United States. Over half the growth in oil demand over the next five years is expected to come from China.

5. For a discussion of whether the US needs a national oil company, see A. Jaffe and R. Soligo, *The International Oil Companies*, James A. Baker III Institute for Public Policy, Rice University (2007); V. Vivoda, “Resource Nationalism, Bargaining and International Oil Companies: Challenges and Change in the New Millennium,” *New Political Economy* 14(4) (2009): 517–34; and R. Pirog, *The Role of National Oil Companies in the International Oil Market*. CRS Report for Congress, August 21, 2007.

6. E. Downs and S. Maloney, “Getting China to Sanction Iran,” *Foreign Affairs* 90(2) (2011): 15–21. On the Alien Tort Act, see O. Murray, D. Kinley, and C. Potts, “Exaggerated Rumors of the Death of an Alien Tort: Corporations, Human Rights and the Remarkable Case of Kiobel,” *Melbourne Journal of International Law* 12 (2011): 57–94.

7. Seven Sisters were Standard Oil of New Jersey (Exxon after 1972), Standard Oil of New York (Mobil), Standard Oil of California (Chevron), Gulf Oil, Texaco, Royal Dutch Shell, and Anglo-Persian Oil Company (BP). In 2007, the *Financial Times* listed the “New Seven Sisters” as Saudi Aramco, Russia’s Gazprom, CNPC of China, Iran’s NIOC, PdVSA of Venezuela, Brazil’s Petrobras, and Petronas from Malaysia. Petroleum Intelligence Weekly, Ranking of Top 10 Oil Companies, December 2011.

8. For a provocative analysis of the future of international oil companies (BP, Chevron, Exxon, Shell and Total) and options for their restructuring, see P. Stevens, *International Oil Companies: The Death of the Old Business Model* (London: Chatham House, 2016).

9. Reserves replacement figures in previous section are from A. Jaffe and R. Soligo, *The International Oil Companies*, James A. Baker III Institute for Public Policy, Rice University (2007). The dynamic of cooperation and conflict between resource-holding states and resource-seeking firms is structured by three overlapping cycles: the price cycle, the project cycle, and the political cycle; see P. Stevens, “National Oil Companies and International Oil Companies in the Middle East: Under the Shadow of Government and the Resource Nationalism Cycle,”

*Journal of World Energy Law and Business* 1(1) (2008): 5–30; "ultimate prize" is from Dick Cheney (then CEO for Halliburton) in a speech in 1999, quoted in G. Muttitt, "Production Sharing Agreements: Oil Privatisation by Another Name?," paper presented to the General Union of Oil Employees' conference on privatization, Basrah, Iraq, May 26, 2005.

10. Concessions were the standard form of access agreement until the 1950s and provided international oil firms with highly favorable terms of access: concessions were very large (those in Iran, Iraq, Kuwait, and Saudi Arabia covered on average 88 percent of the country) and could be held for long periods of time (the average was 82 years). Financial payments were typically a lump-sum royalty and, until Venezuela introduced profit taxes in 1948 (subsequently replicated in the Middle East), included no link to the profitability of production. Companies were also given a very large degree of managerial freedom in deciding where and when to produce, and how to price output. This set up tensions with the host state: it was a decision by the majors in the 1950s to cut oil prices that drove the governments of leading concession countries to form OPEC in 1960, and which gave encouragement to calls for nationalization. See Selected Readings section.

11. For a discussion of "proprietorial" and "non-proprietorial" regimes, and the attempts by major oil importers to overturn nationalizations during the 1990s, see B. Mommer, *Global Oil and the Nation State* (Oxford University Press, 2002). For a comparison of different types of access agreements, see M. Likosky, "Contracting and Regulatory Issues in the Oil and Gas and Metallic Minerals Industries," *Transnational Corporations* 18(1) (2009): 1–42.

12. For an example of work by NGOs that seeks to draw attention of investors to the increasing reliance of IOCs on unconventional and "marginal oil," see L. Stockman, *Reserves Replacement in a Marginal World: Adequate Indicator or Subprime Statistic?* Report produced by Oil Change International, Greenpeace and Platform; "Exxon deal highlights oil reserves issue," *Financial Times*, February 16, 2011.

13. S. Mui and E. Landeros, *Oil Companies' Investments in Dirty Fuels Outpacing Cleaner Fuels by Fifty Times*, Natural Resources Defense Council. Available online at www.arb.ca.gov/lists/lcfs2011/42-comments_of_nrdc_on_oil_industry_investments_lcfs.pdf (2011). "Extreme energy" is from Michael Klare (see chapter 1); "BP frozen out of Arctic drilling race," *Guardian*, August 25, 2010; M. Bradshaw, *Environmental Groups Campaign against Sakhalin-2 Project Financing*, Pacific Oil and Gas Report, Spring (2005): 3–9. Figures for the Baku–Tbilisi–Ceyhan pipeline are from Platform, "The money behind the pipeline," Unravelling the Carbon Web. Available online at www.carbonweb.org/showitem.asp?article=40&parent=5&link=Y&gp=3.

14. M. Minio-Paluello, *The Oil and Gas Bank: RBS and the Financing of Climate Change*, report produced by BankTrack, FOE-Scotland, Nef, People and Planet and PLATFORM (2007); RBS "Our financing of the energy sector," "RBS Sustainability Briefing Document, October 2010; RBS pulls back fossil fuel investments as green deals grow," *Guardian*, April 17, 2016. Available online at https://www.theguardian.com/environment/2016/apr/17/rbs-pulls-fossil-fuel-investments-green-energy.

15. See research by the Carbon Tracker Initiative, "Unburnable Carbon: Are the World's Financial Markets Carrying a Carbon Bubble?" (2011); see also Stockman, *Reserves Replacement* (n. 12 above); C. McGlade and P. Ekins, "The Geographical Distribution of Fossil Fuels Unused When Limiting Global Warming to 2°C," *Nature* 517 (2015): 187–90. McGlade and Ekins conclude that, given the current distribution of reserves and production, Canada should forgo 75% of its oil reserves, Central Asia and the Middle East about 40%, Russia 20%, and the US about 6%, though this latter figure could be much higher if fully accounting for "tight oil."

16. See J. van Ypersele, "Climate Change and Fossil Fuel Depletion." Presentation at the 9th ASPO Meeting, Brussels, April 24, 2011, www.astr.ucl.ac.be/modx/index.php?id=69. The growing flow of

oil into industrializing economies during the twentieth century flooded pollutant sinks across progressively larger spatial scales, from the challenges of urban photochemical smog associated with suburbanization in the late 1950s to today's concern with global carbon dioxide accumulation: see B. Clark and R. York, "Carbon Metabolism: Global Capitalism, Climate Change, and the Biospheric Rift," *Theory and Society* 34(4) (2005): 391–428. For recent reflections on the impact of higher prices and efficiency on oil demand, see Deutsche Bank Global Research, October 4, 2009, The Peak Oil Market; IEA (2010), *World Energy Outlook 2010*; and Stockman, *Reserves Replacement* (n. 12 above).

# CHAPTER THREE
# Marketing Oil

Oil's startling career over the last 150 years – from a bit player in the lighting market to a ubiquitous fuel and feedstock – can be explained only in part by reference to its mercurial properties (its energy density, fluid character, and great abundance). The *desire* for oil – the great pull that draws crude to the surface at the rate of over 90 mmbd – has been manufactured over time. In this chapter, we explore how the dramatic growth of oil consumption in the twentieth century has rested on the standardization of oil products, the cultivation of new markets, and the creation of scarcity in the face of sometimes overwhelming abundance in order to secure the profitability of production. We examine how oil is bought and sold, and the reasons for increasing price volatility over the past decade.

Like measurements of blood pressure or temperature, oil prices are a "vital sign" of the economy, a core metric by which the capacity of the economic body for reproducing itself is assessed. Tracked through benchmark crudes at international exchanges and prices posted at local gas stations, the "price of oil" is one of a select group of metrics that inform the daily routines of many people on earth. The central place oil prices occupy in the public imagination reflects the tight link between the price of oil and economic growth and the proliferation of oil within social routines (particularly around mobility). It also reflects how localized events – from strikes and other stoppages to extreme weather and geopolitical conflict – translate into price signals that are rapidly transmitted around the world via an integrated global oil market (and vice versa). Swings in price cause value to "slosh" back and forth from one end of the oil production network to the other: a rise in oil prices distributes value away from consumers and toward producers, while a fall in prices increases the value of oil to consumers at the expense of producers. A good deal of the politics of oil centers on the strategies of producers and consumers to influence the distribution of value to their advantage and to exert a measure of control over price.

Pricing power has migrated over time, from multinational oil firms to the oil-exporting states of OPEC and more recently to the financial markets. As oil prices have become increasingly volatile, the question of who controls price and where pricing power now lies has sharpened. In practice, the volatility of oil prices is similar to that of many other commodities, yet oil is integrated into personal, corporate, and national economies like no other. For oil producers, high prices and volatility risk the possibility that consumers will switch from oil to cheaper, more reliably priced fuels. For oil consumers, volatile prices raise concerns about the security of supply and create a drag on economic growth, as in the US (see Figure 3.1), while the decreasing affordability of oil can leave poor consumers unable to access the energy services (such as heating and transportation) that oil provides.

A prolonged tightening in the oil market since 2002 appears to mark the end of an "Age of Plenty," and a transition from an era in which demand for oil sets the bounds of supply to one in which oil's availability is significantly constrained. Price volatility, the failure of high prices to drive sufficient new investment, and the influence of speculators on price formation powerfully suggest that the political institutions – like OPEC and the IEA – whose interactions have historically governed the price of oil are no longer effective. Both producers and consumers, it would seem, have lost the capacity to control oil's price.

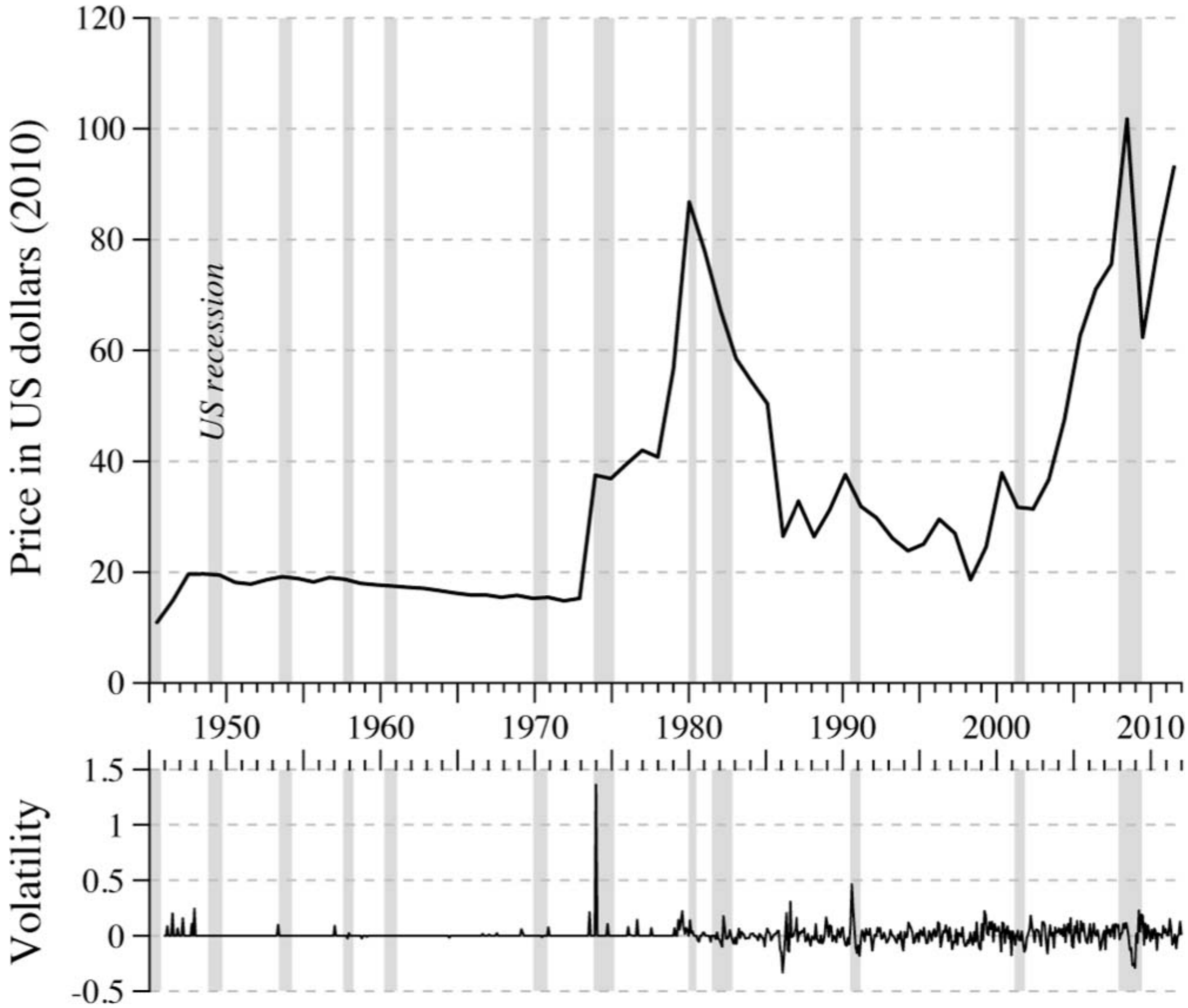


Figure 3.1 Oil price, volatility, and US recessions (1945–2011)

Sources: Federal Reserve Bank of St Louis (WTI monthly price volatility), and NBER (recession periods in gray).

## Standardizing products

The modern economy of petroleum rests on a basic yet quite remarkable fact: the machines, products, and devices that consume oil do so without regard to wide geographical variations in the local availability and quality of crude oil. The unprecedented personal mobility that cars and airplanes provide, for example, arises from their ability to travel across vast swathes of space without loss of function. This fundamentally geographical experience – of freedom from local constraints imposed by the quality and/or quantity of resources – is a key part of the experience of modernity, whose icons are the automobile and airplane and other technologies of time-space compression. While we tend to think of enhanced mobility as a product of great design, a key aspect of the design of these machines is their optimization for very specific fuel inputs. Such narrow specialization in regard to inputs requires the production of an external world outside the machine that can continuously supply these inputs, if function is to be maintained. The "globalization" of travel and trade is underpinned by the simultaneous specialization and standardization of fuels. Standardization, then, is one of the essential conditions that makes the international economy of petroleum possible. At the end of the nineteenth century, the world's largest oil company, Standard Oil, promoted itself by reference to this crucial aspect: initially, standardization assured customers using its fuel that kerosene lamps would be less likely to explode and set the house on fire.

Standardization also underpins the basic exchange at the heart of market trade, both for crude oil and petroleum products. Light or heavy, sweet or sour, crude oil itself is a highly variable commodity. If buyers and sellers are to agree terms, this variability of crude presents a potential problem. Some guarantees of product quality and consistency – against the reality of variability – are needed if buyers are to be certain of what they are acquiring. In the very early days of oil, guarantees on product quality were obtained directly as buyers would sample the product prior to purchase. However, this requirement for direct knowledge limits the ability to buy oil sight unseen and constrains the pool of potential buyers. Getting oil to travel and reach a wide market, therefore, required a way of guaranteeing that the quantity and quality of the product would not vary but would be the same regardless of location. A first element of "standardization," then, was around quantity, and the emergence of the 42 gallon (159 liters) Standard Oil Blue Barrel (bbl) as the unit of measurement for a material that changes volume with temperature and evaporates (changes in volume of up to 5 percent are acknowledged in large trades).

A second element of standardization of crude oil is around quality. Variations in density, viscosity, sulfur content, distillation temperature profile, and a number of other characteristics now define more than 200 different grades of crude, which are identified by the names of key oil fields. These variations are significant because they influence the range of products that can be won from crude through refining. Given this degree of natural variation, trade in oil is facilitated via a pricing system that ties prices to one of a handful of "benchmark" crudes. Variations in quality from these benchmarks then attract a premium or discount for any given crude, producing a spread of prices and price differentials that are themselves wrapped up into financial contracts and traded on the futures and derivatives markets.

Downstream from the refinery, standard-setting organizations play a significant role in creating conditions that enable trade in refined oil products. These include international organizations like ASTM International (formerly the American Society for Testing and Materials) and the International Organization for Standardization, military organizations like NATO and the US Air Force, national and regional standards (such as Europe's EN228 standard for gasoline), as well as some corporate standards. These standards are fundamental to international petroleum sales. They enable buyers and sellers to understand quantity and quality without direct knowledge of the product, allow shortages in one area to be met by other sources of supply, increase competition among refineries and distributors, and help push for cleaner fuel standards. The significant role that environmental standards will play in making future fuel markets is exemplified by the EU's Fuel Quality Directive, which has set specifications on fuels in the interests of protecting health and the environment since 1998. Expansion of the Directive to promote lower-carbon fuel sources, by assigning greenhouse gas values to different renewable and fossil fuels, has been vigorously resisted by unconventional oil producers (which would be given a higher greenhouse gas value) and most particularly by representatives from Canada's bituminous sands industry. GHG emissions for bituminous sands throughout the entire supply chain can be 80 percent higher than some of the lowest GHG-emitting oil sources. A similar low-carbon fuel standard introduced by California in 2007 was challenged in court by the National Petrochemical and Refiners Association, but has remained in effect.[1]

## Managing abundance

Scarcity is a central storyline in the unfolding drama of oil since the late nineteenth century. However, for much of the twentieth century, a primary issue for the oil industry was how to make oil scarce in the face of prodigious abundance so as to ensure profits from its production and distribution. Overproduction has dogged the oil industry for most of its history. This dynamic is now changing, however. Physical and institutional constraints on new supply have eroded spare capacity in the oil production network, while global demand for oil continues to grow. The result is a tightening of the oil market, heightened concerns about supply security, and increased price volatility. At the same time, higher prices for oil – and growing public concern about some of the products and by-products of crude oil production and refining – indicate the possibility of an alternative trajectory in which it is demand for oil that peaks, rather than supply, as part of a broader energy transition. There is already evidence for this alternative scenario within Europe, although both the scale of transition and the pace of change are limited relative to the growth in worldwide oil demand.

### *Shutting oil in: proration and spare capacity*

Strange as it may seem in a contemporary context, the politics of oil has frequently centered on how to "shut in" production and limit the rate at which oil flows onto the market, so as to avoid the depressing effect of excess supply on price. The enormous volumes of oil brought to the surface during the US oil booms of the early twentieth century, together with a highly fragmented pattern of ownership that undermined efforts at coordination, overwhelmed regional markets and created major problems of storage, waste, and damage to property. The practice of "proration" (proportional distribution) was introduced, first in Oklahoma in 1915 and then in other states, with the aim of preventing oversupply and waste. In these states, a government agency allocated allowable production to individual producers in the name of resource conservation. Until the early 1970s and the exhaustion of US spare capacity, the Texas Railroad Commission effectively controlled the rate of US oil production and domestic prices through its proration of the most significant oil-producing state in the country. Although the official role of proration orders was resource conservation and the prevention of waste, its influence on price stability served the interests of large oil producers.[2]

The international oil markets presented a similar collective action problem of managing excess capacity to avoid potentially ruinous competition. From the 1920s onward, a series of agreements among the majors sought to contain the potential for "destructive competition" over supply while at the same time securing their upstream and downstream positions against a growing group of independent oil companies and alternative sources of supply (see Box 2.2). The "Red-Line Agreement" in 1928, for example, committed the oil companies that made up the Turkish Petroleum Company in Iraq – which included Anglo-Persian, Shell, Compagnie Française des Pétroles, Standard Oil of New Jersey, and Mobil – to a policy of not competing with each other for concessions within the boundaries of the former Turkish Empire. The same year, a secret agreement to carve up the international oil market among three of the majors sought to solve a problem of "excessive competition [that] has resulted in the tremendous overproduction of today . . . in which money has been poured into manufacturing [refining] and marketing facilities so prodigally that those now available are far in excess of those required to handle efficiently the world's consumption." Concluded at Achnacarry Castle near Fort William, Scotland, and known as the "As-Is" Agreement, this deal suspended international competition between Anglo-Persian, Standard Oil of New Jersey, and Shell throughout the world with the aim of stabilizing prices.

Although the "As-Is" Agreement was short-lived, Big Oil's integrated production structures and "conservation" systems afforded these firms a measure of control over international prices for much of the first half of the twentieth century. As the center of gravity of production slipped away from the US and toward the Middle East, so these governance structures came under increasing strain. An unintended consequence of efforts by the international companies to preserve market share in the face of growing competition was the emergence of a new international system of proration controlled by producer states. The decision by the majors to cut posted prices galvanized the formation of OPEC in 1960. OPEC's founders saw in the Texas Railroad Commission a model of how price stability could be achieved by allocating production among producers. Like proration in the US during the interwar years, the formation of OPEC occurred in a period of structural oil surplus and falling prices, and marked the beginning of collective action by producer states concerned about government revenues to regulate the balance of oil supply and demand. OPEC's action to restrict oil supply in 1973 (in the context of US support for Israel in the Yom Kippur War and the decision to decouple the dollar from gold) demonstrated the capacity of nationalized oil producers to act together and, for oil-importing countries, raised the specter of supply shortages that continues to haunt contemporary discussions of energy security.[3]

Proration is fundamentally a question of who should bear the costs associated with maintaining the cushion of spare capacity. Far from being a dusty footnote to the history of oil, the issue of spare capacity is a live and contentious one. The failure of high oil prices to produce sufficient investment to restore a "normal" price regime raises the question of where new oil could come from and who should make the investments required. OPEC countries, which hold the bulk of the lowest-cost reserves, may not be willing to make these additional investments because their revenue needs can be met by higher prices. Other oil exporters – like Russia and Mexico – do not seem willing to shoulder the costs of building and maintaining spare capacity although by most calculations they have sufficient reserves to enable them to act as swing producers. Consumers also hold some responsibility for bearing the costs of ensuring a reliable supply and the capacity to buffer short-term disruptions. The "Age of Plenty" may have come and gone, but the critical issue of who bears the costs of bringing supply and demand into balance remains.

## *Soaking up supply: manufacturing a world fit for oil*

The creation of effective demand for oil involved more than organizing its scarcity. It also required embedding oil use within the routines and patterns of daily life by building cities, highway systems and other transportation networks that required massive and sustained inputs of gasoline, diesel, and jet fuels. In the early twentieth century, it was not a given that automobiles would be powered by oil, and the association of cars with oil took a while to take hold. In 1900, 38% of US vehicles ran on electricity, 40% on steam, and 22% on gasoline, with the electric vehicle fleet peaking in 1912. By 1930, however, electric vehicles had been fully displaced by internal combustion engines in the US and Europe. In the US in particular, the actions of corporations, planners, and architects created forms of the built environment that ensured the "American way of life" was dependent on the availability of cheap gasoline. An alliance of automobile and oil companies conspired to replace electrically driven public transportation in American cities – the street car and electric train – with diesel buses. Between 1936 and 1950, for example, the electrically driven tramcar lines in more than 45 major American cities were purchased by bus companies like National City Lines and its subsidiary Pacific City Lines – formed in the early 1930s and funded by General Motors, Standard Oil of California, Phillips Petroleum, and Firestone Tire – only to be shut down, leaving oil-powered transportation in their place. By the late 1950s, 90% of US tramlines had been closed. V8 engines – initially designed for boats and mounted on aircraft – became a "must" for any decent American car after World War II: the largest, Cadillac's 8.2 liter displacement V8 500, averaged 8 mpg in the city. These powerful and profligate engines were largely gone by the mid-1970s following the first oil crisis and did not make a major comeback before the arrival of SUVs in the late 1980s.[4]

Broader forces were at work too. The availability of credit enabled individuals to purchase comparatively large homes on dispersed, suburban lots and the automobiles to travel between them and work, while also enabling city and federal governments to construct an infrastructure of bridges, tunnels, urban freeways, parkways, highways, and airports. In short, consumption practices were laid down in the postwar years that ensured a massive throughput of raw materials, and of oil products in particular.

New consumption norms and practices took on a geographical expression – in the spatial segregation of home and work that led to urban sprawl, the growing connectivity of urban settlements in national space via smooth rolling highways and air travel, and in the micro-geographies of the home that became structured around new products and materials – and locked in demand for oil. The reworking of urban space around the automobile has been widely studied: in extreme cases like Los Angeles, as much as two-thirds of urban space is given over to the car. Such patterns were key parts of the postwar consumption landscape in oil's major markets. Automobile ownership and suburbanization created conditions of mass consumption for oil and its products, not only in North America but also in Europe and increasingly in Latin America and Asia via a model of "development as modernization," in which transportation, personal mobility, and consumption feature strongly. These globalized practices and the landscapes they produced could soak up the abundance of production that exploration and oil-field development was bringing to the market in the 1950s and 1960s. A powerful alliance between automobile manufacturers, oil companies, construction firms, and the state was created in many countries, which lobbied to produce new consumption landscapes that, in turn, reproduced their social power.

In mature markets, many of the conditions under which oil first established its dominance as a fuel no longer hold. Oil prices are higher, alternatives to oil (such as gas for heating and power generation) are more widely available and increasingly cost-competitive, and many governments have raised the level of taxation on fuels considerably. Further, consideration of the environmental, health, and development impacts of oil has begun to appear in decisions about oil consumption in a way that it never did in the mid-twentieth century. As a result of price trends, efficiency gains, and government policies on climate and energy security, demand for oil has already peaked in the OECD. In many of these economies, oil has exited the power sector altogether, replaced by the expansion of coal, gas, nuclear, and renewables, while its role as a domestic and industrial heating fuel has also been squeezed by gas and electricity. In practice, demand destruction takes the form of retooling urban landscapes, transportation systems, and industrial machinery to disembed oil from its current incumbent position. The transportation sector, in particular, has underpinned growth in oil demand for the last 30 years and is currently the primary driver of demand in Asia. Given this tight connection between demand growth and transport, improvements to the efficiency of transportation combined with investment in alternatives to car and air travel will be particularly significant for reducing aggregate demand. The IEA has identified the potential for a worldwide demand side peak in the (unlikely) event that governments commit to maintain carbon dioxide levels at below 450ppm.[5]

## *Squeezing crude: new products from oil*

Owners of crude oil sought to expand markets for oil by developing new products from the remarkable raw material at their disposal. In effect, this involved squeezing crude oil harder – via more sophisticated refineries and cracking techniques – so as to extract from crude a greater range of products and services. The progressive development of thermal cracking techniques in the early twentieth century allowed refineries to break down long hydrocarbon chains of low value into more volatile (i.e. short chain) products that could be sold at higher prices. The subsequent development of catalytic cracking allowed production of higher-quality and more specialized products, such as high-octane gasoline, which enabled oil products to reach further still into industrial, military, and domestic applications.

In the first half of the twentieth century, oil and petrochemicals largely replaced coal tar as the foundation of chemical engineering. The nascent plastics industry – which had its roots in organic materials (e.g. cellulose) and coal tar from the 1850s onward – became firmly affixed to oil and petrochemicals by the mid-twentieth century, particularly via the polymer technologies and thermoplastics to which they gave rise. In the 1950s and 1960s, and following crash programs for the development of synthetic rubber in the US, the petrochemical industry began seeking new markets by manufacturing substitutes for natural products. Plastics began to replace traditional materials in a range of applications – including metals, wood, and glass. Low-density polyethylene (LDPE), for example, developed commercially by Monsanto in 1945, enabled products like the "Sqezy bottle" and the replacement of glass containers for liquids such as shampoo. Both Tupperware and Lycra were introduced in 1949, the former made from low-density polyethylene and the latter from polyurethane. The plastics and chemical industries, seeking new markets for products developed for military applications in World War II, began marketing a suite of new products that included pesticides, fabrics, and household utensils, tying oil and oil products ever more tightly to daily life. The search for new products and markets continues, but the petrochemical sector has been confronted with a range of environmental and health challenges since the 1960s. Plastics, in particular, have acquired a bad reputation due to their environmental persistence and potential health impacts. Bisphenol A, for example – which is used to make polycarbonate plastics – is now banned from some products in Canada and the European Union, while several countries and municipalities now either ban or tax plastic bags. Environmental and health concerns have seen oil products replaced by other materials in some applications (e.g. packaging), constraining demand growth in some markets.[6]

## *The end of abundance or a new beginning?*

The long-term trend has been for oil supply to grow in pace with the expansion of demand, with only relatively short-term interruptions. Between 2002 and 2012, however, a "supply gap" emerged. Rapid growth in Asian economies meant market fundamentals pushed prices higher, yet higher prices initially failed to bring forth sufficient new supply from conventional sources to rebalance the market. Some analysts interpreted this "demand overhang" as evidence of the "peaking" of conventional oil production and that the volume of conventional oil pulled from the ground each year would only decline. Others have seen market tightening as evidence of insufficient investment by IOCs and NOCs, and as an adjustment to new unconventional sources, rather than a fundamental geological constraint. There is agreement, however, that high and volatile oil prices since 2002 are not a temporary phenomenon but mark "the end of cheap oil" and a significant shift in the nature of the resource base. Although oil prices have fallen from over US$100 in the early 2010s, they continue to be high by historical standards. When adjusted for inflation, the average oil price prior to the first oil shock was US$25 per barrel (1946–1972) and US$32 (1986–2002) prior to the last oil boom, while "low prices" in the wake of the most recent boom hover around US$40–50. Increasingly, the gap between supply and demand is being made up by unconventional sources, which have production costs that are three to four times as high as conventional oil. The volatility of prices and their departure from historic norms of around US$25 provide a daily indication that established mechanisms for regulating the availability and affordability of oil no longer seem to be working.

## Oil markets and shifts in pricing power

For much of the twentieth century, the mechanism for allocating oil among consumers and distributing it along the production network was quite unlike a market. Oil prices were set by oil producers until the mid-1980s, first by a small number of vertically integrated companies that controlled the bulk of world production until the late 1950s, and then by the governments of key oil-exporting states which linked their prices to the benchmark Arabian Light Crude. It has only been since the 1980s that a large, functioning market for oil has developed in which prices are "discovered" through the interaction of buyers and sellers, rather than being set by producers. Technologies of electronic trading rapidly expanded this "spot market" (with contracts for delivery within days), which became an important source of liquidity in the oil market as well as the reference point for oil sold through long-term contracts. As the amount of oil passing through spot markets has fallen over time, so the financial futures markets have eclipsed the spot market and now have a leading role in establishing oil prices. Prices are now set by a "paper" market in which trading behavior is closely linked to other financial markets and only weakly tied to physical supplies of oil.

### *Producer pricing and the emergence of a consumer counterweight*

For the first half of the "Age of Plenty," the price of oil (outside the Soviet Union and China) was effectively set by the integrated majors. The majors' control of upstream operations provided a means to regulate the flow of oil onto the market, while rapidly growing demand provided a context that contained inter-firm competition. Trade in oil in this period was dominated by "horizontal" exchanges among the majors (for which prices were never disclosed) and by "vertical" trades between the subsidiaries of an individual firm, the latter often using transfer pricing techniques to reduce overall tax liabilities. In short, oil markets were very thinly developed and the bulk of the world's international oil movements took place within the structure of the multinational oil firms that dominated production. The concept of "posted prices" played a key role in keeping this administrative system together. These prices were set by the majors, rather than determined by open-market transactions, and were used as the basis for calculating the taxes and royalties the majors would pay to the reserve-holding states in which they held their concessions.

By the late 1950s, the percentage of oil entering world markets under the majors' control was slipping. The growing role of Soviet oil exports and the increased role of independents (such as Occidental in Libya and the five independents that were part of a US-led consortium to reactivate Iran's oil industry after the coup in 1953) meant that a market for oil emerged outside the structure of the majors. Competition among suppliers for market share led the majors to sell oil to refiners at a discount, creating a growing gap between posted prices for crude and the actual prices for which oil sold. When the majors moved to cut posted prices in 1959, reserve-holding states reacted by forming OPEC. The initial decision of reserve-holding states to defend posted prices evolved over time into a strategy of equity participation (i.e. nationalization), which gave governments control over a proportion of oil output. This further undermined the majors' control over upstream production, and transformed governments from landlords into hawkers of equity oil. It marked a decisive shift in control over the world market from the major international companies to oil-exporting states.[7]

With the formation of OPEC, the power to set prices remained with producers but shifted from European and American companies to the governments of oil-exporting countries. Like the system of posted prices operated by the majors, the OPEC system was an administered one. Individual oil-exporting states set an official selling price for their crudes, with these prices linked to the "reference price" of Saudi Arabia's Arabian Light. The tightness of this linkage would be tested over time – and particularly in the period of falling prices in the early 1980s – but the basic idea replicated the majors' model of producer collaboration with the goal of containing the threat of potentially ruinous competition for market share. OPEC members demonstrated their power to withhold supply and drive changes in price (both up and down) during the 1970s.

In an effort to wrest some control over price and supply security back from producers, the major oil-consuming countries set up the International Energy Agency (IEA) in 1974 as a counterweight to OPEC. Created on the initiative of US Secretary of State Henry Kissinger within the structures of the OECD, the IEA directed its members to cooperate in order to address "their vulnerability to the new economic power of the oil-producer countries." The IEA's brief has broadened over time, but its core function remains as an oil-importers' club that faces OPEC across the oil market: however, although membership has expanded, the IEA does not include the countries experiencing fastest growth in demand (such as China or India), with the OECD proportion of global oil consumption falling from 71 percent in 1970 to 48 percent in 2015, and expected to be below 40 percent by 2035. In contrast, China now represents about 13 percent of world demand, and large buyers like Sinopec can at times dominate daily physical oil trading. The principal mechanisms at the IEA's disposal are a system of emergency petroleum reserves covering 90 days of imports, an agreement to share these among members in an emergency, and advocacy of governance structures for oil that rely on market allocation and which promote investment in new supply.[8]

### *Market prices and the search for price stability*

The current system for determining the price of oil is market based. Its origins lie in the tension between OPEC and the IEA over the power to control price, and it stepped from the margins of the oil trade in the 1980s with the collapse of the OPEC-administered system of pricing. Between 1986 and 1988, with its market position heavily eroded by competitive discounting by other OPEC members, Saudi Arabia – the anchor point of OPEC reference prices – moved to a market-based system of price determination, with other producers following suit. The essence of the current system is that oil prices are not set administratively by producers but emerge out of the interactions among buyers and sellers. These interactions take place either via the spot market or, increasingly, via the market in oil futures, with prices fluctuating over the course of a single day rather than being set for relatively long periods of time (up to a year or more under an administrative system).

In practice, the "market-based" process of price discovery is a much less pure process than it sounds. First, only a comparatively small (and declining) proportion of trade in oil actually passes through the spot market: in 2010, trades for immediate oil deliveries on the spot market accounted for only around 3.5 percent of global crude production. Far more oil changes hand via long-term (1–2-year) contracts, although those contracts are typically based on a formula that references the spot market price. Second, market pricing revolves around a handful of "benchmark crudes" that make up the spot market. The prices of these benchmark crudes – such as West Texas Intermediate, Dubai-Oman, or Brent/Forties/ Oseberg/Ekofisk (BFOE) – serve as reference points against which the prices of other crudes are determined by the application of a differential. Benchmark crudes are also important because they are used as a price reference point in contracts for a whole series of non-oil transactions (such as the sale of oil derivatives and tax payments to governments). Third, the "price of oil" quoted on the nightly news is not an actual price revealed through trade but an "assessment" made by a price reporting agency such as Platts. This is because buyers and sellers in the spot market sell their oil "over the counter" in direct deals and do not disclose their prices (unlike the futures market where prices are visible). Price-reporting agencies use a combination of market knowledge and information about specific deals to "identify" prices and, as a result, these agencies play an important (and contested) role in the operation of the spot market.[9]

The "thinness" of spot markets and their limited liquidity mean oil prices have instead become increasingly linked to the trade in oil futures. The volume of trades and the number of market actors are much greater in these "paper" markets for oil. Initially a way of hedging against price swings in the physical oil trade – and regarded by conventional economic theory as a source of market stability – paper markets for oil have become progressively disconnected from the trade in physical oil, and are now a relatively autonomous force with significant influence on the price of oil and on the investment strategies of oil firms. The first oil futures contract – for heating oil –

was offered on the New York Mercantile Exchange (NYMEX) in 1978, followed by the introduction of a futures contract for West Texas Intermediate in 1983. An extensive market in oil futures, options, and sundry other oil-related derivatives has since emerged, centered on the NYMEX and the InterContinental Exchange (ICE) in London. The scale of this market has grown rapidly since the late 1990s: the number of open futures contracts on the NYMEX and ICE rose from 149,000 in 1994 (daily average) to just above a million in 2009 – contracts equivalent to over a billion barrels of oil. Similarly striking is a parallel growth in so-called "over the counter" trades which occur off-exchange: as much as 90 percent of swaps and options trading in oil can occur this way. The volume of over-the-counter trades for all commodities is estimated to have increased eighteenfold between 1998 and 2007. Not only has the size of these "dry barrel" markets increased, but the volumes of oil that change hands each day through futures and derivatives contracts can be many times larger than the number of "wet barrels" brought to the surface and circulated through the oil production network: by 2009, the annual trading volume of crude oil futures was nearly eight-and-a-half times world oil production.[10]

A shared goal of oil importers and exporters within this market system has been price stability and the prevention of "price shocks." These are experienced by consumers as sharp spikes in the price of oil that erode value; and by oil exporters as sudden changes in revenue flows (both up and down) that can have disruptive effects on economic development. Furthermore, sustained high prices – and/or a high degree of price volatility – can also undermine the market for oil as consumers switch to alternative fuels or invest in improvements in efficiency that reduce demand. This interest in perpetuating markets for oil attenuates the urge of oil producers to raise prices, and underlies cooperation between OPEC and consuming countries. A manifestation of this shared interest in price stability was the introduction in 2000 of an OPEC price band of US$20–28 per barrel: if prices fell outside this band, OPEC would take action to expand or rein in production. Significantly, this band was deemed "unrealistic" by OPEC in 2005 and suspended when oil had been trading at over US$40 per barrel for a year or so. The continued growth in prices and the apparent inability of either OPEC or the IEA to restore equilibrium indicate how pricing power has slipped out of the hands of both oil producers and consumers, and the growing influence of financial traders in oil markets.

## *Volatility, speculation, and the limits of the market*

Crude prices rose from US$18 per barrel at the start of 2002 to US$145 in July 2008, fell to US$34 in December that year before recovering to US$128 in March 2011, and then bottomed out at US$26 in January 2016. The causes of this volatility have been widely debated. While high prices are linked to "market fundamentals" and a structural imbalance between supply and demand that emerged around 2002, the recent volatility in oil appears to be linked to the increased influence of financial activity in the markets for oil futures and derivatives (see Figure 3.2). Structural conditions of growing demand, limited spare production capacity, and political instability in oil-exporting regions create ample opportunities for financial speculation, and a range of non-oil-related actors has entered the futures markets for oil to take them up. These so-called "noncommercial traders" do not enter the futures market to hedge against price risk as they neither produce oil nor consume it. Attracted to oil as an asset class, noncommercial traders enter the futures market to make a financial bet on oil: they speculate on oil price movements and oil derivatives as an alternative to real estate or stocks and bonds. The volume and significance of "noncommercial" traders in oil markets increased sharply after 2004: the volume of open contracts on NYMEX attributable to noncommercial traders grew from less than 20 percent in 2000 to more than 40 percent in 2008. The growing "financialization" of oil markets and the much greater liquidity of the derivative "paper" barrel market relative to the spot market have occurred at a time of rising prices and increased market volatility. To some observers, volatility and uncertainty over price are now endemic to the oil market. While any causation between financialization and high oil prices is contested, financialization has clouded the role of the futures market in price discovery and contributed to growing uncertainty about the relationship of price to physical oil supply.[11]

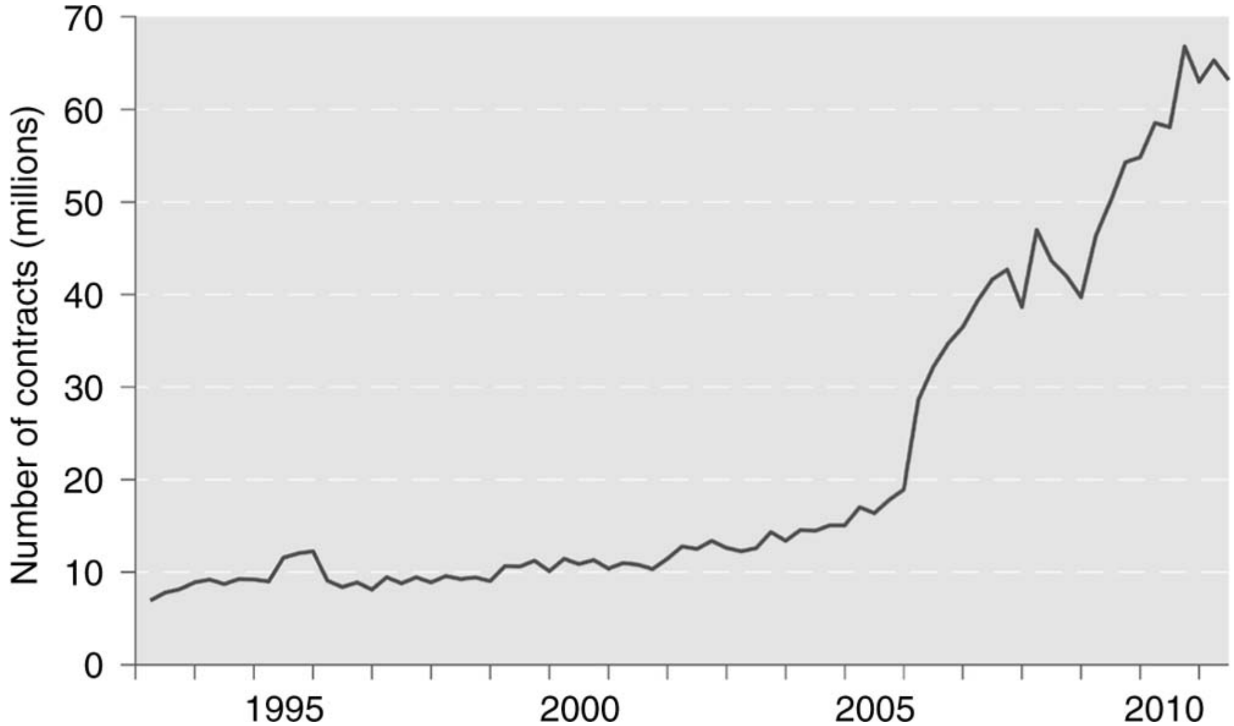


Figure 3.2 Futures and options contracts for oil and other commodities (1993–2010)

*Source:* Authors, based on Bank of International Settlements Quarterly Review data.

Although the role of market speculation in driving the price of oil is disputed, what is clear is that price signals emerging from oil markets are not translating into the sort of changes one might expect with regard to oil demand and supply. Substantial rises in the price of oil since 2002 have neither caused aggregate demand to slacken nor have they generated significant growth in supply. Strong growth of Asian demand has outstripped recessionary effects in OECD markets so that demand for oil has continued to rise even while prices have risen sharply. On the supply side, the financial strategies adopted by many oil companies have prioritized shareholder dividends and buybacks over investment in production. It is widely recognized, for example, that high oil prices since 2004 have not translated into proportional increases in investment expenditure by major oil firms.

The “failure” of the normal market response mechanism to dampen demand and increase supply at a time of high prices raises questions about who now controls the oil market and illustrates the limitations of the market-based model of oil allocation that has dominated consuming countries since the 1980s. Some analysts suggest we may be on the cusp of a new price regime in which the price of oil is no longer set by the marginal costs of production (the cost of the last barrel necessary to meet demand). With its availability constrained, prices become separated from the costs of production, and it is the value to end consumers (rather than the marginal costs of production) that determines price. In the language of economists, oil ceases to be a commodity and becomes a strategic good. The growth of bilateral deals in the international oil market – such as China's use of loans-for-oil as a complement to its equity oil positions (Box 3.1) – suggests that this may already be happening as consumers seek nonmarket mechanisms to "lock in" supplies. These deals effectively segment the international crude oil market and mean that "purchasing power is no longer enough of a guarantee for access to all oil flows."[12]

## Conclusion

This chapter has shown how the centrality of oil to modern life is not a natural state of affairs but has been assiduously produced through creative enterprise during the twentieth century. A vast range of markets for oil products developed as producers struggled with the problem of overproduction. For much of this period, oil supply was led by growth in demand and, in the face of surplus, producers devised various mechanisms to retain control over price. The inherent conflict between oil producers and consumers over the distribution of value takes the form of a struggle over price. The shift from high oil prices in the 1970s to low prices in the 1990s reflected a loss of pricing power by OPEC. Price volatility has increased substantially since 2002, raising the question of where in the production network pricing power now lies. High prices, like those of the last oil boom, are clearly to the advantage of oil producers yet, critically, pricing no longer seems to be entirely within their control. Producers still have the capacity to restrict the flow of oil onto markets, but most have sought to maintain market share in the face of the growing significance of unconventional oil supplies and sluggish growth in global oil demand.

### Box 3.1 Compartmentalizing the market – China's loans-for-oil

Along with its "go out" policy of foreign direct investment by state-owned firms (see chapter 2), China has concluded a series of bilateral loans-for-oil deals. The essence of these deals is balanced two-way trade, in which China receives oil and gas in exchange for industrial machinery, infrastructure development, and other goods, including arms. They are typically long-term commitments lasting 20 or more years. A deal between China and Iran in 2004 is credited with introducing a "new energy mercantilism" into the oil market that "changes the international oil and gas game." Worth between US$200 and US$400 billion over 25 years, this oil and gas deal was anchored by an agreement to export gas from Iran to China in exchange for financing, infrastructure, and the development of a tanker fleet. In 2009, China concluded deals with Brazil, Kazakhstan, and Russia worth US$50 billion. These include a 20-year deal with the Russian state-owned companies Rosneft and Transneft that will give China access to 300,000 barrels a day via the Eastern Siberia–Pacific Ocean pipeline. All together, the three deals in 2009 provide access to 1.2 mmbd within the next 10 years. The effect of these bilateral deals is "to compartmentalize the international oil trade, receiving volumes from selected buyers and withholding oil and gas from open market trading." Critics also point out how bilateral deals undermine efforts to secure multilateral agreements to stabilize prices and, by preventing price transparency, can also facilitate corruption.[13]

During the run up to record oil prices over the last few years, some saw evidence of looming geological constraints and the imminence of "peak oil." Others interpreted high prices as a function of underinvestment by oil companies and reserve-holding states, and political decisions (not physical limits) that set the conditions determining where and how oil reserves could be developed. We side with the latter as an analysis of where constraints on supply originate, and how investments in technology and infrastructure are shaped by political choices. The rapid development of unconventional oil resources in North America, and the sharp drop in the price of oil to which it (and the response of other producers) has contributed, highlights the limits of “peak oil” as analysis of contemporary oil politics. Tar sands and tight oil show how global oil demand can be met by expanding supply from unconventional oil resources, but also the necessary enabling conditions – limited $CO_2$ regulation, corporate tax breaks, weak environmental legislation – and environmental and social consequences of doing so. Unconventional oil has high costs, both in relation to conventional oil and wider social and environmental values. The falls in price recently enjoyed by consumers are a consequence of a struggle for market share, in which conventional oil producers (in the form of OPEC) effectively give up some rent in exchange for a price environment that asserts their dominance in global oil supply vis-à-vis unconventional oil producers (and sustains expanding demand for oil overall). Consumers benefit in the short term, but falling prices distract attention – both analytically and politically – from one of the most significant effects of sustained high prices: demand destruction. In OECD economies, high and volatile oil prices over the last decade encouraged technological and cultural changes that have reduced the intensity of fuel use, demonstrating an alternative way to balance demand with constrained supply. Although moves toward demand destruction have been too small and too slow to be widely effective, they are promising because they seek to undo demand by disembedding oil from urban and transportation infrastructures. However, falling prices relieve consumers of this incentive and create political pressure, in North America and elsewhere, to expand domestic supply in the hope of locking in the gains of cheaper fuel.

# Notes

1. On the barrel, see M. Downey, *Oil 101* (Wooden Table Press, 2009). The Fuel Quality Directive requires suppliers of fuel to report the carbon intensity of their fuels and reduce life-cycle greenhouse gas emissions by 10 percent by 2020; see D. Sperling and S. Yeh, “Toward a Global Low Carbon Fuel Standard,” *Transport Policy* 17(1) (2010): 47–9. T. Zachariadis (ed.), *Cars*

*and Carbon: Automobiles and European Climate Policy in a Global Context* (Springer, 2011). The proposed assigned value for bituminous sands is 107g $CO_2$ equivalent per megajoule of fuel versus an average of 87g $CO_2$ equivalent for crude oil, www.euractiv.com/climate-environment/eu-faces-tar-sands-industry-news-508140. For a classification of fuel sources by GHG emissions, see for example the global "Oil-Climate Index" proposed by Carnegie Endowment for International Peace.

2. P. Odell, *Oil and World Power* (Pelican Books, 1986). Control of the majors in the US market was limited to transportation and refining: the "Seven Sisters" controlled only a third of upstream output with the remainder made up by thousands of smaller companies. Proration's influence on price stability therefore achieved what the majors alone could not and was a source of tension between large and small oil-producing companies: B. Mommer, *Global Oil and the Nation State* (Oxford University Press, 2002: 56); R. Cook, "Pro-ration: The Regulation of Oil and Gas." SPE Gas Technology Symposium, Omaha, Nebraska, June 1978; M. Huber, "Enforcing Scarcity: Oil, Violence and the Making of the Market," *Annals of the Association of American Geographers* 101(4) (2011): 816–26.

3. On Achnacarry and the "As-Is" Agreement, see J. Bamberg, *The History of the British Petroleum Company, Volume 2: The Anglo-Iranian Years, 1928–1954* (Cambridge University Press, 1994), pp. 528–34. International oil companies came to see in OPEC an opportunity for an alliance around price, at the same time as they were disputing the changing terms of access to Middle East reserves. OPEC accounted for sufficient world production to exert control over supply, while its actions provided a convenient cover by which the international oil companies could distance themselves from rising prices to consumers. P. Odell, *Oil and World Power* (Pelican Books, 1986); B. Mommer, *Global Oil and the Nation State* (Oxford University Press, 2002); J. Jesse and C. van der Linde, *Oil Turbulence in the Next Decade: An Essay on High Oil Prices in a Supply-constrained World*, Clingendael International Energy Programme, The Hague (2007).

4. D. Robinson and F. Badin, "Does the Electric Car Have a Future?" *Oxford Energy Forum* 80 (2010): 13–19; M. Paterson, "Car Culture and Global Environmental Politics," *Review of International Studies* 26 (2000): 253–70; M. Huber, "The Use of Gasoline: Value, Oil and the 'American Way of Life,'" *Antipode* 41(3) (2008): 465–86; I. Rutledge, *America's Relentless Drive for Energy Security* (I. B. Tauris, 2005); E. Black, *Internal Combustion: How Corporations and Governments Addicted the World to Oil and Derailed the Alternatives* (St Martin's Press, 2006).

5. OPEC, *World Oil Outlook* (2010); B. Fattouh, "Global Oil Demand Dynamics: Re-balancing the Debate," *Oxford Energy Forum* 80 (2010): 6–8; R. Fouquet, "The Slow Search for Solutions: Lessons from Historical Energy Transitions by Sector and Service," *Energy Policy* 38 (2010): 6586–96; IEA, *World Energy Outlook* (2010).

6. For a history of plastics and their remarkable proliferation in the twentieth century, see S. Freinkel, *Plastic: A Toxic Love Story* (Houghton Mifflin Harcourt, 2011). On efforts by Monsanto to secure peacetime markets for new plastics developed during the war, see S. Phillips, "Plastics," in B. Colomina et al. (eds), *Cold War Hothouses: Inventing Postwar Culture, from Cockpit to Playboy* (Princeton University Press, 2004), pp. 91–123. For a rich collection of essays on the social life of plastics, see J. Gabrys, G. Hawkins, and M. Michael (eds), *Accumulation: The Material Politics of Plastic* (Routledge, 2013).

7. The control of the majors over the supply of oil was as high as 85 percent for areas outside Canada, the US, China, and the Soviet Union; cited in B. Fattouh, *An Anatomy of the Crude Oil Pricing System*, Oxford Institute for Energy Studies, WPM 40 (2011). On the growing gap between posted and actual prices, see D. Yergin, *The Prize* (Simon & Schuster, 1991).

8. R. Scott, *IEA: The First 20 Years, 1974–1994. Volume 1: Origins and Structure*, IEA (1994); B. Mommer, *Global Oil and the Nation State* (Oxford University Press, 2002); T. Van der Graaf and D. Lesage, "The International Energy Agency after 35 Years:

Reform Needs and Institutional Adaptability," *Review of International Organizations* 4 (2009): 293–317. The EIA has released oil from its reserves on three occasions, most recently to offset loss of high-quality "sweet" crude from Libya during the Arab Spring of 2011; see "IEA drawdown marks major shift in oil price policy," *Financial Times*, June 23, 2011.

9. A significant "spot market" for oil first emerged at the end of the 1970s in the wake of the Iranian Revolution, which imposed significant restrictions on the amount of oil available to buyers under reference-price contracts, and where short-term sales of oil through Rotterdam provided some liquidity under very tight market conditions: D. Yergin, *The Prize* (Simon & Schuster, 1991). The long-windedness of BFOE reflects efforts by the price-reporting agency (Platts) to maintain a North Sea benchmark by adding new oil fields to ensure minimal volumes.

10. A. Turner et al., *The Oil Trading Markets 2003–2010*, Oxford Institute for Energy Studies, WPM 42 (2011); J. Parsons, *Black Gold and Fool's Gold: Speculation in the Oil Futures Market*, Center for Energy and Environmental Policy Research, MIT (2009); D. Domanski and A. Heath, *Financial Investors and Commodity Markets*, Bank for International Settlements (2007); B. Büyüksahin et al., "Fundamentals, Trading Activity and Derivative Pricing"; paper presented at the 2009 Meeting of the European Finance Association. While striking, comparisons of trading volumes with oil production (one analysis indicates a global figure as high as 19:1 in 2009) need to be treated carefully as the former is a stock variable ("snapshot") while the other is a flow variable measured over time: see R. Alquist and O. Gervais, *The Role of Financial Speculation in Driving the Price of Crude Oil*, Bank of Canada/Banque du Canada, Discussion Paper 2011–16. M. Labban, "Oil in Parallax: Scarcity, Markets and the Financialisation of Accumulation," *Geoforum* 41(4) (2010): 541–52.

11. The terminology of "commercial/noncommercial traders" seeks to distinguish commodity hedging behavior from speculation. See Alquist and Gervais (2011, cited n. 10). For a quantification of the effect that speculation has on gasoline prices in the US, see R.

Pollin and J. Heintz, *How Wall Street Speculation is Driving Up Gas Prices Today*, Political Economy Research Institute Research Brief (Amherst, University of Massachusetts, 2011). See also K. Medlock and A. Jaffe, *Who is in the Oil Futures Market and How Has it Changed?* James A. Baker III Institute for Public Policy, Rice University (2009). The number of NYMEX contracts for light sweet crude rose from around 600,000 in 2000 to over 3 million by the middle of 2008, with the bulk of this rise attributable to noncommercial traders; see OPEC (2010: 25), *World Oil Report*. On volatility and its relationship to price – so-called "oil vega" – see K. Moors, *The Vega Factor: Oil Volatility and the Next Global Crisis* (Wiley, 2011).

12. J. Rubin, "Demand Shift," in *Carbon Shift*, ed. T. Homer-Dixon (Random House, 2009), pp. 133–52. Paul Stevens comments on the rise of "value-based management" as a financial strategy in the oil industry since the 1990s and its implications for new capacity installation. The essence of this strategy is that "if the company cannot earn a rate of return on its capital at least as great as the equities in the sector and the market more generally, then it should return funds to the shareholders via dividends or share buybacks rather than investing itself," "Oil Markets and the Future," in *The New Energy Paradigm*, ed. D. Helm (Oxford University Press, 2007), p. 129. Stevens points out that in 2005 the six largest international oil companies invested US$54 billion in new projects while returning US$71 billion to shareholders via dividends and buybacks. See also A. Jaffe and R. Soligo, *The International Oil Companies*, James A. Baker III Institute for Public Policy, Rice University (2007). Share buybacks, as a proportion of capital outlay for the leading five supermajors, rose from 1% in 1993 to 37% in 2006 while expenditure on exploration fell in the same period from 13.8% to 5.8%. J. Jesse and C. van der Linde, *Oil Turbulence in the Next Decade: An Essay on High Oil Prices in a Supply-Constrained World*, Clingendael International Energy Programme, The Hague (2007: 13).

13. O. Noreng, *Crude Power: Politics and the Oil Market* (I. B. Tauris, 2007), p. xviii; F. Mohamedi, "China: a new model in overseas oil strategy." Available online at

www.china.org.cn/opinion/2009-09/11/content_18509242.htm (2009).

# CHAPTER FOUR
# Living With Oil

Oil provides a living for millions of people and is a way of life for billions more. In this chapter we consider the ways people make a living by working with oil and, in turn, how the livelihoods and identities nurtured by oil sustain its extraordinary social power. We focus first on the daily business of working in the oil sector and the labor regimes surrounding the hydrocarbon commodity chain. In the chapter's second half, we consider the soft power of petroculture and how, beyond its role as a fuel and feedstock, oil shapes contemporary social and political life in significant ways.

Oil provides work for a motley crew. Rig hands, pipe layers, petroleum engineers, oil market analysts, refinery workers, ocean tanker crews, storage terminal managers, oil marketers, service station attendants, petty fuel traders, and players in the emissions and carbon offsetting markets: these and many others all make a living through seeking, moving, manipulating, managing, or selling petroleum and its products. Understood as an extended hydrocarbon commodity chain, the oil sector sprawls across conventional job classifications so that estimating the size of the total workforce is challenging. A reasonable estimate is that 3.3 million people worldwide are employed in upstream oil and gas and a further 1.6 million in refining. So bringing the world's primary energy source to market requires the labor of around only 5 million people, approximately the same number of people who work in China's coal-mining sector alone. The oil sector's contribution to national employment is often contested, however, with the industry asserting large numbers of indirect employees in the supply chain as a rationale for generous tax breaks. The American Petroleum Institute, for example, argues that the US oil industry supports more than 9 million jobs, whereas figures from the Bureau of Labor Statistics indicate fewer than 1.9 million people are employed directly in the oil sector, with half of them in retail.[1]

Most estimates of oil sector employment count workers formally employed in exploration, production, refining, distribution, and sales. Worldwide, however, millions of people earn money through informal involvement in the oil sector, with most involved in petty fuel trading and other downstream entrepreneurial activities. Trading kerosene, gasoline, and diesel is a strategy for managing livelihood insecurity in many parts of the world. Pensioners in Estonia and Poland, for example, supplement fixed incomes by driving across the border to Russia, Belarus, and Ukraine where fuel prices are generally lower, and returning with a full tank of gasoline which is then siphoned out and sold locally. More than 15,000 people work in the smuggling and street retailing of Venezuelan fuel in Colombia, nearly twice as many as in Colombia's oil company Ecopetrol. In Nigeria, periodic shortages of refined fuels draw men and women into an illegal and highly profitable roadside trade selling gasoline and diesel from jerricans. Fuel smuggling across national borders, such as crude and refined oil products from Syria to Turkey or from Libya to Malta and Italy, illustrates how international trade bans create unintended opportunities to profit from the transport of oil. Similarly, illegal sales of agricultural diesel fuel, which is often taxed at a significantly lower rate than road fuels, show how money can be made by evading national regulatory structures designed to channel oil toward particular social groups. Stealing crude provides a living in many oil-producing regions, including the US where thefts of crude and oil-field equipment rose following the downturn in oil prices and widespread layoffs in the sector. In 2013, thefts of crude oil from wells in Texas were estimated to be around 1–3 percent of the state's production. Oil theft in the Niger Delta, however, is on an altogether different scale, with conservative estimates indicating around 250,000 barrels a day are stolen, equivalent to 10 percent of daily output. Illegal taking of oil provides an income for thousands of people in Nigeria across a wide range of skill levels, including welders who install taps on pipelines, boat operators transporting crude to small-scale refineries in the Delta or to larger ships waiting offshore, guards to secure tap sites and refineries, and a range of "white collar" roles to bribe officials and launder the stolen oil (via sales to international refineries) and revenues it generates. The scale and complexity of theft implies employees of oil companies and state agencies are complicit in the process, so that oil theft in Nigeria supplements the income of a large number of people across the economic spectrum. Indeed, the boundaries between the illicit and legal oil trades are not as clear cut as these terms would suggest, not least because this distinction rests on moral claims about to whom oil rightfully belongs. Furthermore, much of the crude tapped illegally from pipelines and other oil installations in Nigeria ends up on international oil markets, and the political relations that enable oil theft are simultaneously part and parcel of a national political context with which international oil companies must necessarily negotiate if they are to do business in the country.[2]

Good money can also be made from failure, when oil erupts from its formal channels and ceases to flow in an orderly fashion from wellhead to consumer. Specialist firefighting teams are employed by well-control companies, such as Boots and Coots and Safety Boss who extinguished oil-field fires in Kuwait during the first Gulf War. Oil work also includes spill-control specialists and the teams of workers who clean beaches, de-oil seabirds, and monitor environmental conditions following events such as the grounding of the *Exxon Valdez* supertanker, the *Deepwater Horizon* disaster in the Gulf of Mexico, or numerous smaller-scale ruptures at wells, pipelines, and storage tanks. Such cleanup operations have become oil economies of their own, contributing to regional employment and national GDP. For example, around 50,000 people were employed in responding to *Deepwater Horizon*, while more than 11,000 people were involved in cleaning up after *Exxon Valdez*. Efforts to mitigate climate change extend the realm of oil work into the “backstream” component of the hydrocarbon commodity chain. This includes, for example, work associated with carbon capture and storage (CCS) utilizing depleted and abandoned oil wells. At the moment, employment in this sector is very limited, given the weak rollout of CCS into commercial use. Most work in oil’s backstream simply extends the long-established practice of using carbon dioxide to enhance oil recovery such as at Occidental Petroleum’s Century plant in Texas, the world’s largest facility for removing and capturing carbon dioxide by volume. However, CCS facilities like those at Statoil’s Sleipner field, where carbon capture is driven by Norway’s taxation regime for $CO_2$ emissions that extends to petroleum production, indicate the potential for oil sector employment linked to managing a "reverse flow" of carbon back underground. The Carbon Capture and Storage Association has claimed that, according to the UK government, the "CCS industry will sustain 100,000 UK jobs by 2030 and . . . ultimately be of a similar size to the oil and gas industry." However, such claims now look fanciful, given the government's subsequent cut in support for CCS commercialization. Finally, there is the work of securing oil's transit provided by military and paramilitary employees, who protect sea-lanes and other transport corridors through which oil flows. In short, while oil remains significantly less job-intensive than many other energy sources, it still takes a good deal of work to ensure it flows in ways that capture value and secure power.[3]

## Making a living

Managing and manipulating oil's flow pays the bills for millions of people worldwide. Some of these work roles are geographically concentrated at key nodes in the production chain, such as sites of extraction or the small number of "energy cities" worldwide highly dependent on oil and gas sector employment, like Houston, Aberdeen, Stavanger, Abu Dhabi, Dammam, and Calgary. In oil fields and oil cities alike, the relative concentration of employment in the oil sector translates shifts in the international price of oil directly into labor-market conditions, with job opportunities, pay scales, and property prices expanding or contracting in cycles of boom and bust. Other roles are more widely dispersed and some, like fuel haulage and gas station retailing, are so commonplace that their central role within the hydrocarbon commodity chain is often overlooked. Most people who work in oil are employed in this downstream component of the chain: in the United States, around half of all official employment in the oil and gas sector is in gas station retailing, which accounts for 850,000 jobs, most of which are low paying. Volatility in oil prices has a more limited effect on employment downstream than upstream, but automation and economies of scale have had significant effects over time in the availability of work (and levels of pay) in these sectors.

A small number of oil jobs have acquired an iconic status within popular culture. Foremost among them is, perhaps, the roustabout or general rig hand. This is physically demanding, relatively low-skill work typically contracted under casual employment conditions with limited job security and strongly associated with young, male, and migrant labor. The limited skills required, prospect of progression to more senior roles (such as driller, toolpusher, or derrickman), rates of pay compared to the wider economy, and the heroically masculine representation of arduous work in dangerous conditions continue to draw people to the sector and ensure the roustabout remains a potent cultural figure. More vilified than celebrated for their practices of risk taking is the work of international oil traders who, concentrated in New York, London, and Singapore's gleaming towers, can move the price of oil with a push of a button. In June 2009, for example, a single trader with PVM Oil Futures in London bought 7 million barrels of crude oil – enough to meet the daily consumption needs of all of Latin America – in an alcohol-fueled "late-night trading binge" on his laptop, acquiring control of 69 percent of the global market volume and single-handedly driving up the international oil price by US$1.50 per barrel. With such power comes great wealth, and oil traders regularly appear in the ranks of the world's wealthiest individuals. Gennady Timchenko, co-founder of one of the world's major commodity trading companies Gunvor Group, ranked 85th in a list of the world's billionaires in 2016, for example. Their combination of personal wealth, opaque dealing practices, and capacity to prosper from sanctions and prohibition have secured oil dealers a darkly glamorous place in popular culture: Marc Rich, credited with developing the spot market for oil in the 1970s and founder of the company that would become Glencore, became popularly known as the King of Oil while also being indicted on federal charges of tax evasion, fraud, and illegal oil deals with Iran.[4]

These two iconic roles, roustabout and trader, exemplify the diverse, segmented, and yet functionally interdependent character of the job market in the oil sector, and their differential exposure to forms of risk. They also highlight the profoundly gendered nature of oil work, expressed in sharp divisions of work along gender lines, workplace cultures that reproduce distinctive gender norms, and the perpetuation of romanticized masculine identities (gunslinger, frontiersman, hustler, deal maker) around many of the sector's core tasks. Jobs in extraction and refining are intensely dominated by male workers. Although the proportion of women in the sector has increased, participation of women in the workforce remains very low even in Europe and North America, with only 15 percent in the US upstream and midstream. In some contexts, recruitment of women into oil and gas has been identified as a way to address a professional skills shortage in the sector: in the early 2000s, for example, the UK Offshore Operators Association encouraged women to consider a career in North Sea oil and gas. The gendered nature of oil work means that oil's booms (and busts) have differential effects on the employment opportunities for women and men. Ghana's offshore oil boom, for example, appears to have provided few direct jobs for women, even though there is a long history of female business ownership in Ghana and gender ideologies do not prevent women from working outside the home. Rig personnel are generally male, and companies established in the wake of the boom offering services in worker recruitment, warehousing, and security "tend to be male owned and staffed, apart from secretaries, human resources officers and some security guards." By contrast, women own businesses and find employment "at the fringes" of the oil economy as caterers and housekeepers, selling building supplies or renting storage space to the influx of population servicing the offshore. Women also work in a range of informal sector jobs and, as in other oil towns, sex work also provides a livelihood for women and some men.[5]

Oil's professional geoscience and engineering workforce is also highly gendered: internationally women account for 18–27 percent of geoscience-related roles, while less than one-fifth of petroleum engineers are women. On average women occupy fewer senior positions than men across the sector. Distribution and service station retail work, on the other hand, is more evenly gendered, although the degree to which women are involved in this sector varies by cultural context. Oil work is not only gendered, but also frequently divided on national/racial lines, particularly in the upstream sector of the IOCs which employs expatriates for overseas operations, especially at the beginning of operations and for supervisory roles. This "colonial" pattern has deep historical roots and, in the operations of IOCs overseas, the division of work along lines of nationality is often replicated in the separation of housing and recreational facilities. The oil company “compound” is one of oil’s distinctive landscape forms, and its capacity to replicate European or American cultural and social norms for expatriate workers depends on its separation from the conditions in which national workers (and the broader population) must live. The labor market for oil and gas workers is highly international and, in many cases, is not limited to specialist skills. Both IOCs and NOCs are, however, employing a growing number of nationals in their projects. This reflects not only the relative costs of expatriate and local employees but also local employment objectives of host governments. Written into domestic legislation or specified in individual contracts, these generally require 70–80 percent of employees to be nationals.[6]

## *The nature of oil work*

Oil work, particularly at the upstream end, tends to be physically hard, require long hours, and involve exposure to danger. Pay rates reflect this, with oil work among the highest paid for comparable sets of skills. In Nigeria, for example, salaries in oil and gas can be four to five times those in banking and academia for similar levels of qualification, while in Indonesia non-production workers can earn around seven times as much in the oil and gas sector as in hotel work or manufacturing. Such wage differentials draw people to work in the oil fields, whether they be drill rig workers from Bangladesh, India, and Pakistan contracted to Saudi Aramco, or mechanics and truck drivers from Newfoundland and New Brunswick employed in the Albertan tar sands. Within the oil industry, paychecks often double or triple with more remote field postings. At the height of the tar sands boom in Alberta, for example, a full-time heavy truck operator with a high-school diploma and additional training could earn around US$130,000 as opposed to US$30,000 in Newfoundland for a comparably skilled job. Refining jobs include a wide range of construction, engineering, and management roles. In Canada, refineries employ around 7,000 people, with salaries in this sector averaging around US$118,000 compared to a national average income of approximately US$50,000. While upstream employees are well paid in comparison to other sectors, there are wide wage gaps based on occupation, skills, and gender. In developing countries, wages paid to some oil workers can be insufficient to support a decent livelihood. Other employees, however – particularly those in national oil companies – receive comprehensive benefit packages.[7]

Mobility is not only oil's major end use but also an intrinsic character of much oil-related work. The uneven distribution of oil-rich regions, remote locations of many oil fields, need for specialized labor, and temporary character of drilling operations all tend to create a pattern of mobile labor. Biweekly commuting is the norm among many highly skilled offshore oil workers, while roustabouts working on North Dakota's fracking sites or in Alberta's tar sands can leave home for months at a time. Rotation schedules are a key dimension of work contracts, with the relative duration of "on weeks" versus "off weeks" indicative of the rank, location, and hardships associated with particular jobs. These mobilities deeply shape the lives of individual workers and their families, often resulting in part-time single-headed households and a high degree of financial dependence for the spouse at home which can create chronic tensions among couples. Some small communities in Atlantic Canada have seen nearly all their men leave for Alberta's tar sands, with "oil patch widows" left behind shouldering the burden that this places on their community, including sectors that often rely on male volunteer work such as junior sports league or firefighting. Yet many of these communities, especially small and rural ones, deeply rely on oil wages as workers concentrate much spending and nearly all investment at home. Communities hosting oil extraction are also affected by work mobilities, although in different ways. Where security concerns mean workers travel in armed convoys and live behind thick fences, or work rotations and travel logistics mean workers only fleetingly "touch down" in host communities, there can be a frustrating lack of local economic opportunity from oil development. Other communities, however, are deeply affected by the high demand for temporary accommodation and "entertainment" services during drilling campaigns and plant construction time. The effects of long-distance commuting on host and home communities are thus diverse and vary considerably according to specific contexts, yet are often a major concern.

The work of extracting, moving, and refining crude – as well as retailing (in the form of physical assault on gas station workers, for example) – can also be hazardous. Comprehensive figures are not available, but fatality rates in the oil and gas sector tend to be higher than for workers in general. At least 144 people died in the US upstream and midstream oil and gas sector in 2014, a fatal injury rate of around 16 deaths per 100,000 workers – higher than all other occupations other than agriculture, forestry, fishing, and hunting – compared to a national average for all workers of 3.3 per 100,000. The North American unconventional oil boom has been accompanied by an increase in the number of deaths on the job. Work-related fatalities in the US oil sector increased by 28 percent between 2003 and 2013, a period in which the industry doubled the size of its workforce and increased the number of drill rigs by two-thirds. Between 2003 and 2014, more than 1,300 oil and gas workers were killed on the job in the US. Key risks include explosions and fire from the release of combustible gases, falls and trips, being struck by moving objects, or becoming caught in machinery. Additional risks come from electrocution, chemical exposures (e.g. from hydrogen sulphide, or breathing in silica dust associated with the fracking process), or structural collapse of equipment such as rig masts. However, the principal cause of death and injury among North American oil-field workers is vehicle accidents, which in the United States are around 8.5 times as high as for all workers.

The offshore working environment is characterized by additional risks associated with working at sea and transportation to and from the platform. Working offshore has become increasingly common as the significance of worldwide offshore oil production has grown, from less than 10 percent of production in the 1980s to 31 percent by 2015. Helicopter accidents are the primary cause of death for offshore oil workers, with over a third of fatalities attributed to them. The offshore has also had a record of large-scale disasters, including the capsize of the *Alexander L. Kielland* rig in the North Sea in 1980 which killed 123 people; the foundering of the *Ocean Ranger* rig off the coast of Newfoundland in a storm in 1982, killing 84; and deaths of 22 people in a fire on the *Mumbai High North* processing platform off India's west coast in 2005. Upstream workers can also be exposed to additional risks stemming from the transnational and enclave character of operations, which make them a high-profile target for separatist and other political movements. The Movement for the Emancipation of the Niger Delta regularly carried out attacks on oil facilities in the Niger Delta in the 2000s, including taking nearly one hundred people hostage on a Shell offshore rig in 2003, and a successor movement attacked Chevron and Shell facilities in Nigeria in 2016. Onshore facilities have also been targeted, such as the attack by an al-Qaeda-linked group on the Amenas gas plant in Algeria in 2013 which killed 40 workers, and a gun and bomb attack on oil installations and a workers' residential compound at Al-Khobar in Saudi Arabia in 2004, where 22 people died. In contrast to fatalities, the rate of non-fatal injuries tends to be lower in the oil and gas sector than in the economy as a whole. For example, there were 431 non-fatal injuries per 100,000 workers in the UK offshore sector between 2011 and 2014, less than half the rate in manufacturing and around a third of that in construction. For those whose work brings them close to crude and its products, the business of extracting and refining oil can be a dangerous experience and when accidents happen they tend to be serious.[8]

The oil industry's experience with major disasters, such as the fire on the *Piper Alpha* platform in the North Sea that killed 167 people in 1988, has driven improvements in offshore safety and working conditions. International oil companies have developed extensive safety cultures and there are a number of initiatives to spread best practice, such as the incident-reporting system of the International Association of Oil and Gas Producers. Visitors to offshore platforms report them places "saturat[ed] with practices, performances, media, and bureaucracies of risk avoidance and safety – many of them written on and enacted through the body in dress and modes of walking." There are also national systems of safety legislation that, over time, have developed monitoring, reporting, and enforcement mechanisms. Major oil companies have invested millions to implement safety practices across their operations and bring about operational and cultural change, often needing to confront and modify behaviors deeply rooted in cultural norms. Introducing safe working practices at drilling operations, for example, requires confronting norms of autonomy, bravery, and infallibility that have been central to the image of "manly" oil work and to status on the job site. Developing a workplace culture of collective responsibility and risk avoidance, in which individuals are able to ask for assistance or express concern, is a substantial task and in some instances cultural change in the oil sector has been profound.[9]

Criticisms remain, however, about the level of resourcing around safety (in comparison to the scale of oil revenues), and regulatory agencies' effectiveness in the face of economically and politically powerful interests. There are concerns that the complex system of outsourcing and contracting allows large operators to devolve responsibility for safety and insurance to smaller firms who lack the resources and/or experience to provide it. And there are also concerns about the culture of oil work itself, in which a form of heroic masculine individualism and long hours, encouraged by bonus systems that reward speed and availability, create risk-taking behavior. Critics point to a check-box safety culture as masking the class character of oil work, while others have pointed to the importance of workplace democracy and worker control in ensuring safe working conditions, highlighting the experience of the North Sea in the wake of *Piper Alpha*. While the 2010 *Deepwater Horizon* disaster revealed systemic failures by the industry and its regulators, broader studies of the safety literature also point to the misguided sense of invulnerability resulting from "zero fault" patterns often achieved through narrowly quantifiable controls and compliance assessments.[10]

### *The power to control flow? Unionization and subcontracting*

The integral role of oil to transportation and many other aspects of life mean that those who work in the hydrocarbon commodity chain occupy a strategically significant position. Withdrawing labor at any point along the production chain can reduce or even halt oil's flow, giving oil workers potential leverage in negotiations with employers and governments. In practice, however, the record of oil workers in securing their demands is mixed. The capacity of workers to leverage their strategic position depends on the density and diversity of oil infrastructure, the country's position in the oil production network, and national policies governing the rights of workers to organize collectively. Worldwide, upstream and refinery sector oil workers are employed in a wide range of different conditions affecting their capacity to organize. Some are employees of state firms in which there is union representation (e.g. Kuwait National Oil Company, or Statoil where an estimated 68 percent of employees are union members), while others work for state firms with no meaningful tradition of unionization (e.g. Saudi Aramco). Some are employed by private sector firms and are unionized (e.g. Total), while others work for private sector firms who have been actively hostile to unionization (e.g. ExxonMobil). Many, however, have neither permanent nor direct employment relations with the operating oil company but are employed on fixed-term contracts or work as agency employees or casual workers. Some downstream workers in gasoline retail are sole proprietors and self-employed. The overall picture of employment conditions is complex and geographically variable. Differences in employment conditions have implications for employment security and industrial relations more generally. Hours on the job, rates of pay, occupational health and workplace safety are, at their root, issues of economic democracy and the degree to which oil workers can exercise control over the character and conditions of their work.

The right to create associations for advancing workers' objectives has been a core terrain of political struggle since the early twentieth century. Strategies for containing unionization in the oil sector have varied historically, including the use of intimidation and violence against workplace organization, the corporate promotion of industrial councils and company unions as an alternative to national unions, and outright bans on union formation. Big Oil proved to be one of the most resistant sectors to unionization during its formative years in the US in the first half of the twentieth century, even after passage of the National Labor Relations Act (Wagner Act) in 1935 that guaranteed the rights of private sector employees to organize into trade unions and engage in collective bargaining. Union organizing has shaped the industry in very significant ways. In Mexico, demands and strike action by the Petroleum Workers Union of Mexico (Sindicato de Trabajadores Petroleros de la República Mexicana) played an instrumental role in the processes that led to nationalization of US and Anglo-Dutch petroleum interests by

President Cardenas in 1938. In the United States, action by the Oil, Chemical and Atomic Workers Union (OCAW) helped drive collective bargaining in the oil industry and the introduction of the Occupational Health and Safety Act in the 1970s. In the wake of the *Piper Alpha* disaster in the North Sea in 1988, the Oil Industry Liaison Committee – an independent union of offshore oil workers, later to merge with the National Union of Rail, Maritime and Transportation Workers – played a key role in campaigning for improvements to offshore health and safety and conditions of employment.[11]

While labor unions in the oil sector have had important roles in some national contexts and continue to do so, unionization levels are generally low. Refining tends to have higher rates of unionization than do upstream exploration and production or downstream distribution and retail, reflecting refining's structural position as a "bottleneck" in the production chain, downstream dependency on refined products rather than crude itself, and the growing size (and reduction in number) of individual refineries. Strikes by refinery workers in France, timed to coincide with the Euro 2016 soccer competition, affected all the country's major refineries and storage depots, leading to fuel shortages across the country and government introduction of a 30-liter cap on fuel sales per vehicle. A strike by unionized employees at facilities owned by Costa Rica's national oil-refining company in 2015, in which workers refused to sell or deliver jet fuel, caused the main airport in the capital to operate on reserves and request airlines flying routes in Central and South America to carry sufficient fuel for their return journey. Both strikes occurred within the context of broader labor struggles, indicating how action by refinery workers can often provide a critical "pressure point" on governments in the context of efforts to drive through social reforms.

The significant structural position of refineries has also been harnessed by downstream consumers, environmental campaigners, and workers located further downstream in the production chain as a means of creating pressure for change. Farmers and truck drivers in the UK blockaded oil refineries and storage depots in September 2000, protesting the contribution of government fuel taxes to rising fuel prices, reportedly causing 90 percent of fuel stations to run dry. In 2007, union members with UNITE, representing 2,000 fuel-tanker drivers in the UK, voted to strike in protest at growing outsourcing of fuel deliveries by oil refineries and major fuel retailers. Climate campaigners have also leveraged the chokepoint character of refining: in 2016, climate campaigners used mass disobedience techniques to blockade rail tracks transporting oil to the Shell and Tesoro refineries in Washington State. Oil workers in crude-exporting states occupy a similar structural position in that withdrawal of labor can quickly affect the country's ability to export. A three-day strike by workers at state-owned Kuwait Petroleum Company in 2016, targeting public sector pay reforms and potential privatization, reduced the country's crude output by two-thirds and refinery output by half.[12]

In some national settings, the structural position that oil workers occupy within the production chain is buttressed by a moral authority stemming from the historical association of oil work with patrimony and nationhood. In Ecuador, for example, employees at Petroecuador leveraged the long-standing association of working for the state petroleum company with stewarding the nation's resources to successfully oppose privatization. Oil workers have had more ambivalent relations with environmentalists, as transitioning away from oil implies job losses and disinvestment in the conventional oil production chain. While environmentalists often associate oil workers with a supposedly "evil industry," some nonetheless see safe working conditions in the sector as crucial to avoid oil-related accidents such as spills. One avenue for aligning interests between the two groups is to rethink oil workers' role in the energy transition. This includes re-tooling existing engineering, science, and service skills as part of green employment initiatives; with, for example, the decommissioning of offshore oil platforms in the North Sea an opportunity for training in renewable energy installation, or the potential of petroleum engineers to work as carbon storage specialists.

The bargaining power of oil workers waxes and wanes with the cyclical character of oil prices and has been undermined over time by a trend toward outsourcing and the casualization of employment conditions. Publicly listed oil companies tend to fire (and hire) workers more quickly than do national oil companies, moving to cut the size and wages of their workforce at times of falling prices. In the

US, for example, the sharp decline in price in the second half of 2014 drove down the number of operating rigs from around 1,900 to 619 within fifteen months. Around 100,000 jobs were cut by oil and gas extraction firms and support services in the US during this period. In contrast, the cyclical character of the industry also means it is characterized by periods in which shortages of labor can effectively constrain the pace of expansion and workers can obtain significant wage premiums. The shortage of skilled labor is, in part, a legacy of the 1990s when a sustained period of low prices saw large layoffs and deterred entry into the sector. Labor shortages are not only a feature of high-skill geoscience and engineering roles, but are also significant for lower-skill levels too, particularly associated with production and support work.

To accommodate patterns of boom and bust, publicly listed companies have increasingly outsourced oil work. The number of hours put in by contract workers doubled between 1985 and 2000, although company employees' hours remained broadly the same; contractor hours subsequently increased threefold during the long boom from 2000, while company hours increased by only half. Subcontracting labor is widespread in the international oil sector and covers the full range of skill profile from highly qualified specialists to general manual work. Outsourcing is particularly extensive among the IOCs as a means of managing costs, although state-owned oil companies also subcontract large parts of the work process to access specialist skills and manage labor. In the upstream sector, outsourcing provides operators with flexibility across the life cycle of a project from exploration through development and production, while in refining periodic shutdowns for maintenance and repair create incentives for operators to employ labor on a contract basis. International oil companies have a long history of outsourcing technological innovation to major service companies, such as Schlumberger and Halliburton. In response to the downturn in oil prices in the late 1980s and early 1990s, oil majors sought to cut core upstream costs and outsourced much of their internal capacity in geophysics, drilling, and well-control to specialist providers. As a consequence, service companies now hold much of the capacity for technological innovation and experience, a situation contributing to the structural weakness of Big Oil in relation to its ownership of core assets (see chapter 2).[13]

Extensive subcontracting makes work a complex choreography. Teams working on a drill rig or production platform will often be employed by several different companies. An offshore platform with a crew of 120 workers, for example, will include full-time employees of the platform operator, as well as others working for the operator on a temporary basis. Many other people on the platform will be employees of specialist firms contracted to the operator to provide drilling or well-logging services, for example. There will also be service workers providing catering, cleaning, and maintenance functions, and who are likely to work for companies contracted by the platform operator. There may be temporary workers, too, employed by staffing agencies but who report to/are directed by either the platform operator or one of the other contracted companies. Most oil contract workers are in this type of "triangular" employment relationship, in which they are employed by a company which is contracted to provide labor or services to the main operator. Contractual relations are frequently replicated in different geographical settings so that upstream oil extraction takes on a modular form – "a bundled and repeating set of technological, social, political, and economic practices aimed at profit making that the industry works to build wherever companies find commercially viable hydrocarbon deposits." This modular form is arguably a feature of the "neoliberal" character of the international oil industry and key to its ability to replicate across very different operating environments. It has a longer history, however: the development of the UK oil sector in the 1970s, for example, was shaped by US oil companies and their network of contractors who were effectively transplanted into the North Sea, so that "the command structures, the relations between contractors, the pace of work, the conventions on health and safety were all American. . . . with the exception of the steel fabrication and construction work, local workers were mainly used for tasks that required little prior skill." The desire of operating companies to replicate proven relationships and access to expertise is frequently at odds, therefore, with a host government's objective of maximizing local employment opportunities from oil development.[14]

## Oil as life: the soft power of petroculture

Oil's importance to contemporary social life exceeds its capacity to cover the mortgage or pay the rent for those who work in the sector. Oil permeates the experience of living for billions of people to a degree unmatched by any other commodity. The near-universal nature of oil demand, its centrality to modern modes of mobility and food production, and its mercurial capacity for economic and social transformation mean that oil profoundly shapes people's experience of space and time, understanding of economic and political possibility, and desires and expectations for the future. It is no philosophical flight of fancy to suggest that the experience of living with oil profoundly shapes cultural practices and habits of mind. Oil possesses a cultural power, then, that goes beyond its pervasiveness as a feedstock and fuel within contemporary societies and the forms of physical dependency to which this gives rise. Over time, oil has seeped into the ways in which we think, value, and act by underwriting ways of life in which particular social norms and ideals – about autonomy, freedom, growth, and the 'good life', for example – could take root. From the desire for suburban living and holidays in the sun, to efforts to combat photochemical urban smog and growing awareness of anthropogenic climate change, day-to-day experiences of living with oil have incubated some of modern society's core ideals, many of which ostensibly have nothing to do with oil. From this perspective, oil's incumbency is not an inevitable outcome of its energy density, but a product of cultural and material conditions fostered by oil consumption. Oil's soft cultural power is also institutionalized in significant ways. Oil companies actively shape public life through their sponsorship of the arts, science communication, and other prominent aspects of civic society. This cultural domain is an important frontier for those challenging the incumbency of oil in social life and seeking to hold oil companies to account, as movements like the Art Not Oil coalition and the Liberate Tate network (focused on ending oil company funding of the Tate Art Galleries in the UK) demonstrate. These organizations argue that companies like BP and Shell use arts sponsorship as a means of securing social legitimacy while, at the same time, distracting attention from their environmental, social, and financial responsibilities.[15]

A consequence of oil's cultural power is that many of the terms, assumptions, and identities through which some of today's most pressing social questions are framed are a product of living with oil. These include, for example, questions about the relationship between economic growth and sustainable forms of development, whether governments can adequately address environmental injustice while also acting to protect cheap and available gasoline as a citizenship right, and what constitutes human progress in the Anthropocene. Part of the challenge of moving beyond oil, we argue, is to think in ways not shaped by the cultural power of oil. As many arts and activist organizations are demonstrating, this means challenging and recasting some of the identities and cultural norms that perpetuate oil's apparent inevitability. This section explores how the "life worlds" made through oil are not only material and energetic but, in significant ways, are also cultural and political. Because these life worlds are highly diverse, so too is oil's cultural politics. Here we highlight three of the significant ways in which oil shapes contemporary cultural and political identities.[16]

### *Striking it rich: prospective wealth and the attenuation of inequalities*

It may have lost some of its luster in the context of anthropogenic climate change, but oil's association with economic growth and prospective wealth continues to loom large in popular imagination. The prospect of an oil boom carries enormous political weight for communities hosting oil extraction, while the economic fillip to be had from cheap fuels is rarely lost on consumers or the governments of oil-importing states. The promise of future wealth condenses oil's complex social history into a single narrative of economic transformation, tempting host communities to seize their moment. The cultural power of oil as "wealth in waiting" rests on several linked ideas with roots in the twentieth century's experience of oil. There is the powerfully graphic imaginary of the oil gusher in which raw geology is rapidly liquidated into energy and money, a rocky variant of the "rags to riches" tales through which the possibility of upward social mobility is sustained. The enormous potential of unleashing trapped subterranean wealth captures something of the "cyclonic frenzy" of oil-fueled transformation, and the experience of oil frontiers and oil cities exposed to its violent processes of "creative destruction." There is also the meticulous assembling of oil's availability, via inventories and atlases of national oil reserves and calculations of what remains to be extracted, the planet's "ultimately recoverable resource." Initiated in the first half of the twentieth century and normalized by frequent repetition, these audit processes give oil the properties of a warehoused good, a commodity standing ready for use and deployable at will in the service of future objectives.[17]

An effect of this subterranean reserve is to extend the horizon of development into the future. The prospect of future wealth via oil attenuates current injustice and growing economic inequalities: more growth and development, fueled by expanding oil production and use, emerges as a solution to an array of social problems, including some in which oil is directly implicated. Here oil's cultural power derives from its strong alignment with deeply held notions of modernization and technological progress through which oil companies become agents for lifting people out of poverty and "energizing lives" of a growing middle class, as India's Bharat Petroleum puts it. In its 2040 Energy Outlook, for example, ExxonMobil forecasts a "new era of energy abundance" unlocked by unconventional oil and gas in which its corporate objectives as an oil and gas producer are well aligned with a "world standing at the cusp of decades of enormous growth and better living standards for billions of people".[18]

More generally, the way in which we think about economic growth, that is an economy able to expand continuously without external constraint, has been shaped in significant ways by the transition in the first half of the twentieth century from coal to oil as the primary energy source for mobility and industrial power (particularly in North America and to a lesser extent in Europe). In comparison to coal, oil's superior energy density and capacity to flow with very limited inputs of human labor reduced the operative effects of resource constraints upon economic growth. The rapid substitution of oil for human labor in agriculture (e.g. diesel tractors and irrigation pumps) and in manufacturing (intensification of technological development) historically spurred large improvements in labor productivity, making it possible to think of growth as a capacity without external limit. Taken together, these powerful cultural ideas have given oil apparently magical properties. Its capacity for accelerated transformation, the promise and spectacle of suddenly changing one condition into another, continues to dazzle even while knowing all is not as it seems. Challenging and dismantling oil's cultural apparatus is therefore a central task in developing a post-consumer ethics that has the capacity to move societies "beyond oil." The degrowth movement, for example, seeks not only to demonstrate the viability of lighter forms of living but also to displace some of the foundational concepts of contemporary petroculture (e.g. growth, development, happiness) or radically reframe them with alternatives.[19]

### *The good life: freedom, autonomy, and choice*

Much of the cultural power of oil derives from the values, meanings, and identities it fosters. These are not conferred by oil directly (as if they "rub off" during encounters along the commodity chain) but from the experiences of living (e.g. mobility, comfort, variety, speed) it enables. The cultural and political identities fostered by oil are manifold, extending both along the length of the hydrocarbon commodity chain and across a very wide range of geographical settings, as the foregoing section on the politics of work makes clear. Here, however, we focus on the identities and social values nurtured through moments of oil consumption. The enormous expansion in oil output since the 1950s was driven not so much by population growth as by the rise of consumerism: output grew ninefold, while population grew threefold in this period. We have shown in chapter 3 how refineries worked in this period to generate new forms of value from crude via the development of materials and markets. But it was not only in material terms that oil opened up new realms and spaces of consumption. Critical too was cheap oil's capacity for enabling workers on relatively modest wages to access a range of experiences (home ownership, leisure time, family vacationing), accumulate goods (automobiles, household consumer durables), and maintain living conditions (heating and cooling, practices of food provisioning) that could once only be procured at great cost, whether measured in monetary terms or the time taken to secure them. In effect, cheap oil lubricated the friction-prone relationship between workers and employers. It enabled workers to experience improvements in the quality of life in the form of expanded opportunities for consumption without employers losing significant power over workers' terms and conditions. Rising consumption was never a universal experience but was filtered by prevailing norms of gender and race: in the United States, for example, many non-white workers were excluded from the "golden years" of postwar growth associated with an expanding middle class, while women's participation was often contingent on marital arrangements with men.[20]

The cultural effect of rising oil consumption, however, has been to create a sphere of life apparently autonomous from the act of work, and similarly dissociated from the humdrum tasks of cooking, cleaning, and readying for work. Consumption, travel, and leisure have filled this "world beyond work," defining the good life for billions of people and creating novel geographies of aspiration such as the detached suburban home, the privatized mobility of the (large) car, and the overseas holiday. The cultural power of oil here arises, in part, from the way it synthesized new norms of consumption with existing and widely held notions of morality. The effect has been to make "living well" synonymous with the new, dispersed geographies of home, work, and leisure, and with access to the liquid fuels required to suture these spaces together into a way of life. In this context, events that threaten to deny access are encountered not as inconveniences but as attacks on life itself: as, for example, when rising oil prices and "pain at the pump" threaten the viability of commuting for low-paid workers, severing the vital link between home and place of work through which lives are reproduced and sustained. The "American way of life" provides a vivid example of how oil becomes life, and how being necessary to life creates a deeply held sense of an entitlement to oil that can become a major obstacle to reform. In comparison, we know little about the ways in which oil consumption and life are fused in other cultural contexts, although the cultural power of the "American life" extends well beyond its shores and derives, in part, from the brute fact that for billions of people it is unattainable.[21]

Individual autonomy and self-determination are two significant habits of mind fostered by the experience of living in landscapes fashioned through oil consumption. The suburban home and the private car vividly illustrate how oil consumption can fuel a powerful sense of economic and political agency: both home and car individualize important capacities, whether to exclude at will or to traverse space with limited effort. The much celebrated "freedom" of the open road is among the most culturally potent examples and neatly captures the illusory quality of this autonomy, given its dependence on fossil fuel suppliers, automobile manufacturers, major public investments in infrastructure, and a host of governmental actions from taxation to foreign policy. The broader point, however, is that these habits of mind have since traveled far from their postwar suburban roots to permeate wider understandings of social life. In this sense, it becomes possible to think about how living with oil has shaped the broader political landscape. Here comparisons with coal, which was even more dominant during the formative years of industrialization than is oil today, highlight oil's distinctive impress on the cultural politics of contemporary capitalism. The vast number of people needed to extract coal and move it by rail and water, and the dense geographies of coal-mining work and the communities it supported, and the way collective exposure to hazardous conditions and arduous physical work drove demands to improve safety, created conditions for effective social struggles. These conditions transformed the energy bottleneck held by miners and other coal workers into political power, expressed, for example, in the role of coal workers in the labor movement, or the capacity of striking miners to bring down national governments. While oil refineries replicate some of this social power, the cultural experience of much oil work is more fully individualized than the collective experiences of tightly bonded mining communities. On the consumption side, oil accelerated the fragmentation and rearrangement of families and communities (via travel opportunities and other changes in lifestyle) set in motion by earlier coal-based industrial and transport revolutions. To some extent, coal also underpinned more collective and inherently social experiences of consumption than those associated with oil with, for example, weekly public-bath attendance rather than daily showers at home, or weeks-long travel by steamships rather than hours-long flights by airplane. Despite contributing much to cosmopolitanism, oil consumption remains closely tied to the private practices (home, work, leisure) through which people make their lives: the majority of oil is consumed in transportation, for which the private car is the largest user and home–work commuting the primary use. To the extent that landscapes and technologies of oil consumption facilitate beliefs in self-determination, autonomy, and the capacity (and responsibility) to make one's own life, then, they also provide a cultural crucible for the politics of neoliberalism that greatly reduces the collective bargaining power of workers.[22]

## *A clear and present danger: Anthropocene anxieties about oil*

Not all habits of mind fostered by the experience of living with oil promote further consumption, or the reproduction of oil's cultural power. People living and/or working in oil fields and refinery sites have long known oil's dark side and that its capacity to provide employment, generate economic growth, and realize life dreams is always twinned with risks to public health, environmental degradation, and other forms of violence that threaten life. Global climate change science and research on urban air pollution due to vehicle emissions strongly indicate that present patterns of oil consumption pose a risk to life that extends well beyond drill sites, refineries, and the formal infrastructure of the hydrocarbon commodity chain. Research in the atmospheric sciences highlights the dilemma of fossil-intensive energy systems that, structured to deliver security of supply, create systematic environmental and health insecurities for millions of people. Urban air pollution associated with emissions from transport and power generation is a major problem in cities around the world. In Africa, air pollution is now responsible for more mortality than malnutrition or dirty water, with growing emissions from transportation compounding the long-standing problem of poor indoor air quality associated with traditional cooking and heating fuels.[23] Increasingly, then, the cultural politics of oil revolves around pollution and risk to life, whether in the form of nitrogen oxides associated with urban diesel emissions, soot, and particulates from kerosene cook stoves in developing countries, or the global accumulation of greenhouse gases.

In regard to global climate change, the experience of living in a warming world has proven to be an incubator for new ways of thinking about society's relationship to the planetary environment, articulated in the concept of the Anthropocene. The Anthropocene is a provocative proposition, as it seeks to describe the significance and scale of human influence on the planet's ecosystems in geological terms. There is disagreement, however, over when this period might have begun and whether, indeed, it is possible to identify a period of geological time from the limited vantage point of its beginning. However, the cultural power of the Anthropocene rests not on its precise dating but from its claim that human activity is a force of geological scale. The idea that we now inhabit a period of time that is distinctive in geological (rather than merely human) terms is made and sustained in part through the experience of oil, as one of the trinity of fossil fuels that have powered industrial growth. Research on the flow of carbon between lithospheric stocks of fossil energy and atmospheric carbon dioxide repositions oil as $CO_2$-in-waiting. The effect is to reframe oil's social significance, from an invitation to prospective wealth and the good life to a warning of present danger and a risk to life itself. Alongside climate change science, a range of artistic interventions now similarly probe and problematize the cultural practices and habits of thought that sustain oil's social power. The creative remapping of proven oil reserves as emissions-in-waiting (see work by Carbon Tracker, for example) is just one of several revisualizations of oil that have the capacity to shake off ways of thinking which deny the role of oil extraction by companies and governments (as opposed to individualized acts of combustion) in driving climate change. Anthropocene thinking can also disrupt prevailing petrocultures in other ways, such as highlighting the indefensible character of economic growth models that treat environmental, health, and other social consequences of petroleum fuels as "externalities." Accounting for carbon emissions at US$50 per ton, for example, should increase the cost of a barrel of oil by about US$20. The cultural politics of the Anthropocene, however, are ambiguous and unsettled. On the one hand, it contains the possibility of rejecting petroculture or recasting it in more environmentally sustainable and socially just ways. On the other, Anthropocene thinking can underpin arguments for planetary stewardship that entrench existing reserves of expertise and authority, and where claims of a global climate emergency distract from historically specific responsibilities (such as calls for India to reduce emissions for the good of the earth, without acknowledging Europe and North America's head start in emissions generation).[24]

## Conclusion

Living with oil is currently normal but historically extraordinary. Compared to energy systems based on wood or coal, oil requires much less work to furnish society with heat and mobility. It is this lower labor intensity that, in part, lies behind oil's remarkable proliferation through society and capacity for creating novel experiences of space and time for those able to command its services. But for all its flow properties and associated ease of use, the process of extracting, processing, transporting, storing, and distributing crude oil and petroleum products still takes a great deal of work, involving a wide range of tasks that require different forms of expertise, personal commitment (e.g. disruption to family and/or community life), and exposure to risk. The people who carry out this work, and the processes of collaboration, competition, and control that characterize relationships among them, constitute a critical part of oil's production network.

Understanding the hydrocarbon commodity chain as work and life foregrounds four things. First, it recasts oil as more than a source of energy or a machine for making money. It humanizes the oil business as a way of making a living, drawing attention to the raw diversity of people, work practices, geographical locations, and forms of risk involved. It highlights, for example, the sharply gendered character of oil work across many parts of the production chain, and the limited and uneven character of unionization. Second, it emphasizes how these diverse and often dispersed work processes must be coordinated if oil is to flow in ways that realize value, and that this necessarily involves forms of control over the conditions in which people work. Work in the oil chain is characterized by relations of collaboration, competition, and resistance which can simultaneously cut different ways. Corporate culture or national pride may encourage a sense of collaboration among workers within a firm or on behalf of a national oil sector (and, by association, a sense of competition with other firms and/or countries). But these same competitive pressures may drive company management to cut wages, extend work times, or otherwise reduce workers' control over the rhythm of work and its relationship to other life activity, encouraging collective forms of organizing and resistance. And, at the same time, oil workers may be involved in international and/or inter-firm collaboration in the areas of project development, science, technology, and strategy, as well as efforts to forge international labor solidarities that transcend those of company or nation.

Third, a focus on work foregrounds how "bread and butter" issues like pay, working conditions, and safety are ultimately linked to the control and ownership that workers have over these conditions. How people work, when and where they work, and the risks to which they are exposed while working are shaped as much by the right of workers to organize as by corporate codes and safety policies. The politics of oil, then, extends to questions of economic democracy. Fourth, a focus on the material conditions of life under oil highlights how the experience of living and working with oil can shape cultural and political identities in important ways. During the twentieth century expanding oil use has promoted cultural norms of private consumption and individualized modes of transport in ways that have made oil synonymous with the good life. Many of these ideas are compelling and deeply held, but can be better understood as cultural effects of living with oil, rather than as either necessary or innate. However, those working most closely with oil, or who bear the negative consequences of its extraction and use, have known oil rather differently, as a threat to life itself (see chapter 6). Experience of global climate change, and urban air pollution linked to petrol and diesel emissions, extends this countercultural understanding of oil in ways that potentially unsettle conventional petroculture. The challenge is to find equally compelling ideas which have the capacity to query and then disassemble oil's cultural power. Arts and activist movements are one place from which this is emerging. So too are the physical and social sciences, with their capacity to draw equivalences between things that in social life are radically dissociated (such as national oil reserves and carbon emissions, or fuel taxation policy and climate change).

There is, however, no need to wait for new ways of thinking to emerge. Bold interventions in the built environment (e.g. in low-carbon infrastructure, or in high-quality public transportation) can work in the same way that highway construction did for oil, shaping future ideas and aspirations. Where alternative energy systems have been introduced and shown to work, assumptions about the necessity, value, and desirability of oil consumption can be challenged, and the cultural knot binding oil to the good life can begin to fray.[25]

## Notes

1. Estimates of employment are from the International Labour Organisation, *Social Dialogue and Industrial Relations Issues in the Oil Industry* (Geneva, 2009) which notes global figures on employment in the oil sector do not exist. By aggregating national figures, the ILO estimates 4 million people were employed in upstream oil and gas in 2004 (although this had fallen to around 3 million in 2009) and a further 1.5 million in refining in 2006. We have scaled these figures to account for an increase in oil production between 2009 and 2015 (< 10 percent). Figure for workforce in China's coal mining is from Bloomberg (2016), which indicates "more than 6 million people" employed in the sector, although in 2016 the Chinese government notified its intent to cut employment at coal mines by 1.3 million as part of a 9 percent capacity cut (http://www.bloomberg.com/news/articles/2016-03-29/china-s-job-saving-coal-fix-may-mean-more-trouble-in-appalachia). For debate over the contribution of oil sector to US employment, see Centre for American Progress (2014), *Big Oil, Small Jobs: A Look at the Oil Industry's Dubious Job Claims* (https://www.americanprogress.org/issues/green/news/2014/01/22/82571/big-oil-small-jobs-a-look-at-the-oil-industrys-dubious-job-claims/).

2. On fuel movement and economic insecurity in Europe, see M. Xheneti et al., “EU Enlargement Effects on Cross-border Informal Entrepreneurial Activities,” *European Urban and Regional Studies* 20(3) (2012): 314–28. On petty trading of fuel in Nigeria: “Nigeria fuel crisis: Why is Africa’s largest oil producer short of petrol”, BBC News online, April 7, 2016 and “Nigeria’s Female Black Market Petrol Merchants”, Women’s Meeting Place (online), May 27, 2016. On theft in the Texas oil patch: “Crude Oil Thefts Rise in Texas as Low Prices Force Job Cuts,” National Public Radio, 17 February 2016, and “Oil Theft Soars as Downturn Casts US Roughnecks Out of Work,” Bloomberg, November 16, 2015. Estimates of the amount of crude stolen in Nigeria vary widely, reflecting an underlying problem of measurement: official figures of production are measured at the terminal where crude is collected, but well-head production figures needed to calculate losses are not available. Not all losses from pipelines are theft: some are attributable to inadequate maintenance and vandalism. On crude theft in Nigeria, see C. Katsouris and A Sayne, *Nigeria’s Criminal Crude: International Options to Combat the Export of Stolen Oil* (Chatham House, 2013); E. Akpomera, “International Crude Oil Theft: Elite Predatory Tendencies in Nigeria,” *Review of African Political Economy* 42 (2015): 156–65; also, O. Emmanuel, “How crude oil is stolen,” http://chegepublishing.net/how-crude-oil-is-stolen/. On Colombia’s parallel fuel trade, see R. Iriarte, “Dispatches: Pimpineros,” *America’s Quarterly,* Summer 2013.

3. Job claim in relation to CCS dates back to 2010 and includes CCS applications beyond oil and gas, see http://www.ccsassociation.org/faqs/why-do-we-need-ccs-social-and-economic-benefits/.

4. R. Mason, “Steve Perkins, the broker who traded $520m when drunk, to resume career in Switzerland,” *Telegraph* (London), July 1, 2010; on Timchenko, see http://www.forbes.com/profile/gennady-timchenko/, and, on US sanctions targeting Timchenko following Russia’s occupation of Crimea, see “Why the US is Targeting the Business Empire of a Putin Ally,” Bloomberg, April 29, 2014. These sanctions appear to have made Timchenko richer, as he sold his shares in Gunvor in

March 2014 before the oil crash. On Marc Rich, who died in 2013, see D. Ammann, *The King of Oil: The Secret Lives of Marc Rich* (Macmillan, 2009); “Marc Rich: controversial commodities trader and former fugitive dies aged 78,” *Guardian*, June 23, 2013.

5. On gendered identities in oil work, see G. Miller, “Frontier Masculinity in the Oil Industry: The Experience of Women Engineers,” *Gender, Work and Organization* 11 (2004): 47–73; M. Filteau, “A Localized Masculine Crisis: Local Men’s Subordination within the Marcellus Shale Region’s Masculine Structure,” *Rural Sociology* 80(4) (2015): 431–55; and R. Ely and D. Meyerson, “An Organizational Approach to Undoing Gender: The Unlikely Case of Offshore Oil Platforms,” *Research in Organizational Behavior* 30 (2010): 3–34. On the gendered character of employment in Ghana’s oil sector, see R. Overå, “Local Navigations in a Global Industry: The Gendered Nature of Entrepreneurship in Ghana’s Oil and Gas Service Sector”, *Journal of Development Studies* (2016) (from where the quote in this paragraph originates); F. Obeng-Odoom, *Oiling the Urban Economy: Land, Labour, Capital, and the State in Sekondi-Takoradi, Ghana* (Routledge, 2016); and A. Adusah-Karikari, “Black Gold in Ghana: Changing Livelihoods for Women in Communities Affected by Oil Production,” *The Extractive Industries and Society* 2(1) (2015): 24–32. On 2014 US industry statistics, see http://www.api.org/~/media/files/policy/jobs/ihs-minority-and-female-employment-report.pdf.

6. Wang Bin’s (2008) epic 14-hour film *Crude Oil* provides a stunning visual portrait of the nature of oil work in China’s Qinghai Province. The experience of work in the US shale oil boom has been the subject of much recent writing; see for example coverage by *Atlantic Monthly* and *National Geographic* among others. The edited collection by W. Caraher and K. Conway, *Bakken Goes Boom: Oil and the Changing Geographies of Western North Dakota* (Digital Press, University of North Dakota, 2016) captures experiences of living through an oil boom via the work of artists and journalists. For reviews of local employment and local content policies, see “Wanted: Local Workers for the Oil and Gas Industry,” International Labour

Organisation, December 12, 2012; and S. Tordo et al., *Local Content Policies in the Oil and Gas Sector* (World Bank, 2013).

7. “From $200,000 a year to zero for some oil patch workers”, *Toronto Star*, February 6, 2016.

8. The Bureau of Labor Statistics records fatalities in the US oil and gas sector over time and by region; see http://www.bls.gov/iif/oshwc/cfoi/cfch0013.pdf. K. Retzer, “Motor Vehicle Fatalities among Oil and Gas Extraction Workers,” *Accident Analysis and Prevention* 51 (2013): 168–74; 202 oil and gas extraction workers died in work-related vehicle crashes from 2003 to 2009, a fatality rate 8.5 times that of all private wage and salary workers (7.6 vs 0.9, $p < .0001$). Safety belt non-use was identified in 38.1 percent ($n = 77$) of the cases. UK figures from *Health and Safety Report 2015* (Oil and Gas UK, 2015).

9. Quotation is from H. Appel, “Offshore Work: Oil, Modularity, and the How of Capitalism in Equatorial Guinea”, *American Ethnologist* 39(4) (2012): 692–709.

10. See M. Watts, “Securing Oil: Frontiers, Risk, and Spaces of Accumulated Insecurity,” in *Subterranean Estates*, ed. H. Appel, A. Mason, and M. Watts (Cornell University Press, 2015), pp. 211–36; S. Dekker and C. Pitzer, “Examining the Asymptote in Safety Progress: A Literature Review,” *International Journal of Occupational Safety and Ergonomics* 22(1) (2016): 57–65. On offshore safety culture, see R. Ely and D. Meyerson, “An Organizational Approach to Undoing Gender: The Unlikely Case of Offshore Oil Platforms,” *Research in Organizational Behavior* 30 (2010): 3–34.

11. On unionization and labor history, see I. Bernstein, *The Lean Years: A History of the American Worker, 1920–1933* (Haymarket Books, 1960); H. Grant, “Solving the Labour Problem at Imperial Oil: Welfare Capitalism in the Canadian Petroleum Industry, 1919–29,” *Labour/La Travail*, Spring (1998): 69–95; C. Woolfson et al., *Paying for the Piper: Capital and Labour in Britain’s Offshore Oil Industry* (Routledge, 1997/2013).

12. On Costa Rica, "SJO operates on reserve fuel as union strikes," Business Monitor Online, October 28, 2015; on French refinery strikes, "French Strikes and Fuel Shortages to Cause Severe Travel Disruption, Disorder Likely to Affect Euro 2016 Football Tournament", IHS Global Insight, May 26, 2016; on blockades at refineries in Washington State, "'Break Free' fossil fuel protests deemed 'largest ever' global disobedience," *Guardian*, May 16, 2016.

13. Contractor hours from *Safety Performance Indicators Data Report, 2013 Data* (International Association of Oil and Gas Producers, 2014. For a review of working conditions for contract workers, see I. Graham (2010), *Working Conditions of Contract Workers in the Oil and Gas Industries*, Working Paper 276, International Labour Organisation, Geneva, which describes these employment relationships as "triangular."

14. The notion of modularity has been developed by Hannah Appel in the context of her work on offshore oil in Equatorial Guinea. See, for example H. Appel, "Offshore Work: Oil, Modularity, and the How of Capitalism in Equatorial Guinea," *American Ethnologist* 39(4) (2012): 692–709, which is the source of the first quotation in this paragraph (p. 697). Second quotation is from C. Woolfson et al., *Paying for the Piper: Capital and Labour in Britain's Offshore Oil Industry* (Routledge, 1997/2013), p. 24.

15. A growing literature names and parses petroculture, much of it emerging contemporaneous to the new field of environmental humanities. See, for example, work by the Petrocultures Research Group at the University of Alberta, led by Imre Szeman and Sheena Wilson, including *After Oil* (Petrocultures Research Group, 2016) which explores the social, cultural, and political changes needed to transition away from oil (www.petrocultures.com), and I. Szeman et al., *Fuelling Culture: 101 Words for Energy and Environment* (Fordham University Press, 2017); S. LeMenager, *Living Oil: Petroleum Culture in the American Century* (Oxford University Press, 2013), which describes oil in terms of "prospective wealth"; S. Strauss et al., *Cultures of Energy: Power, Practices, Technologies* (Left Coast Press, 2013); J. Stewart, "Making Globalization Visible?: The Oil

Assemblage, the Work of Sociology and the Work of Art", *Cultural Sociology* 7 (2013): 368–84; and J. Marriott and M. Minio-Paluello, *The Oil Road: Travels from the Caspian to the City* (Verso, 2012).

16. "Life world" originates in philosophy and the social sciences (see work by Heidegger, Husserl, and Habermas among others) where it is used to describe the realm of everyday experience. It is used in the context of oil by H. Appel et al., *Subterranean Estates: Life Worlds of Oil and Gas* (Cornell University Press, 2015) where it acknowledges the challenge of living with oil given its "power to make live or to make life, and of course, to shorten, disrupt and threaten life too" (p. 27).

17. On work done to shore up oil as a "standing reserve" in the face of concerns about carbon, see H. Knox, "Carbon, Convertibility, and the Technopolitics of Oil," in *Subterranean Estates*, ed. H. Appel, A. Mason, and M. Watts (Cornell University Press, 2015), pp. 309–24; see also S. Wakefield, "The Crisis is the Age", contribution to forum on "After the Anthropocene: Politics and Geographic Inquiry for a New Epoch," ed. E. Johnson and P. Morehouse, *Progress in Human Geography* 38(3) (2014): 439–56, in the context of the Anthropocene. For a wider discussion of oil's "magical" properties, see F. Coronil, *The Magical State: Nature, Money and Modernity in Venezuela* (University of Chicago Press, 1997), and G. Weszkalnys, "Oil's Magic: Contestation and Materiality," in *Cultures of Energy: Power, Practices, Technologies,* ed. S. Strauss, S. Rupp, and T. Love (Left Coast Press, 2013), pp. 267–83. "Cyclonic frenzy" is the description political economist and economic historian Harold Innis (1894–1952) gave to the process of capital accumulation during natural resource development, based on his analysis of the Canadian experience.

18. ExxonMobil (n.d.), "The outlook for energy: a view to 2040." Available online at http://corporate.exxonmobil.com/en/energy/energy-outlook.

19. On the formative role of oil in enabling commonplace notions of "the economy" and the possibility of infinite economic growth to

take root, see T. Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (Verso, 2011). On the impacts of oil on labor productivity (and corresponding effects on the economic geographies of production), see G. Bridge and M. Bradshaw, "Deepening Globalisation: Economies, Trade and Energy Systems," in *Global Energy: Issues, Policy and Implications*, ed. P. Ekins, M. Bradshaw, and J. Watson (Oxford University Press, 2015); see also M. Huber, *Lifeblood: Oil, Freedom and the Forces of Capital* (University of Minnesota Press, 2013) who describes the time-space compression effects of coal and oil as "conditions of possibility for the very ideas of global markets, global civil society, and global states" (p. 11). On the degrowth movement, see G. D'Alisa et al., *Degrowth: A Vocabulary for a New Era* (Routledge, 2015), and S. Alexander, "Voluntary Simplicity and the Social Reconstruction of Law: Degrowth from the Grassroots Up," *Environmental Values* 22(2) (2013): 287–308.

20. This short section on "the good life" is particularly informed by Matthew Huber's work on the political economy and cultural politics of oil in the United States. See, for example, M. Huber, "The Use of Gasoline: Value, Oil, and the 'American Way of Life,'" *Antipode* 41(3) (2009): 465–86; M. Huber, "Fuelling Capitalism: Oil, the Regulation Approach, and the Ecology of Capital," *Economic Geography* 89 (2013): 171–94; and M. Huber, *Lifeblood: Oil, Freedom and the Forces of Capital* (University of Minnesota Press, 2013) which is the source of the quotation "world beyond work."

21. There is, however, some work on cultures of oil *production* in non-western contexts: see, for example, D. Rogers, "Deep Oil and Deep Culture in the Russian Urals," in *Subterranean Estates*, ed. H. Appel, A. Mason, and M. Watts (Cornell University Press, 2015), pp. 61–71; and R. Golden Timsar, "Oil, Masculinity and Violence: Egbesu Worship in the Niger Delta of Nigeria," in *Subterranean Estates,* ed. H. Appel, A. Mason, and M. Watts (Cornell University Press, 2015), pp. 72–89.

22. Huber's *Lifeblood: Oil, Freedom and the Forces of Capital* (University of Minnesota Press, 2013) makes this argument in the context of the United States and is an excellent guide to how the

material conditions of oil consumption create "structures of feeling" (as he puts it, using Raymond Williams's productive phrase) around the self-made life. Huber's notion of "entrepreneurial life" enables him to draw connections between the much-storied environmental and urban history of American oil consumption and the cultural politics of neoliberalism. Also relevant to oil consumption and the cultural politics of neoliberalism, see D. Campbell, "The Biopolitics of Security: Oil, Empire, and the Sports Utility Vehicle," *American Quarterly* 57(3) (2005): 943–72; M. Watts, "Soft Machine: A Note on Oil 'Addiction,'" *Human Geography* 1(2) (2008); and M. Huber, "Oil for Life: The Bureau of Mines and the Biopolitics of the Petroleum Market," in *Subterranean Estates*, ed. H. Appel, A. Mason, and M. Watts (Cornell University Press, 2015), pp. 31–44.

23. Rana Roy, "The Cost of Air Pollution in Africa." OECD Development Centre, Working Papers 333 (2016).

24. This section draws on P. Le Billon and G. Bridge, "The Politics of Oil in the Anthropocene", in *Handbook on Geographies of Energy,* ed. B. Solomon and K. Calvert (Edward Elgar, 2016). For classic statements on the Anthropocene, see P. Crutzen and E. Stoermer, "The 'Anthropocene,'" *Global Change Newsletter* 41 (2000): 17–18; and W. Steffen, "The Anthropocene: From Global Change to Planetary Stewardship," *AMBIO* 40 (2011): 739–61. On the Anthropocene as a site of experimentation, see J. Lehman and S. Nelson, "Experimental Politics in the Anthropocene," *Progress in Human Geography* 38(3) (2014): 444–7. For an example of creative remapping, see "Unburnable carbon: are the world's financial markets carrying a carbon bubble?" (Carbon Tracker, 2011). On oil and carbon externalities, see A. Bowen, "The Case for Carbon Pricing" (Grantham Research Institute on Climate Change and the Environment, 2011). For an example of research estimating the scale of unburnable oil (in the context of a global carbon budget limiting warming to 2°C) see C. McGlade and P. Ekins "Un-burnable Oil: An Examination of Oil Resource Utilisation in a Decarbonised Energy System," *Energy Policy* 64 (2014): 102–12.

25. Another approach is to work with the cultural grain, delivering the same cultural experience but without being fueled by oil. This is a direction of travel that characterizes the automobile industry, for example, where cultural norms around autonomy, speed, and range are accepted (along with the public subsidy of private forms of mobility). Indeed, the technical challenge has been to attain these norms in the context of an alternatively powered automobile, with the result that a culture of automobility derived from oil's Age of Plenty is left largely intact.

# CHAPTER FIVE
# Securing Oil

In 1980, US National Security Adviser Zbigniew Brzezinski convinced President Jimmy Carter to declare that "an attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force."[1] What became known as the Carter Doctrine responded to the recent overthrow of the shah in Iran, the Soviet invasion of Afghanistan, and an attack on Mecca's Grand Mosque by a fringe Saudi Islamist group. Framed by the US defeat in Vietnam and the impact of the OPEC oil embargo, the doctrine revealed deep US anxieties over oil supplies and consolidated a common understanding of oil security centered on the Persian Gulf and driven by military means. Three major wars later – and after the occupation of Iraq by American troops for nearly a decade – the Persian Gulf remains the epicenter of energy geopolitics and among the most tense and militarized areas of the world.[2]

Oil markets and importing states have reacted not only to major tensions and conflagrations in the Persian Gulf but also to armed militancy in the Niger Delta, piracy in the Gulf of Aden, and insurrections in Russia's periphery. Geopolitical scenarios of international disputes, and even "oil wars," are played out in many locations where oil reserves overlap disputed territories, as in the Gulf of Guinea, the Arctic, the China Seas, and more recently the Mediterranean (see Table 5.1). Despite incidents, such as Suriname's navy forcibly halting oil exploration in waters disputed with Guyana in 2000 or skirmishes between China and its neighbors, many of these disputes are solved through negotiations or international arbitration toward a sharing agreement or boundary definition. Legal processes involving the Law of the Sea tribunal or the International Court of Justice (ICJ) have been frequently rejected, however, as seen in the case of Nigeria's conflict with Cameroon over the Bakassi peninsula, or China's conflict with the Philippines. More generally, the dominant supply security concerns of oil-importing states have shifted from threats of oil nationalism and oil embargoes in the 1960s–1970s to concerns about political instability in producing regions and the rise of non-state actors.

Table 5.1 Main internationally disputed oil areas

| *Area* | *Countries* | *Status* |
|---|---|---|
| Arctic Ocean | Russia, Canada, US, Norway, Denmark | Prospective fields – arbitration, negotiations, militarization |
| Barents Sea | Norway, Russia | Proven fields – agreement 2010 |
| Baltic Sea | Lithuania, Latvia | Prospective fields – negotiations |
| Mediterranean Sea | Israel, Lebanon, Turkey, Greece | Proven fields – negotiations, militarization |
| Persian Gulf (Abu Musa and Tunb Islands) | Iran, UAE | Proven fields – militarization |
| Caspian Sea | Azerbaijan, Turkmenistan, Iran | Prospective fields – negotiations |
| East China Sea (Senkaku/Diaoyutai Islands) | Japan, China, Taiwan | Prospective fields – negotiations and militarization |
| South China Sea (Spratly and Paracel Islands) | China, Vietnam, Philippines, Malaysia, Taiwan, Brunei | Prospective fields – agreement 2011 and militarization |
| Celebes Sea | Malaysia, Indonesia | Producing fields – negotiations |
| Timor Sea | East Timor, Australia | Producing fields – agreement 2002 |
| Gulf of Guinea | Cameroon, Nigeria, Ghana, Ivory Coast | Producing and proven fields – arbitration, negotiations |
| Mid-Atlantic | Guyana, Suriname | Proven fields – arbitration |

| *Area* | *Countries* | *Status* |
|---|---|---|
| South Atlantic (Falkland/Malvinas Islands) | UK, Argentina | Proven fields – Argentina withdrew from 1995 agreement in 2007, militarization |
| Abyei | South Sudan, Sudan | Producing fields – militarization, negotiations |
| Lake Albert | Uganda, DRC | Proven fields – agreement 2007 |

## Oil wars

Oil became the most strategic of commodities during the twentieth century. Military interventions, *coups d'état*, and overseas bases have all been used by major powers to control oil-producing regions. Security considerations have been extended to oil transportation routes, motivating the control of maritime transportation and pipeline routes, and contributing to a logic of militarized "imperialism" – the best examples being the history of the Suez Canal and, more recently, maritime transit through the Strait of Hormuz and Malacca. Accessing oil supplies was a major concern for both Nazi Germany and Japan during World War II, driving Hitler to fatally divide its Eastern Front forces between the fight for Stalingrad and the capture of Caucasian oil, and urging Japan to invade the Dutch East Indies to unsuccessfully circumvent a US oil embargo. Securing oil supplies and the interests of western oil majors were the main drivers of first British and later US policy in the Middle East, precipitating repeated military interventions, permanent naval presence, and support for repressive autocratic regimes. Whereas the number of conflicts initially declined after the Cold War, it has subsequently grown among oil-producing countries. In 1992, one in five countries at war was an oil producer, but by 2012 this proportion was nearly one in two. Although this trend partly reflects a growth in the relative number of countries qualifying as "oil producers," it is a particular concern given the longer duration and higher severity of many oil-related hostilities. Conflicts making headlines have included many oil-producing regions, such as Nigeria's oil-rich Niger

Delta, Colombia's criminality and insurgency in oil areas, renewed civil war in South Sudan, coup attempts in Chad, violent unrest and repression occurring in the oil-rich Chinese autonomous region of Xinjiang, Gaddafi loyalists fighting with rebels for control of key oil infrastructures in Libya, as well as continuing hostilities in Iraq and Syria.

A growing number of studies indicate oil extraction increases the risk of conflict. One set of arguments focuses on the idea that oil is "scarce," notably because oil reserves are highly concentrated; fewer than 30 countries are net exporters, and a handful of countries hold the vast majority of known conventional oil reserves. According to this argument, oil's strategic importance makes it a valuable "prize" over which importing states engage in intensely fought geopolitical struggles. This type of "oil wars" narrative tends to be most visible within mainstream media during major oil crises, typically marked by high prices, and thus amenable to scarcity-focused explanations. Interstate wars over oil, however, are relatively rare, and mostly result from the aggressive policies of oil-rich revolutionary regimes seeking to rearrange their regional political order, with Iraq's Baathist regime under Saddam Hussein representing a dramatic archetype. Another set of arguments pertains to the way oil production's uneven distribution of costs and benefits often negatively affects local populations, as well as the opportunities for funding rebellion. These conflicts mostly consist of civil wars occurring in low-income but oil-dependent countries, especially in oil areas with politically marginalized populations aspiring for greater autonomy, and where oil resources are located onshore and thus more impactful on local communities and accessible to insurgent groups. More generally, four main types of conflict associated with oil can be recognized: geopolitical struggles over oil sources, such as the 2003 US-led invasion of Iraq and US–China rivalry; oil-funded political violence or "terrorism" by so-called rogue states, such as Libya under Gaddafi; territorial disputes over oil areas, such as in the South China Sea between China and most of its neighbors; and community-level violence, insurgencies, and "criminality" affecting oil production and transportation, such as in Colombia and Nigeria. Some conflicts partially related to oil have also been among the deadliest since World War II, such as the Biafra War and the conflicts in southern Sudan.

Since coveted by competing western commercial interests in the early twentieth century, the massive petroleum reserves and revenues of the Persian Gulf region have made it both an opportunity and a threat to the region. Commercial oil discoveries in the region exacerbated the struggle among European imperial powers over the spoils of a defeated Ottoman Empire after World War I. The economic and geopolitical significance of the region's reserves has reinforced a western security imperative of preventing the (re)emergence of a powerful regional rival. Oil has not only motivated western interests in the region but has also significantly affected the balance of power within and between regional states. The vast revenues available to states and their elites have also increased inequalities in wealth and power which, despite religious or nationalist ideologies and populist economic measures, have often exacerbated internal dissent and instability. The end result has been a complex overlay of domestic, regional, and international tensions often resulting in large-scale hostilities, state repression, as well as chronic insurrections, foreign military interventions, and punishing sanction regimes.

Iraq, in this regard, has been the most frequently and harshly affected country in the region. Its litany of oil-related conflicts starts with the British invasion of Ottoman-ruled Iraq during World War I, and the violent imposition of a Hashemite monarchy under British mandate. It extends to recurring conflicts with Kurdish populations, an eight-year war with Iran in the 1980s, and Iraq's invasion of Kuwait in 1990 and subsequent intervention by a US-led coalition (the first Gulf War). It has also taken the form of harsh repression against Shia populations in oil-rich southern Iraq, and the opportunistic invasion of Iraq led by the US and the UK in 2003. The US Coalition Provisional Authority had planned to privatize Iraq's oil sector, nationalized since the late 1960s, but these proposals were resisted by Iraqi parliamentarians (and by Iraq's oil worker unions). Instead, service contracts were issued to international oil companies, while a new federal constitution allocated oil revenues based on demography and compensation for historical harms experienced under Saddam Hussein. Born mostly out of demands from Kurdish legislators, Iraqi federalism has faced repeated setbacks. It reached a point of crisis in 2014 as a result of widespread grievances toward al-Maliki's Shi'ite-dominated regime in Baghdad, major tensions over the distribution of oil revenues, and resurging Sunni militancy following US military withdrawal.

Seeking to enact a de facto partition of the country by declaring the creation of an Islamic caliphate incorporating parts of Syria, the Islamic State in Iraq and the Levant (ISIL/ISIS/ Da'esh) and associated Sunni insurgent groups took control of much of western Iraq including Mosul, Iraq's second city. ISIL rapidly grew in stature and capabilities from an al-Qaeda outfit to a proto-state able to control and operate oil fields in northeastern Syria. However, lower international oil prices, the destruction of tankers and key oil infrastructures by Russia and the US coalition, as well as the loss of oil fields to Kurdish and Iraqi government forces reduced its revenues and refining capacity for local consumption. By early 2016, Iraq faced continuous strife, with Iranian-backed Shi'ite politicians dominating federal institutions and Shi'ite oil-rich governorates demanding more direct control over oil revenues, heavy fighting to prevent the formation of an autonomous Sunni region under ISIL rule (see Box 5.1), and a resolutely autonomous Kurdish region in the north seeking to pursue self-sufficiency through oil exports.

### **Box 5.1** Oil and the "Islamic State"

Oil has been portrayed as central to the finances of the Islamic State (ISIL), which rapidly moved from an al-Qaeda splinter group to a proto-state during 2014. Yet the jihadist group was only able to seize oil and gas fields in Syria, most of them in decline, as well as some marginal oil fields in the mostly Sunni northeastern region of Iraq. Such control still enabled ISIL to gain significant earnings through long-established oil smuggling networks through Turkey and Iran, and sales to the Syrian regime and competing insurgent groups. By 2015, ISIL became increasingly constrained in its export options as well as its refining capacity for local consumption as a result of the sharp decline in international oil prices, the loss of oil fields and smuggling routes to Kurdish and Iraqi government forces, and bombing of tankers and key infrastructures by the US and Russia. In response, hundreds of micro-refineries were set up to supply the needs of the population, and smuggling shifted from vast tanker truck operations to smaller-scale and more clandestine routes. By early 2016, ISIL was only earning an estimated US$1–1.5 million per day from oil sales, still about a quarter of its revenues but only a third of its peak earnings in 2014 and far from what the organization would need to sustain the type of military expenditures and public services that its caliphate project envisioned. Beyond the financing aspect, oil has perhaps more to do with the conditions under which ISIL emerged, including repeated oil-driven western interventions in the region, and sectarian domestic politics that inequitably distribute oil revenues among the various ethno-religious groups.

The term "oil war" is frequently an oversimplification that overlooks the complex and recursive interactions between oil and political economic institutions. It describes a wide range of conflicts: colonial wars to gain control of oil regions; military campaigns to seize or destroy oil assets during broader con-flicts; wars of independence taking place in a context of recent oil discoveries and production; foreign military invasions and territorial conflicts between regional oil producers; intra-state conflicts over national government;

secessionism within oil rich regions; violent racketeering and oil traffick-ing; government and vigilante groups repression; communal conflicts; as well as victimization and criminalization-related violence associated with oil production. Several critical studies have pointed to the biases and limitations of a conventional geopolitical perspective on "oil wars," notably one that pits China against the West. Technical and financial collaboration across "national divides" are frequent, and if the Chinese market increases demand, Chinese investments also increase supply. The geopolitical struggle for oil is more than a zero-sum game. As discussed in chapters 4 and 6, other forms of violence are also prevalent, including the social, environmental, and health impacts of oil extraction, refining, and consumption.

If geopolitics looms large in approaches to oil security, these conventional, state-centered perspectives on geopolitics provide only a partial understanding of what it means to "secure" oil. Governing the risks associated with oil dependence is at the core of securing oil for oil producers and oil consumers, as well as for those who witness the production network but are not integrated within it. For producers, it is about a form of governance that secures the greatest benefits from oil and that reduces internal tensions associated with frustrated development and perceptions of corruption, mismanagement, or foreign interference. For consumers, it is about reducing the volatility and uncertainty of supply, including those associated with political tensions and economic upheavals in oil-producing countries. In this way, the new oil security agenda links reducing volatility and uncertainty in oil markets to the broad development of oil-producing societies (as discussed in chapter 6), rather than a narrowly conceived regime stability paradigm that seeks simply to uphold contracts and oil deliveries. Part of this new security agenda is, therefore, also concerned with addressing the environmental and social costs of oil and seeking energy alternatives.

## Energy security

The "security" of energy normally refers to the maintenance of a reliable supply at prices that are affordable to consumers yet profitable enough for producers to justify investments in future production. Intuitively appealing it may be, but a host of complications lies behind this simple definition. First, energy security and oil security are not the same thing. Oil is only one potential source of energy, and national and regional strategies to secure oil can work against broader goals of energy security. On its own, the desire of governments to secure oil supplies can distract attention (and divert resources) from strategies that seek to diversify the energy mix and enhance resilience to oil "shocks." Fixed infrastructure can create a false sense of supply security and leave an importing country at the mercy of a political reversal, such as a sudden regime change in a long-allied major oil supplier, or of a natural disaster like an earthquake that results in multiple pipeline ruptures. Second, oil security does not mean the same thing for consumers, oil companies, or oil-producing countries. Cheaper oil may increase a sense of security for consumers, but it lowers investments by energy companies and revenues for energy-producing countries. A lack of investment leads to falling production volumes, increasing energy insecurity in the long term. Reduced production, if not offset by rising prices, can lessen revenues for producing countries and thus increase the risks of political instability. For governments of oil-producing countries, energy security means an ability to satisfy domestic energy consumption *and* the export markets vital to their economy.

Third, (in)security can arise out of the way the oil network is organized. State-driven models of organization raise concerns about political interference in access to reserves, distorted investment incentives, or restrictions on trade. Market-driven models, on the other hand, have left some governments anxious about supply as the oil market tightens. The vitality and adaptability of markets so valued by their proponents can also be a source of vulnerability. In 2012, for example, the largest independent refining company, PetroPlus, filed for insolvency, creating anxiety about the loss of gasoline, jet fuel, and other petroleum products from some of its refineries including Coryton, one of the largest refineries in the UK. The participation of sovereign wealth funds in the equity of now fully privatized "national" oil companies, such as the French company Total, has also raised concern about the degree of control and intentions of the foreign governments controlling these funds.

Fourth, (in)security arises from the way vulnerabilities and benefits are distributed along the production network. Global energy markets tend to spread risks among a large number of players, attenuating the impacts on individuals. The release of strategic oil stocks by wealthy industrialized countries, for example, can help all oil importers by decreasing global prices. Yet the transmission mechanism of a global market also means localized events can trigger broad chain reactions: a pipeline sabotage or unexpected refinery shutdown can send tremors throughout world oil markets. Fifth, efforts to "secure oil" by one set of actors can create various forms of insecurity (including violence) for others, most notably for those who live alongside and around the infrastructure of oil extraction, transportation, and refining (not to mention gas station staff exposed to fumes and violent crime). Abuses by security forces are common, especially when local populations resist displacement or challenge pollution and the social disruption arising from oil development. Energy projects can leave local populations more energy insecure by destroying traditional energy sources, while refineries, pipelines, and electricity transmission systems often fail to serve their immediate communities: despite their proximity to tremendous wealth, those who live in oil's extractive zones are often among the most fuel poor. The consequences of energy security choices extend beyond energy to other sectors of the economy. Subsidies and diversion of farmland for biofuel production, for example, were partly driven by US security concerns over the country's reliance on oil from the Middle East but can compromise food security for farmers and urban consumers. More broadly, the concerns raised by oil-related GHG emissions are particularly acute for the populations most vulnerable to climate change (and least responsible for it).

Finally, conventional definitions of oil security adopt a national scale of reference, but attention to alternative geographical scales – municipalities frustrated by lack of action on greenhouse gas emissions, households anxious over fuel bills, agricultural communities facing declining yields from oilinduced climate change – reveal the trade-offs that "securing oil" entails, and how security has a *relational* character: thus (in)security and vulnerability are a function of position within the oil production network (and energy networks more broadly). Our goals in this chapter are to explore these multiple and contested dimensions of oil security, and to show how “securing” oil requires addressing four criteria: oil’s availability, accessibility, affordability, and acceptability.

Table 5.2 Energy security criteria by resource type

| *Resources* | *Oil* | *Coal* | *Natural Gas* | *Hydro* | *Nuclear* |
|---|---|---|---|---|---|
| Availability | Medium ↘ | Very high ↗ | High ↗ | Low ↘ | Medium ↗ |
| Accessibility | High ↘ | High ↗ | Medium ↗ | High ↗ | Low ↗ |
| Acceptability | Medium ↘ | Medium ↘ | High ↘ | Medium ↗ | Low ↘ |
| Affordability | Medium ↘ | High ↗ | Medium ↗ | High ↘ | Medium ↘ |

## *Comparing energy sources*

As a first cut, we provide a “snapshot” comparison of how four key criteria – availability, accessibility, affordability, and acceptability – play out across the five main primary sources of energy at the world scale: oil, coal, gas, hydro, and nuclear (see Table 5.2). Such comparisons are implicit within contemporary debates about energy transition and a move away from fossil fuels toward more secure, affordable, and lower-carbon energy systems such as renewables (wind, solar).

Oil is still the dominant source of primary energy supply in the world, but its 33 percent share is on the decline. Large reserves of unconventional oil exist in the form of bituminous sands and “shale oil,” but these provide a lower energy return on the energy invested in their extraction (EROEI) and have higher environmental impacts, thus reducing their affordability and acceptability. The accessibility of oil to IOCs has declined, due to greater competition from NOCs and the politics of resource nationalism among some producer countries. On the other hand, technological innovation and higher prices have increased the commercial viability of unconventional resources (and conventional resources in unconventional locations – e.g. Arctic, deepwater) and extended the resource frontier. The accessibility of oil via open international markets is likely to decline as oil equity stakes increase (notably through Asian NOCs) and exporting countries consume a larger share of their production. Oil's acceptability is also declining as evidence grows of its connections to climate change, soil and water contamination, human rights abuses, and links with political violence and military interventions. Affordability improved after 2014 but remains perceived.

Coal, by contrast, is more widely available, easily accessible, and cheaper to produce, characteristics that make it the fastest-growing fuel. Yet its uses are more limited, and it is not easily transformed into a liquid fuel for transportation. Although coal is often deemed less acceptable than oil, this judgment hinges in large part on the efficient capture of carbon dioxide emissions which is both more feasible and advanced for point-sources like coal-fired electricity generating plants than the diffuse emissions associated with oil combustion. Some rapidly growing economies – such as China and India – still heavily rely on coal for electricity generation, an energy policy legitimated in part by the historic coal-powered industrialization of many OECD economies and which sets the national need to address energy poverty via expanding electrification against the international climate change agenda. Like coal, hydroelectricity and nuclear power supposedly provide "cheap" energy when socio-environmental costs are ignored. Hydro and nuclear options are further limited by suitable location criteria, massive capital costs, and nuclear proliferation concerns. China is revisiting its hydropower policy after acknowledging the costs and risks of the Three Gorges Dam, while Germany and Switzerland have decided to phase out nuclear generation in the wake of the 2011 tsunami-related Fukushima nuclear plant disaster in Japan.

In contrast to these energy sources, natural gas reserves and production are growing rapidly and in a way that, to its proponents, makes gas a "transition fuel" and "energy bridge" to a lower-carbon future. To its critics, however, any dash for gas comes at the expense of investment in renewables and effectively "locks in" a new era of carbon-intensive energy. Increased production of liquefied natural gas (LNG), combined with marine shipping with cryogenic vessels and a larger distribution network of standard gas pipelines, has greatly increased the accessibility of gas for consumers. Increased recovery and processing of natural gas liquids (NGL) also adds to the supply of unconventional liquid fuel for transportation markets. The sharp increase in the availability of natural gas – in the North American market in particular – stems from the rapid development of unconventional "shale gas" deposits, a process that involves hydraulic fracturing, a practice widely deemed unacceptable due to underground water pollution and methane release risks.[3]

Oil matters because of its energy density and transportability, making it difficult and costly to substitute given existing needs and infrastructures. Some substitution occurred in the late 1970s and early 1980s when natural gas, coal, and nuclear or hydropower replaced heating oil throughout most industrialized countries, and fuel efficiency in transport was significantly improved. Oil is not easily substituted in crucial economic sectors such as transportation, although with the right policies or price incentives car transport could shift to electrification and natural gas. But oil insecurity has also been *made* to matter: it is not simply a function of oil's superior energy density, geological limits, or China's rapid growth. Insecurity also derives historically from the wastage and short-sightedness of an "Age of Plenty" that considered oil the lubricant of infinite growth.[4]

## Availability

The traditional focus of oil geopolitics is the strategic actions of firms and states to secure advantage from the balance of oil supply and demand. This balance rests on geological and economic foundations, with political action selectively opening up or closing down the flow of oil. The availability of oil at a planetary scale is central to debates over the significance of "peak oil." Optimists point out that conventional oil reserves are at an all-time high, the number of oil-producing countries is increasing, vast unconventional reserves are available, and natural gas could to some extent replace oil as transportation fuel. By contrast, pessimists highlight the exhaustible character of oil as a resource, a significant drop-off in the rate at which giant oil fields are discovered, the technical limits and environmental impacts of unconventional sources, and fast-rising demand from Asia. As discussed in chapter 2, the state of reserves remains debated, but there is a growing consensus that it will be difficult to increase conventional oil production. The number of oil-producing countries has increased as high oil prices promote investments in new regions (in Africa, for example, Ghana and Uganda are joining the ranks of oil producers), but many of these recent discoveries are marginal in terms of the volume they add to global supply and the bulk of conventional oil production within the next two decades is still expected to come from the largest estimated reserves, especially those around the Persian Gulf.

In 2004, the International Energy Agency and US Energy Information Agency forecasted a global demand of 120 mmbd by 2030. Many analysts, including some employed by these organizations, now think this will be difficult to meet without a return to high oil prices. Oil companies have been at pains to maintain an annual rate of production grown of 1.6 percent over the past two decades, reaching 92 mmbd by 2015. Getting to 120 mmbd will require about US$13 trillion in investment, roughly equivalent to what is required to fully implement the climate pledges made at the UNFCCC's Paris Agreement in 2015 to bring about an energy sector capable of keeping temperature rise under 2°C. As discussed in chapters 7 and 8, there is a need to reconceptualize "oil supply security" in terms of achieving efficient and "climate-friendly" transportation. This will require a sharp departure from the usual politics of securing oil.[5]

There have been multiple strategies for securing oil availability. The US has long followed a military option, deploying its own military in strategic locations, consolidating its local allies, and intervening militarily when the conditions are seen as imperative (as in the 1991 liberation of Kuwait) or opportune (as in the 2003 invasion of Iraq). The latest such measures include the creation of the US African Command (AFRICOM) that critics see as focused on protecting oil flows from the Gulf of Guinea region, and further naval deployment in the Persian Gulf to deter (or prepare for) a confrontation with Iran. Yet the setbacks in Iraq have demonstrated the limits and horrendous costs of such militarization. Other governments have chosen alternative strategies but may not stick to them. The European Union currently bases its energy security policy on greater market interdependence through the Energy Charter Treaty, strategic partnering (e.g. the EU–Russia Energy Dialogue), and facilitating improvements to governance within oil-producing states. Yet European Union member countries have frequently "hardened" their oil security strategy. The UK has a long history of military interventions in the Persian Gulf and remains a key ally for the US. France has also militarily propped up allied oil regimes, including in Gabon and more recently Chad, and – along with the US and the UK – used military force to help bring down oil-funded regimes, such as that of Gaddafi in 2011. China is cautious not to signal any external military aggressiveness, but it is building up its navy, suggesting that it also retains military options.

Tensions over oil regions and so-called "oil wars" should not be understood as simply driven by resource competition but rather as the political interplay of major oil-importing countries, oil companies, oil-funded states, and local populations. Oil revenues provide petro-states with the ability to pursue their ambitions through military means, while often creating a sense of vulnerability resulting from a history of foreign interference and contemporary dependence on oil exports. This context has often given rise to (populist) "revolutionary" petro-states, whose leaders have been more inclined to conduct wars of conquest and preemptive aggression, while motivating international powers or neighboring countries to take countermeasures, including economic sanctions and military interventions. International powers, such as the UK and the US, have been eager to undermine regional powers that could challenge their political or military dominance and economic interests. One result has been the arms race and multiple armed conflicts that have marked the Persian Gulf over the past hundred years.[6]

## Accessibility

Only 35 countries are currently net oil exporters, a number likely to decline within two decades as small producers exhaust their fields and domestic oil consumption increases in producing countries. Accessing this shrinking resource base is a major conundrum for oil companies and consumers alike. For companies, it means chasing opportunities to develop new fields and/or grow reserves, securing financing for exploration and production, and creating the infrastructure to get oil to markets. Competition among IOCs and NOCs has long been part of the “great game” to secure access (and exclude others), but increasingly this competition over resource and market access has to take into account the acceptability of conditions of exploitation, transit, and emissions (see p. 167).

For consumers, a diminishing supply of conventional oil is likely to mean average prices will rise, although the impacts of this will vary, as not all consumers are the same. High-income importing countries (such as Japan) worry mostly about *supply risk* or the disruption of supplies, while for low-income countries (such as Mali), *market risk*, or the unaffordability of oil, is the main preoccupation (see p. 159). Although distinct, supply and market risks are often tied together as disruptions increase prices.

## *Supply risks*

The reliability of supply is affected by the risks associated with a high dependence on oil imports, limited geographical diversification of imports, and instability in oil-supplying countries. These factors can be compounded where a country is exposed to international sanctions that make oil imports difficult, or where there are few import route options or an absence of refining capacity and/or emergency stocks. Exposure to weather events (that drive spikes in demand or disrupt distribution) and to strikes and social unrest (that prevent the distribution of oil products) can often pose a more significant supply risk to individual consumers than international events.

Countries treat supply risk as a strategic concern. Such concerns were clearly at work with respect to the two world wars: preparing for war, the British and German governments sought to control oil sources as they had converted their navies from coal to oil in the 1910s. Hitler’s failed *Fall Blau* military campaign in 1942 first aimed to capture and later to destroy oil fields in the Caucasus. Japan’s preemptive strike on Pearl Harbor responded in part to the threat of an oil embargo by the US as Japan attempted to consolidate its power in Southeast Asia to secure access to natural resources, including oil from the Dutch East Indies. Western powers did not hesitate to intervene militarily when Saddam Hussein seized Kuwaiti oil fields. Oil security concerns have further risen during the past decade, especially supply risk concerns as a result of the post-9/11 “war on terror,” terrorism and piracy in the Gulf of Aden, and popular uprisings in the Middle East and North Africa (MENA). Saudi military intervention to protect the Sunni minority government in Bahrain during the uprising of an aggrieved Shi’ite majority exposed the increasing vulnerability of autocratic (often pro-western) governments in the region, while the diverse outcomes across the region of the Arab Spring in 2011 reduced oil supplies from Libya by about 1 mmbd and from Syria by about 0.3 mmbd. Overall instability in the region has subsequently increased, with heightened tensions between Saudi Arabia and Iran, a further regionalization of armed conflicts in Iraq, Syria, and Yemen, and a coup attempt in Turkey.

The most common geopolitical threats to oil security include a sustained interruption of commerce through key shipping lanes, such as the Strait of Hormuz in a conflict with Iran or rising tensions between the US and China, and to major pipeline routes and maritime oil terminals, such as Turkey’s Ceyhan port; civil war in large oil-exporting countries, as seen in Libya after the 2011 uprising and NATO intervention, with two competing governments – one in Tripoli and another in the eastern town of Tobruk – claiming control of the oil sector and jihadist militias including ISIL seeking to either destroy or control key oil infrastructures; embargoes on oil imports, as in the case of Haiti and Serbia during the 1990s; and, more tenuously, a military conquest to consolidate oil reserves as was feared in the case of the Iraqi takeover of Kuwait in 1990. The geography of supply risk is classically defined by “choke points” or bottlenecks, with vulnerable parts of the oil transportation network protected by military bases (along key pipelines) and navy patrols shadowing maritime oil flows (see Figure 5.1). Some of the most severe if brief disruptions, however, result from domestic unrest and fuel protests targeting refining and distribution. Blockades by angry truckers, farmers, or fishermen seeking to maintain fuel tax rebates or protests against policy reforms, as seen in the UK in 2000 and in France in 2000 and 2016, have blocked refineries, tanker off-loading sites, and gas stations, turning these infrastructures into strategic sites of political mobilization and police intervention.

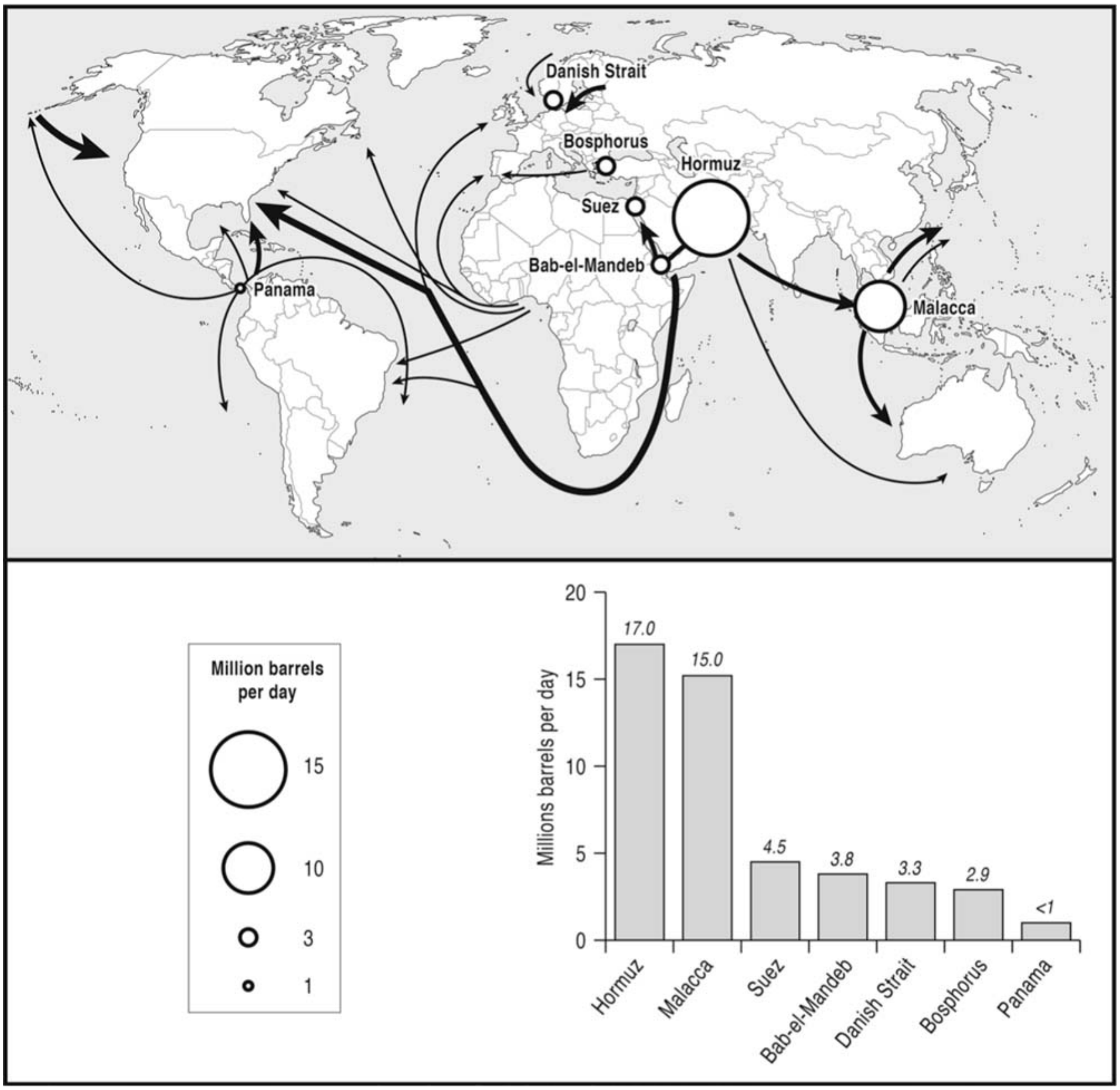


Figure 5.1 Maritime choke points

*Source:* US General Accounting Office, 2007.

Prices are also an indirect concern for supply security. Low oil prices can have at least two effects. The first is to push marginal producers out of business and over the long run concentrate supply around the cheapest producers which are also often the largest, thus reducing supply diversity. Low price trends in the mid-1990s and indications of depletion among many smaller producers (such as the UK) have raised medium- to long-term supply security concerns among major oil importers, while a halving of the average oil price since 2014 has reduced the commercial viability of some unconventional oil deposits. Security concerns have been raised in Western Europe over the growing shift of refining capacity outside the OECD toward Asia. Prices can also have an effect on the politics and stability of producing countries. High prices can consolidate a regime but also increase expectations from the population, while low prices generally see a reduction of subsidies and a risk of popular uprisings.

Supply risks are also affected by the foreign policy concerns of producing countries. Bolstered by vast foreign currency reserves and long-term forecasts of high prices, many exporting countries invest heavily to extend their influence. Nigeria and Angola have become dominant players in regional security within the Gulf of Guinea, seeking to rival western powers. As discussed in chapter 7, some GCC (Gulf Cooperation Council) countries such as Qatar have taken very proactive foreign policy stands. Yet embargoes *by* producing countries have tended to be brief and ineffective, thanks to alternative supplies and producer reliance on oil export revenues, while embargoes *on* producing countries have been more common and sustained (see Box 5.2). Their economic impact can be massive, however, especially when markets overreact and consumers panic, as seen with the 1973 oil embargo by Arab OPEC members against the US and the Netherlands. More widespread is political unrest in producing countries that tightens supplies, as demonstrated by the impact of oil unrest in the Niger Delta that chronically brought down production in 2008, or the civil war in Libya, which since 2011 has taken about 1 mmbd of high-quality crude off the market.

## Box 5.2 Revisiting the "oil weapon"

Oil embargoes can put acute pressure on importing countries. Used by the US against US-oil dependent Japan in 1941, the "oil weapon" came to fame in October 1973 when Arab members of OPEC took measures against countries supporting Israel during the Yom Kippur War. These included a 70 percent increase on the posted price of Arabian light, gradual restrictions on production, and country-specific measures, including an embargo on oil deliveries to the US, Netherlands, Portugal, South Africa, and Rhodesia. Taking place over a five-month period, these measures proved very blunt, as they affected most countries rather than only supporters of Israel, and largely ineffective, as targeted countries obtained oil indirectly or from other sources. A side effect, much appreciated by oil companies and exporting countries alike, was a massive increase in oil revenues. Over the medium term, however, this "oil shock" accelerated the diversification of oil supply away from OPEC countries. Geopolitically, the oil crisis nevertheless proved momentous by revealing the rising vulnerability and decreasing power of western countries, especially that of the US. By then, the US had lost the war in Vietnam, devalued its dollar by pulling out of the Gold Exchange Standard, and its stock market had crashed, while US oil companies lost ground to producing states.

The "oil weapon" has since scarcely been used by producing countries. During the 1991 Gulf War, the Iraqi government set fire to about 500 Kuwaiti oil well-heads and dumped up to 3 million barrels of oil into the Persian Gulf – among the largest oil spills in history. This was more out of anger for losing the war and to punish Kuwait, another oil producer, than to affect oil importers, with prices only briefly spiking in January 1991. In April 2002, Saddam Hussein declared a one-month suspension of oil exports to protest Israeli actions in Palestine and unsuccessfully called for Arab producers to cut output by 50 percent and cease exports to Israel and the US. In 2008, Libya suspended crude oil deliveries to Switzerland after one of President Gaddafi's sons was arrested in Geneva. Despite relying for 15 percent of its imports on Libyan crude, Switzerland did not suffer major disruptions, thanks to alternative supplies. NATO's intervention and UN sanctions on Libyan oil companies during the 2011 Arab Spring, in contrast, put major strains on the market by taking about 1 mmbd off the market. If attacked, Iran is the most likely country to use the oil weapon through selectively cutting its oil production and disrupting oil traffic out of the Persian Gulf through the Strait of Hormuz. Both would have a major effect on oil prices. A barrel of Brent crude reached US$147.27 on July 11, 2008, following Iranian missile launch exercises. Iran, however, heavily relies on oil exports and such a move would be very costly and bring major military response from the US. In fact the "oil weapon" is more frequently used *on* oil exporters. The US imposed sanctions on about half a dozen oil exporters, mostly unilaterally but also through the UN Security Council as in the case of Iraq, while it was joined by the EU and Japan to put pressure on Iran until the US reversed its policy following a nuclear agreement with Iran in 2015.

### *Ensuring reliable oil supplies*

Supply reliability is traditionally pursued through geographical diversification, dependable infrastructures, commercial incentives, and military force. Diversifying supplies is relatively easy for oil, given its transportability and relatively low cost of transportation. It is common for countries to import oil from a dozen producing countries, although the calibration of refineries to specific crudes limits this flexibility. Supply diversification was at the core of the 2001 US energy strategy defined by Vice-President (and former Halliburton CEO) Dick Cheney. It was also a policy that suited oil corporations struggling to maintain their booked reserves and weary of energy conservation and climate change mitigation measures. Iraq, with the world's largest undeveloped and most profitable conventional oil reserves, became a chief target of this policy post-9/11.

Access to oil is an important component of China's energy policy, and to a lesser extent that of India, with massive investments in Africa but also in the Middle East and Central Asia. By 2030, the OECD plus China and India are expected to account for 70 percent of world consumption but only 15 percent of production. Oil pipelines to China are being rapidly developed, with links established with Kazakhstan (Atyrau–Dushanzi pipeline), Russia (Eastern Siberia–Pacific Ocean–ESPO pipeline), Myanmar (Sittwe–Kunming), and plans for Pakistan (Gwadar–Kashgar), and additional links between the Canadian tar sands and Pacific tidewater. Between 2006 and 2010, Chinese companies laid more pipelines within and into China than in the previous four decades, and doubled again that amount by 2015. Among the most strategic is the Myanmar–China pipeline, which bypasses the Malacca Strait. China is also ramping up its emergency reserves at a rate of 50 million barrels a year to meet IEA standards of 90 days of supplies by 2020. India, the world's second-largest growth market for oil, lags behind but completed its first major strategic reserve in 2011 and plans to have three weeks of reserves by 2020.

Military force is also deployed to ensure reliable supplies, especially along transportation corridors but also at production sites and refineries. The British maintained a military force along the Suez Canal after conceding formal independence to Egypt in 1922 (before being expelled as a result of the Suez Crisis in 1956). The US relinquished control over the Panama Canal only in 1999, withdrawing troops as a Chinese company took over the canal's management lease, but maintaining its Guantanamo naval base in Cuba. By far the largest oil-related military expense is that of the US in the Persian Gulf, with estimates in the range US$30–250 billion per year since the mid-1970s. The US navy first entered the Gulf during World War II to protect US oil installations in Saudi Arabia and Bahrain from Italian bombers, and replaced the British as the dominant western force from the 1960s onward. US forces played a leading role in protecting oil flows from Kuwait during the Iran–Iraq War of 1980–8, liberating Kuwait in 1991 and invading Iraq in 2003. Oil-related military expenditure by China is rising as the country relies on tanker traffic going through the Malacca Strait for 80 percent of its oil imports. Controversially building up military bases in disputed islands of the South China Sea, China is also seeking to ensure "safe sea-lanes" throughout the Indian Ocean through defense agreements and ports upgrading in Bangladesh, Burma, Pakistan, and Sri Lanka, as well as a first official overseas military base in Djibouti. Having commissioned its first aircraft carrier in 2012, China aims to have at least four carriers by 2020 and is perfecting a mid-range anticarrier missile.

More broadly, importing countries see regime stability in producing countries as a major asset to maintain supplies and contractual arrangements. Oil tends to reinforce regime durability, especially for dictatorships, through populist programs, stronger patronage networks, well-funded security apparatus, and foreign military assistance. Several rulers have seen their tenure shortened by *coups d'état*, suspicious accidents, and outright invasion, however. One important paradox is that efforts to create oil security for some – rulers, oil companies, and consumers – often actively produce insecurity, violence, and dispossession for others, which in turn can undermine oil supply security in case of sabotage or uprising. As discussed further in chapter 8, solving this security paradox requires a shift from a conventional geopolitical perspective on oil security to one that addresses the social and environmental impacts of oil and the improvement of governance in oil-rich countries.[7]

## Affordability

Affordability is *the* major criteria for consumers fearing "pain at the pump" and governments worrying about the economic impacts and social backlash of price hikes. More importantly, affordability is a key element of energy security for billions of people living in relative poverty. About 2.7 billion people still rely on biomass for household energy uses; at least 1.2 billion have no access to electricity; and many cannot afford motorized transportation and agricultural tools. The question of fuel prices (and subsidies) is thus crucial for the poor, especially in countries with large rural populations relying on diesel generators for electricity, motorized transport to access distant markets, and basic mechanized tools, such as water pumps, for their livelihoods. This is perhaps most striking in supposedly "oil-rich" countries such as Iran, Yemen, and Nigeria. Fuel subsidies negatively affect the national balance of payments, disproportionally benefit the richest and largest oil consumers, and divert funds from alternative energy and, notably, electrification infrastructure. Yet eliminating fuel subsidies without an alternative source of energy and compensatory social welfare mechanism can remove a crucial safety net for the poor.

Affordability is achieved first and foremost by high incomes, infrastructure availability, and improved energy efficiency. Low energy taxation also helps in the short term, but is counterproductive in the long term as a sense of entitlement builds up, along with higher volume consumption, leaving consumers vulnerable to future price hikes. Affordability influences demand, but oil prices are relatively inelastic: higher prices will not immediately and proportionally cut down consumption. US households, for example, will first cut savings, then food, before vehicles and fuel. Still, oil consumption peaked on a per capita basis in several OECD countries around the time of the second oil crisis in 1979, mostly as a result of a shift away from oil for heating. Affordability – along with contribution to urban air quality – is an important design objective for new more fuel-efficient cars being developed for the flourishing Chinese and Indian markets.[8]

The *market risks* defining affordability not only relate to the capacity to pay for oil but also to the oil intensity of an economy. Countries that are cash-strapped with heavily oil-dependent economic sectors – such as heavy manufacturing or a tourist sector reliant on cheap flights – face a higher degree of market risk than others. Affordability also varies within a given country with, for example, fuel costs varying in the US between 3 percent of average household income in California to 10 percent in Maine as a result of local climate, driving patterns, and heating infrastructure. Income inequalities, residential areas, and housing play a major role. The most vulnerable populations include low-wage long-distance commuters relying on fuel-inefficient cars and living in houses lacking effective insulation while often still using oil furnaces for heating.

High and volatile prices are now seen as a major energy security issue, with efforts being made to regulate oil markets and to ensure a better flow of information to them to reduce uncertainty – such as through the Joint Organizations Data Initiative (JODI). Still, energy poverty ranks low on the international energy agenda compared to supply risks and environmental impacts. Mobility probably should rank below education and food, but rural transportation can be a major factor in poverty alleviation, while oil is used for multiple purposes in poor countries, including for electricity generation. Affordable oil is therefore a critical issue for many low-income, oil-importing countries that often spend more on their oil bills than on health and education. There is thus an equity issue attached to “wasteful” patterns of oil consumption in affluent economies that drive prices up for essential services in poor countries. Energy poverty is also particularly striking among some of the communities living in and around oil fields. Despite recent progress, about 60 percent of gas associated with oil production in Nigeria was still flared by 2015, a loss of about US$4 billion, while 50 percent of the population – in a country that produces around 2.4 mmbd and is the world’s twelfth-largest oil producer – has no access to electricity. More broadly, the question of oil price subsidies in producing countries is politically sensitive: low or “at cost” prices reduce energy poverty in producing countries but they also reduce revenues for local authorities that could be allocated to the poor while encouraging wasteful consumption by those who are better off.[9]

Some oil-producing countries have played on this notion of affordability. Internationally, former Libyan ruler Gaddafi exported oil at cut-rate prices to allied governments in the region, such as the Central African Republic. Venezuelan President Hugo Chávez also sent “cheaper oil” to a dozen countries, including Cuba, as a foreign policy tool. Since 2005, Venezuela has provided heating oil to poor communities in the US, calling it a “humanitarian gift” after US Congress cut similar subsidies and US oil companies refused to help the “energy poor.” It is domestically, however, that the largest effects are felt through low taxation and oil price subsidies.

## *The high consumption–low taxation trap*

Heavily taxing oil may seem like an odd idea to increase energy security. Low fuel taxes do reduce a family’s energy bill over the short term, but they increase consumption over the long term and increase vulnerability to future price hikes. Low taxation also increases a sense of entitlement and thus resistance to higher fuel taxes. The end result is a high consumption–low taxation trap, for which the US is the first culprit and victim. By 2006, 60 percent of

Americans recognized the need for a shift in energy policy, but 85 percent resisted higher fuel taxes. In the past two decades, taxes were only raised twice in the US: the Clinton administration battled Congress to obtain a four-cent increase in 1993, and Obama got a seven-cent increase in 2009, a far cry from the doubling or tripling of taxes necessary to motivate changes in consumption. Not only are fuel taxes in the US among the lowest in the world, but much fuel tax revenue is earmarked for highway expenditures, thus reinforcing road transport.

European governments, in contrast, have long imposed high fuel taxes to reduce energy dependence, improve energy efficiency, reduce trade deficits, and finance social programs. Even Norway, a major oil producer with a dispersed population, imposes one of the highest fuel tax rates in the world (see Table 5.3). By 2006, gasoline tax in Europe averaged 60 percent of the final price, compared to 20 percent in the US, the lowest among OECD countries. The US is not the only country caught in the trap. Many oil exporters sell gasoline at cost or even subsidize it, including Venezuela, Saudi Arabia, and Iran. With a gasoline price of 3 cents per liter, Venezuela in effect loses US$8 billion per year to make oil more affordable to its population. Until 2007, Iraq had maintained cheap gasoline prices, despite a lack of refining capacity following years of embargo and military attacks, with the government having to import and subsidize fuel at a cost of US$7 billion per year. Price hikes and subsidies removal frequently result in "fuel riots" feeding larger protest movements, as in Nigeria in 2012.[10]

Table 5.3 Gasoline taxes or subsidies for selected countries

*Source:* Calculated from international theoretical price of 53 US cents per liter (incl. refining and distribution) and domestic price at the pump for 2006. Negative numbers express subsidies relative to theoretical price. GTZ International Fuel Prices Report, 2010.

| Countries | Norway | Europe | Japan | India | Russia | China | US | Saudi Arabia | Iran | Venezuela |
|---|---|---|---|---|---|---|---|---|---|---|
| US cents per liter | 127¢ | 80¢ | 56¢ | 48¢ | 24¢ | 16¢ | 10¢ | –37¢ | –44¢ | –50¢ |
| Tax rate | 70% | 60% | 51% | 48% | 31% | 23% | 16% | –70% | –83% | –94% |

Raising fuel taxes in the US remains paradoxically the most important factor in improving oil security in that country in the longer term. While price elasticity is low for oil, consumers respond more to an increase in fuel tax than to a market price hike. Had the US imposed high fuel taxes early enough – to reduce a sense of entitlement to “cheap oil” and thereby influence the choice of cars and lifestyles – the US could be now consuming half as much as it does. This would not only have saved the US about the equivalent of its trade deficit with China, but fuel taxes would have brought much needed revenues for its now near bankrupt authorities – a bankruptcy itself aggravated at the federal level by oil-related military interventions in the Persian Gulf. The politics of fuel prices and taxation is very sensitive, however, and often considered a political taboo. As long as the US was a major oil producer, low taxes on oil products were effectively a subsidy for its economy. Industrial goods could be more cheaply produced and shipped. Cheap gasoline also boosted car manufacturing, which in turn became a major economic driver. The US became a net oil importer in 1948, but oil remained cheap and no serious measures were taken until the 1970s’ oil crises when fuel-efficiency standards and consumer concerns increased the average fuel economy of residential vehicles from 12.2 miles per gallon in 1977 to 21.3 in 1987. Fuel-efficiency regulations were later relaxed as oil prices deflated, leaving the US exposed to sharp price hikes in the new millennium. China in the meantime is trying to prevent a US scenario, increasing taxation and pushing for lowconsumption vehicles that further increase the risk of wiping out US carmakers who do not adapt. Because of improvements in affordability due to the rise in US shale oil production and oil price decline experienced in 2014–15, the US needs to take major steps to curtail consumption, including getting out of the high consumption–low taxation trap that so few politicians seriously challenge.[11]

## *China's growing oil insecurity*

China is the world's fifth-largest oil producer, yet the growth of its oil sector dates back only to the 1960s and, unlike the US, the country has never been a major oil exporter. Domestic oil production did help the country's rapid development since the mid-1980s but the country returned to a net importer status in 1993 (see Figure 5.2). No immediate shock ensued as oil prices remained low until 2003, while China may have become even more competitive as oil price increases affected its competitors more deeply. This situation may not last, however, with consumption rising at 7 percent per year while its domestic production is expected to reach a plateau within less than a decade. By 2015, China had become the world's second-largest oil importer after European Union countries.

Chinese companies are actively securing oil supplies through new pipelines, offshore exploration, long-term supply contracts, and overseas oil ventures. Government assistance includes preferential loans to companies, as well as financial, military, and diplomatic support for host countries, including opposition to UN sanctions against oil-exporting governments accused of grave human rights abuses, as in the case of Sudan. Chinese companies also benefit from cheap and qualified staff, which is particularly valuable for labor-intensive projects such as pipeline construction. Chinese companies, including CNPC ("PetroChina"), were able to increase equity oil from 140 thousand barrels in 2000 to 1.4 mmbd in 2010, with plans to reach 5 mmbd by 2020, roughly a third of China's expected demand. The Chinese government's active *oil diplomacy* is in part motivated by its own survival. The government is most attentive to energy supplies as its legitimacy rests on the assumption of rapid economic growth improving the lives of its citizens. Yet it is well aware of the risks of oil import dependence and the need to slow down oil demand growth and increase energy efficiency gains.

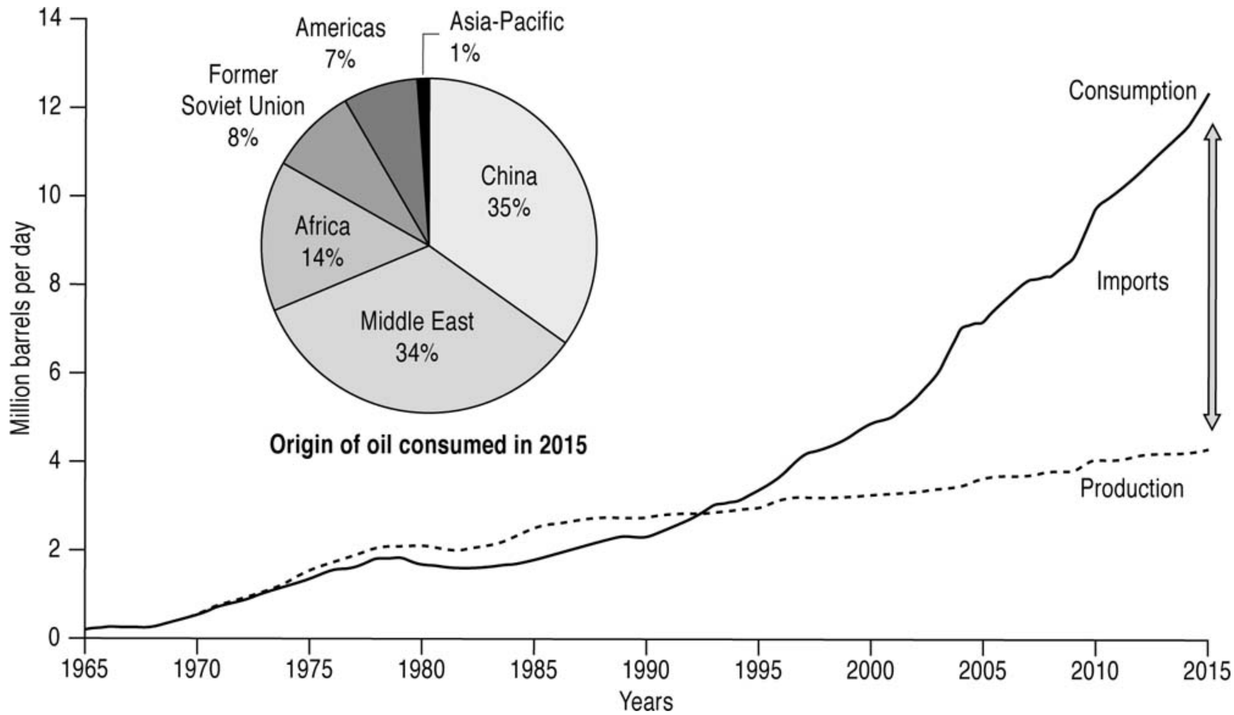


Figure 5.2 Chinese oil production and consumption (1965–2015)

The rise in passenger vehicles presents the Chinese government with its strongest challenge. Only 80,000 cars circulated in China in 1991, but 21 million cars were sold in China in 2015 alone, and there could be 250 million cars on Chinese roads by 2020, raising demand well above the government's target of a peak oil demand of 12 mmbd set in 2008 and already reached in 2015. China paid about US$230 billion for oil imports in 2010, not far from its foreign trade surplus of US$260 billion. Many measures are being taken by Chinese authorities to curb car-related consumption, including strict vehicle fuel efficiency regulations, higher taxation on fuel, a car licensing quota, restricted vehicular licensing and access to business districts, and incentives for electric vehicles. China is already 10 miles per gallon (mpg) ahead of the US in terms of car-fuel efficiency and pushing for 47 mpg in 2020, compared to 42 mpg for the US. However, effective restraints on demand for cars (and miles traveled, more generally) will prove challenging in the face of rising consumerism.[12]

## Acceptability

Acceptability has become a prominent criterion for oil security. Climate change remains a priority on the international agenda. Yet both the 1997 Kyoto Protocol and 2015 Paris Agreement were signed as oil prices hit record lows and sales of SUVs record highs, exacerbating critiques of selfish consumerism and the inadequacies of current policies. The rise of civil society organizations reaching broader audiences through the internet also helped raise awareness of social acceptability: about half of the world's oil production comes from countries listed among the bottom third performers for human rights protection. The 9/11 attacks caused much anger among US citizens against supposed oil-rich "sponsors of terrorism" in the Middle East, while millions of people opposed the US-led invasion of Iraq shouting "no blood for oil." High oil prices, economic uncertainties, and geopolitical concerns had somewhat trumped climate change and human rights during the last oil boom, but more affordable prices also raised concerns about a rebounding of oil consumption.

The oil sector has responded to claims about its social and environmental performance. The case for oil's acceptability now often rests on cutting GHG emissions through carbon capture and sequestration, improving the governance and human rights records of producing countries, and claims that alternative energies represent "unrealistic" options. There is some truth to these positions and assertions but also serious limits (as further discussed in chapter 8). The oil sector can live with social concerns about scarcity and peak oil: after all, it is up to the industry to demonstrate it can deliver *more* oil. Climate change, human rights abuses, and governance are much trickier issues for the oil sector to address. They require changing practices so as to deliver *better* oil, as well as embracing a systematic reduction in demand for their products.

### *Making oil acceptable*

Securing acceptability is a concern for oil companies seeking to expand markets, ease staff recruitment, or avoid consumer boycotts and divestment campaigns. Even national oil companies face such issues, for example when seeking to raise funds on western financial markets, as in CNPC's attempted US$10 billion initial public offering on the New York Stock Exchange in 1999. Oil still remains a mostly anonymous commodity branded by retailers. No gas pump informs consumers where the oil is coming from and what its environmental and social impacts are. Consumer perceptions of oil are largely based on popular conceptions of geopolitics, corporate advertisement, and targeted advocacy campaigns. But even selecting a retail brand does not ensure that oil will come from that company: most oil comes from the nearest oil refinery and tanker truckfilling racks.

To alter these perceptions and "secure acceptability" for their practices and products, oil companies – mostly IOCs – invest massively to improve their safety record, reduce emissions, and address governance issues. Oil majors also routinely spend hundreds of millions of dollars in the US alone to polish their image and promote gas sales. Damage control can push public relations departments into overdrive, as with BP spending about US$93 million in advertising in the four months following its 2010 *Deepwater Horizon* oil rig spill. Companies will also invest in technological innovation and investments to reduce environmental impacts and especially emissions within the industry, while some are investing in renewable energy development. Acceptability is also a concern for producing states. Equatorial Guinea spent millions of dollars on Washington, DC lobbyists to avoid its regime being portrayed as one of world's worst dictatorships. The Canadian government has invested billions of dollars into carbon-capture technologies, advertisement, and lobbying to get rid of the tar sands and "dirty oil" image that sticks to its bitumen-based synthetic crude and threatens its access to the US market. Following 9/11, favorable US public opinion toward Saudi Arabia dropped from 47 percent to 27 percent, a perception that renewed calls to shift oil imports away from the Middle East and increase energy self-sufficiency in the US. The Saudi government replied with campaigns denying its support for terrorism.

The social acceptance of oil projects by host communities in producing countries and the related reputational risks in consuming markets have become a major concern for many companies. Protests, blockades, and sabotage can undermine production, and repression by local authorities – such as the outrageous hanging of Ogoni activist Ken Saro-Wiwa by the Nigerian dictatorship in 1995 – can result in both consumer boycotts and an escalation of hostilities in production areas. Many recent campaigns seek to persuade people that oil companies care deeply about society and the environment. Corporate social responsibility (CSR) can involve significant changes in practice, although it is ultimately conditioned by corporate objectives and often cannot address broader governance and macroeconomic issues. Some oil companies have supported new standards, such as the Voluntary Principles on Security and Human Rights, to prevent abuses relating to company operations. To address more structural factors, many companies are also participating in governance reforms such as the Extractive Industries Transparency Initiative (EITI).

Acceptability will remain an important factor for some countries and consumers, especially given trends that push oil development into more challenging social and ecological contexts. Major issues include the exploitation of conventional oil in high-biodiversity areas and the Arctic, and the high energy and environmental demands of extracting and upgrading unconventional oil sources like Alberta's bitumen. More broadly, the criterion of acceptability questions the role for oil (and other fossil fuels) in an energy future that must square social demands for affordable, reliable, and lower-carbon means of providing energy services.[13]

## Conclusion

Securing oil, from a conventional perspective, is about ensuring reliable supply. In this chapter, we have shown that a broader understanding is necessary to grasp the challenges ahead. Tight markets over the past decade have reinforced a supply-driven security paradigm but its singular focus occludes other dimensions of security. The changing resource base and the increasing role of higher-cost, "hard-to-reach" conventional crude and oil from "dirty" unconventional sources in global supply is diversifying the geography of oil availability (away from the Middle East) and changing established geopolitical calculations. At the same time, the extension of oil's extractive frontier has placed the acceptability of oil center stage – via concerns about human rights, water pollution, biodiversity conservation, and climate change – and challenged many oil companies' claims about their contribution to social welfare, development, and environmental sustainability. For some, supply security and concerns about affordability dictate the rapid growth of unconventional production. For others, the environmental implications of pursuing unconventional sources justify a more rapid transition out of hydrocarbons. Emerging regulation of carbon-heavy fuels (e.g. synthetic crudes from bituminous sands) by some importing markets, such as California and the European Union, is likely to lead to bifurcated markets characterized by price differentials between "clean" and "dirty" fuels. Countries producing "dirtier" fuels may seek to access and/ or develop alternative markets (most likely found in countries with lax acceptability criteria and/or limited supply options) while opposing the internationalization of tighter regulation. The battle to "secure" markets for Canada's tar sands is a case in point and demonstrates what is at stake as oil producers, oil consumers, and other witnesses to extraction contest the availability, accessibility, affordability, and acceptability of oil.

A second significant geopolitical shift is the relocation of demand growth away from most OECD countries to China, India, and so-called "emerging economies." Investments by these fast-growing economies to secure supply should increase the global availability of oil. At the same time, however, equity oil arrangements and upstream competition make it less accessible to OECD economies and to the traditional IOCs, while demand growth outside the OECD may also reduce oil's affordability. Higher oil prices raise the question of fair access to energy and augur growing tensions between producing and consuming countries, as well as among major oil importers. Higher prices also raise issues of macroeconomic impact (for both importers and exporters): for importing states, a significant paradox is the very limited impact of higher oil prices on China's economic growth, in contrast to the negative effects observed on already weak growth in most western countries. A third dimension is greater awareness of the need to ensure broad-based development in oil-producing countries (further discussed in chapter 6). Gains here are also likely to have positive effects on the accessibility of oil although, over the longer term, economic growth and social development will entail growing domestic consumption and thus reduced oil exports.

The geopolitics of oil, then, is rather more complex than “oil wars” scenarios suggest. We have interpreted “securing oil” not as a zero-sum game over a fixed and scarce resource, but as a broader struggle to define the role that oil will play in an energy future. We have sought to show how oil security means different things to different people: while there are some synergies among the four criteria of availability, accessibility, affordability, and acceptability, it is also clear that there are significant trade-offs. Much of the new geopolitics of oil is about defining its role with respect to bringing about more affordable energy at lower environmental costs and improving the contribution oil makes to development in producing countries. As discussed in the following chapters, reaching these seemingly contradictory objectives is a difficult, but not an impossible, task.

# Notes

1. Jimmy Carter, The State of the Union Address Delivered before a Joint Session of the Congress. January 23, 1980. Available online at http://www.presidency.ucsb.edu/ws/?pid=33079.

2. Iraqi armed forces invaded neighboring Iran in September 1980 to undermine its Islamic revolution and seize the oil-rich province of Khuzestan. Anxious not to see the Iran regime prevail, western and regional governments grudgingly supported Iraq, turning the Iran–Iraq War into an eight-year stalemate. The Iraqi regime of Saddam Hussein sought to regain wealth and prestige by militarily annexing Kuwait in 1990. Thrown out of the emirate within seven months by US-led coalition forces, Saddam Hussein finally came to a violent end as a result of the US-led invasion of Iraq in 2003. See D. Stokes and S. Raphael, *Global Energy Security and American Hegemony* (Johns Hopkins University Press, 2010).

3. See A. Grigas, *The New Geopolitics of Natural Gas* (Cambridge University Press, 2017). On oil and gas distinct diversification

trends, see G. Cohen et al., "Measuring Energy Security: Trends in the Diversification of Oil and Natural Gas Supplies," WP/11/39, IMF (2011).

4. L. Hughes and D. Shupe, "Applying the Four 'A's of Energy Security as Criteria in an Energy Security Ranking Method," in *The Routledge Handbook of Energy Security*, ed. B. K. Sovacool (Routledge, 2011). Other renewables include geothermal, wind, and solar.

5. Investment figure of US$13 trillion to expand and maintain oil production is from the IEA's *World Energy Investment Outlook* (2014, table 2.1, p. 58) and is an estimate for the period 2014–35. "Full implementation of [Paris] climate pledges" is estimated by the IEA to cost US$13.5 trillion in the period 2015 to 2030 (IEA 2015, *Energy and Climate Change: World Energy Outlook, Special Briefing for COP 21,* p. 4).

6. See M. Klare, *Rising Powers, Shrinking Planet* (Metropolitan Books, 2008);J. Colgan, *Petro-Aggression* (Cambridge University Press, 2013); P. Le Billon, *Wars of Plunder* (Oxford University Press, 2014); M. Ross, *The Oil Curse* (Princeton University Press, 2012).

7. About 60 countries in the world produce more than 50,000 barrels of oil per day, but nearly half remain net oil importers. E. Gupta, "Oil Vulnerability Index of Oil-Importing Countries," *Energy Policy* 36(3) (2008): 1195–211; K. D. Jacoby, "Energy Security: Conceptualization of the International Energy Agency," *Facing Global Environmental Change* 4 (2009): 345–54; M. A. Delucchi and J. J. Murphy, "US Military Expenditures to Protect the Use of Persian Gulf Oil for Motor Vehicles," *Energy Policy* 36(6) (2008): 2253–64; R. J. Stern, "United States Cost of Military Force Projection in the Persian Gulf, 1976–2007," *Energy Policy* 38(6) (2010): 2816–25. Global oil stocks include two billion barrels of commercial stocks and two and a half billion barrels in strategic stocks, about 52 days of consumption.

8. On the relative importance of income, see R. Kowsari and H. Zerriffi, "Three Dimensional Energy Profile: A Conceptual

Framework for Assessing Household Energy Use," *Energy Policy* 39(12) (2011): 7505–17. Price elasticity for oil is about –0.09 (10 percent price increase reduces demand by 0.9 percent) in the short run and –0.31 in the long run, but the higher the price in absolute terms the greater the responses by consumers; see T. Havranek et al., "Demand for Gasoline is More Price-Inelastic than Commonly Thought," CUDARE Working Paper 1119, Berkeley (2011). Average households in OECD countries now spend about 5 percent of their income on transportation fuel, for a total of about 20 percent on energy.

9. On energy poverty in the UK, see B. Boardman, *Fuel Poverty: From Cold Homes to Affordable Warmth* (Belhaven Press, 1991). The fuel bill of 58 net fuel-importing countries increased by US$60 billion, or 3.2 percent of GDP in 2007–8, about three times the 2006 domestic health budget of all low-income countries; see Statement by the Managing Director of the IMF, October 10, 2008.

10. The price of gasoline in Iraq went from 1.5 cents to about 35 cents per liter between 2005 and 2007, with an informal market price of one dollar per liter; see www.fas.org/sgp/crs/natsec/RS22923.pdf. The 1989 "fuel riot" in Venezuela resulted in between 275 and 3,000 deaths.

11. European countries heavily taxed transport fuel from the 1950s onward, in the case of France in 1951 to pay for roads and rearmament, and again in the context of the 1970s' oil crisis; see J. Dunn, "The French Highway Lobby: A Case Study in State–Society Relations and Policy," *Comparative Politics* 27(3) (1995): 275–95. On US public opinion about fuel taxes, see "New poll finds little support for fuel tax," *The Americano*, April 20, 2010; T. Friedman, "Who is afraid of a gas tax?" *New York Times*, March 1, 2006. Direct fuel taxes are more effective at reducing fuel consumption than fuel-efficiency incentives; see N. Wozny and H. Allcott, "Gasoline Prices, Fuel Economy, and the Energy Paradox" (MIT CEEPR, 2010); S. Li, "Gasoline Taxes and Consumer Behaviour" (Harvard and RFF, 2011). Reducing US oil consumption by half would result in a decline of oil prices since the US consumes about 22 percent of global oil production.

Arguments against higher taxation of automobility include: the freedom to choose (although market choice is structured by corporate decision making and strongly influenced by marketing); an anti-tax ideology (which tends to ignore large tax expenditures on car-related infrastructure); concern that taxes are economically inefficient and disproportionately hurt the poor (although the economic benefits of improvements in energy efficiency can be substantial and the distributional impacts of taxation depend on how tax receipts are allocated); and denial of significant environmental and social externalities (despite scientific evidence). See A. M. Bento et al., "Distributional and Efficiency Impacts of Increased US Gasoline Taxes," *American Economic Review* 99(3) (2009): 667–99.

12. H. Wang, "China's Oil Policy and Its Impact," *Energy Policy* 23(7) (1995): 627–35. EIA *Energy Outlook 2011*. On Chinese NOCs and oil diplomacy, see S. Chen, "Motivations behind China's Foreign Oil Quest: A Perspective from the Chinese Government and the Oil Companies," *Journal of Chinese Political Science* 13(1) (2008): 79–104; J. Jiang and J. Sinton, "Overseas Investments by Chinese National Oil Companies: Assessing the Drivers and Impacts" (Paris: International Energy Agency, 2011). See X. Yan and R. J. Crookes, "Energy Demand and Emissions from Road Transportation Vehicles in China," *Progress in Energy and Combustion Science* 36(6) (2010): 651–76; P. Gao, S. Sha, D. Zipser, and W. Baan (2016), "Finding the Fast Lane: Emerging Trends in China's Auto Market." Survey. McKinsey & Company. Available online at http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/finding-the-fast-lane-emerging-trends-in-chinas-auto-market.

13. For human rights rankings, see CFIP at Carleton University. Human Rights Watch, *China's Involvement in Sudan: Arms and Oil*, November 24, 2003; B. Geman, "BP Upped Ad Spending to $93m over Spill," *The Hill*, September 1, 2010. The limits of CSR are discussed by J. G. Frynas, "The False Developmental Promise of Corporate Social Responsibility: Evidence from Multinational Oil Companies," *International Affairs* 81(3) (2005): 581–98.

Saudi reaction to the 9/11 image problem is explained by J. Zhang and W. L. Benoit, “Message Strategies of Saudi Arabia’s Image Restoration Campaign after 9/11,” *Public Relations Review* 30(2) (2004): 161–7. See A. Nikiforuk, “The Fallacy of ‘Ethical Oil,’” *The Tyee*, September 22, 2010. For an ardent critique of the oil industry, see A. Juhasz, *The Tyranny of Oil: The World’s Most Powerful Industry – and What We Must Do to Stop It* (Harper Paperbacks, 2009). For a corporate response putting the blame on government policies, see J. Hofmeister, *Why We Hate the Oil Companies* (Palgrave Macmillan, 2010).

# CHAPTER SIX
# Developing Through Oil

Oil seduces those who would control it, feeding dreams of instant wealth and economic transformation. The Polish journalist Ryszard Kapuscinski once remarked how "oil creates the illusion of a completely changed life, life without work, life for free. Oil is a resource that anesthetizes thought, blurs vision, corrupts . . ." Developing through oil is an aspiration for many oil-producing countries but the reality of everyday life for many in Angola, Iraq, Iran, Libya, Kazakhstan, Nigeria, Congo, and Saudi Arabia falls far short of this goal. Turning oil wealth into broad and lasting social development is a massive challenge for producing countries. Oil-field development draws in very large capital investment but creates relatively few direct jobs; the revenues it generates can be vast but also highly volatile; and the wealth and opportunities it creates fall disproportionately to ruling elites and foreign corporations, despite oil being "public property." These challenges require sound long-term policies, robust and accountable governance institutions, and a diversified economy able to withstand the effects of oil wealth. Yet oil wealth can work against these requirements. It fuels short-term populist policies or unrealistic long-term plans, weakens institutions through corruption, bloated bureaucracies, and lack of accountability, and concentrates (rather than diversifies) economic activity through overvalued currency and labor-market distortions. Furthermore, most of the new oil producers are poor countries where capacities for meeting these requirements and sustainably absorbing oil wealth are limited. When oil begins to flow, it quickly dominates and distorts the economy.

The expectations associated with oil and its potential for socioeconomic and material transformation are key to understanding the politics of oil and development. Cheap oil fuels hope and desire for greater mobility, material abundance, fast economic growth, and modernization. For those who control its flow, oil provides a concentrated revenue stream without equal and a source of enormous social power. Economic development in the twentieth century owes much to the cheap and flexible energy that an expanding flow of oil has provided. But this development has come at a high price, especially for the people and environments in and around sites of extraction and refining. In many oil-producing countries, oil's promise of modernization is honored in the breach. In this chapter, we show how oil's role in development is complex and multifaceted. We try to account for the role of oil in development, who wins and who loses, and why oil-based development often proves so difficult. We then consider the development consequences of the end of the "Age of Plenty."

## Accounting for oil in development

Oil's high energy density, relative abundance, and easy portability have made it a powerful enabler of economic development. From the 1920s onward, oil became widely adopted across a range of uses and economic sectors, from heating and power to transportation and plastics. Oil transformed agricultural production in a way that coal never did: in the US, for example, gasoline tractors replaced horses and manual labor, growing from barely a thousand in 1910 to over a million in 1932. Oil and gas underpinned the rollout of high-yielding, input-intensive arable crops from the 1960s onward (the "Green Revolution"), via the use of pesticides, fertilizers, pumped irrigation, and climate-controlled storage and transportation. Freeing up people from backbreaking agricultural work, lowering food prices, and generating economic surpluses, the massive energy surpluses provided by oil have allowed both economic growth and diversification (see Box 6.1). More generally, cheap oil has enabled economies to outrun local resource depletion and achieve huge economies of scale in production and transportation (via, for example, the application of more powerful engines or coolchain technology).

## Box 6.1 The oil we eat: petroleum in the geopolitics of food production

About two billion people spend only a few hours per week to get food. Only 2 percent of the active population in the US, the world's largest net food exporter, is directly involved in food production, and US households spend around 10 percent of their income on food – among the lowest in the world. Oil and gas inputs make food production cheap, while trucks and cars make "food gathering" easy. Such rich diets would require three weeks of production by a subsistence manual farmer for a single day of consumption, and a single food calorie requires ten calories from oil and gas. Not everyone is benefiting, however. Billions of people still spend much of their time producing food but are often outcompeted by the rich world's dumping of agro-products subsidized in part by lower fuel taxes.

Without oil and gas, the current industrial food system is unsustainable. Replacing oil by biofuels, such as corn ethanol, mostly compounds the problem by allocating farmland to fuel rather than food production, while most biofuels have a low energy return on energy invested (EROEI) and still require high natural gas inputs.[1]

Easily transportable, petroleum products fuel generators in many poor or remote parts of the world, providing vital electricity for health care, basic infrastructures, and access to education and mass media. Oil's rich chemistry has made it the basic material of the "Plastic Age." The ease with which it can be transformed into myriad products – from lipstick and clothing to car parts and containers – has facilitated rapid increases in rates of material consumption in industrial economies since the 1950s. The global draw on oil is immense: it is equivalent to 150,000 cars filling their tanks every minute, a rate of flow two and a half times that of the River Thames. Propelling over a billion vehicles – from mopeds to jets and cargo ships – oil continues to be central to economic growth and the geographical mobility so characteristic of the modernization and globalization of economies in the twentieth century.

Low-income countries caught in colonial relationships were largely bypassed by the economic growth and broad social gains achieved in western economies through an increased dependence on oil. For many, the fruits of their independence turned bitter during the successive oil crises and recessions of the 1970s and early 1980s. Lower oil prices after 1985 were advantageous to oil-importing countries, although high levels of debt and dependency on primary commodity exports often overwhelmed potential gains for poor countries. In India and China, however, oil-fueled agricultural modernization and growing international trade have contributed to lifting hundreds of millions of people out of poverty. These periods of growth have been several times more oil intensive per unit of GDP than in already industrialized countries where economies have shifted toward services. After growing rapidly in the 1970s, the oil intensity of GDP in China has been steadily declining and is still about twice that of the US and the EU. India's oil intensity peaked in the late 1990s but remains high. In absolute terms, however, oil consumption and its impacts have risen considerably as surging GDP outstripped this general decline in oil intensity.

## Accounting for environmental and social costs

Oil may facilitate the lives of many (and provide extreme wealth for a few) but the production network for this versatile resource also distributes a series of social and environmental costs. Media coverage of dramatic events makes some of these costs highly visible, such as the 1969 Santa Barbara offshore rig oil spill off the California coast, the 1.6 million barrels spilled following the wreckage of the *Amoco Cadiz* in Brittany in 1978, the 1989 *Exxon Valdez* tanker spill in Alaska, or the *Deepwater Horizon* fire and Macondo blowout in the Gulf of Mexico in 2010. So does environmental campaigning against "dirty oil" from the Alberta tar sands or "marginal oil" from Arctic drilling. But beyond these iconic cases of the "deeper, dirtier, and riskier" pursuit of oil, many of oil's social and environmental costs are hidden from view. Worker injuries, traffic accidents, respiratory infections, pesticide accumulation, plastic trash, and leaking pipelines are a chronic corollary of oil's global production network. Often occurring on a small scale, these events when aggregated together build up into large-scale consequences affecting millions.

## *Environmental costs*

At a global scale, oil is among the largest sources of pollution. From highways and plastic trash to oil spills and carbon dioxide, the life cycle of oil products – from exploration to extraction, transportation, refining, consumption, and disposal – endangers ecosystems all over the planet. More than 3,500 rotary oil rigs are drilling for oil, and 5 million oil wells tap 33 billion barrels of oil each year from 40,000 oil fields around the world. Crude oil is then sent through 540,000 kilometers of oil pipelines and 4,500 oil tankers to about 700 refineries. These provide fuel through 600,000 gas stations to a billion motor vehicles parked or circulating on a vast extent of man-made hard surfaces. A chief source of air pollutants (such as particulates, benzene, and nitrogen oxides), oil still accounts for about a third of fossil fuel-related GHG emissions, a drop from 50 percent in the late 1970s.[2]

The exploration and extraction phases of oil production can produce seismic disruptions and large amounts of solid and liquid waste, some of which have high concentrations of toxins. Worldwide, drilling wastes may amount to 300 million barrels, while oil extraction generates about 90 billion barrels of so-called *produced water*, the saline water in the mixture of oil and water lifted from reservoirs. Nearly all produced water is reinjected into oil reservoirs, but some ends up in waste pits. Leaks from pits into streams have been a core health complaint of oil-field communities in Ecuador. Vast amounts of water are injected into reservoirs to enhance oil recovery, between 1.4 and 4.6 barrels to every barrel of oil produced in Saudi Arabia, while the extraction and upgrading of bitumen from the tar sands requires about 4 barrels of water for every barrel of synthetic crude oil. Accidental spills during drilling or lifting oil to the surface can have massive consequences, especially at offshore sites where well plugging and relief well drilling are complicated. The explosion of Pemex's exploratory well *Ixtoc I* in June 1979 spilled 3.3 million barrels into the Gulf of Mexico. Two decades later, the explosion on BP's *Deepwater Horizon* platform, also in the Gulf of

Mexico, resulted in the deaths of 11 workers and a spill estimated at 5 million barrels between April and July 2010. Intentional spills from Kuwaiti oil terminals and tankers by Iraqi forces during the 1991 Gulf War provoked the largest oil spill in history, with estimates ranging from 4 to 11 million barrels. Iraqi forces also set approximately 600 oil wells on fire as the Allied air offensive began, with the last oil-well fire capped on November 1991, nine months after being set on fire by Iraqi troops.[3]

Transport-related impacts affect mostly coastal and riparian communities along tanker and pipeline routes. The Persian Gulf is the geographical area most affected by major tanker accidents, two-thirds of which were the result of Iraq–Iran hostilities. The second most affected area is the Atlantic coast of Europe and especially the entrance to the English Channel with major spills in Brittany and Cornwall since 1967 (the *Torrey Canyon*, the world's first supertanker accident). There is mounting concern over the potential impacts from accidents in the north Pacific and Arctic sea-lanes for moving oil to East Asia. Coastal ecosystems and communities are the most affected, with fishing and tourism-based communities waiting years, if not decades, to be often inadequately compensated. ExxonMobil declared having spent US$4.3 billion as a result of the 1989 *Exxon Valdez* spill in Alaska, which included about US$2.1 billion in cleanup costs and US$900 million in a civil settlement, but appealed some compensatory and punitive damages for nearly two decades. Tanker and production accidents make headline news but they account for only a fifth of the total volume of spills, the rest coming in part from illegal bilge and operational discharges. Other marine pollution includes plastics – which constitute about 90 percent of all rubbish adrift on oceans, contributing to "dead zones" such as in the massive Pacific Gyre – and noise pollution associated with seismic exploration.

Land-based pollution results from pipeline ruptures and spills. About 2.5 million barrels spilled from 5,000 pipeline incidents in the US between 1991 and 2010. Extensive networks of aging pipelines linking small and widely scattered fields to oil terminals are particularly prone to spills, and chronic occurrences can build into very significant volumes over the years. An average of 800 spills per year was reported in Nigeria between 2006 and 2009, and up to 13 million barrels of oil may have been spilled in the Niger Delta since oil exploitation started in 1958. There is much controversy over the relative importance of causes, including pipeline corrosion, poor maintenance, and operational mistakes versus oil theft and sabotage. The oil pollution of creeks and acid rain from gas flaring have had devastating impacts on the health and livelihoods of local communities.

Pipelines are often routed through low-income communities that have limited access to economic and political power, especially in urban settings such as Los Angeles. Construction itself is frequently marred by criticisms of inadequate compensation of land users, heavy-handed evictions, and, in some cases, human rights abuses. Construction of the Chad–Cameroon pipeline sought to set a new standard with the most sophisticated efforts to date to avoid such problems in low-income countries (see chapter 8), but dissatisfaction has remained among many affected communities while broader concern for human rights abuses in Chad persists.

The environmental risks associated with upstream activities are increasing. Environmental regulation and scientific knowledge and monitoring are greater than ever, but oil companies are increasingly seeking to develop reserves in locations that are technologically complex and environmentally challenging. Many of the remaining significant reserves of conventional oil lie in the ultra-deep water offshore and in the Arctic, while accessing the substantial known reserves of unconventional oil – such as in Canada or Venezuela – requires wholesale landscape transformation through open mining or vast amounts of energy to liquefy and extract bitumen or ultra-heavy crude in situ. Likewise, alternative liquid fuels – such as biodiesel and ethanol production – are associated with deforestation and the development of biomass plantations.[4]

The last two stages of the oil life cycle also distribute environmental and health impacts in ways that are highly uneven. Refineries mostly affect the health of local communities, again often low-income marginalized populations, with higher reported rates of leukemia and cancer, as well as psychosocial reactions to perceived or actual emissions. Oil consumption results in localized air and water pollution, as well as the emission and accumulation of greenhouse gases, while car travel demands massive infrastructure and can negatively affect the health of users and bystanders. In the US, 6.3 million kilometers of paved roads, which along with car parks for about 215 million cars cover around 16 million hectares, compete with other land uses including agriculture – itself increasingly directed at biofuel production. Cars themselves consume vast amounts of raw materials, the production and disposal of which have environmental impacts. Air and water pollution mostly concentrate in areas of use, with many urban areas – particularly in rapidly growing cities of the global South – turning into cesspools of toxic chemicals. GHG emissions have a global reach, although their effects on local and regional climates are highly differentiated. Whereas the benefits of oil consumption (car ownership, low-cost travel) accrue mainly to the richest fifth of the world's population, it is the poorest who are expected to experience the most serious consequences of climate change, including urban poor and rural populations in drought-prone regions.

### *Social costs*

The people most directly exposed to the oil production network are oil workers (see chapter 4) and the local communities that host oil infrastructure. The most exposed communities are those in poorly regulated production areas. Oil exploration often involves accessing ecosystems in remote locations, resulting in disproportionate impacts on indigenous communities, with at least seventy indigenous groups currently affected around the world. Environmental and social impacts resulting from oil sector activities include deforestation, road building, and the arrival of migrant oil workers. Impacts extend beyond the oil sector itself as, for example, road construction can facilitate land colonization by settlers. Although "opening" land for development can help reduce poverty and is often promoted by national authorities, colonization can have strong negative impacts on indigenous communities. Communities located near transportation and refining infrastructures are also disproportionally affected, many of these being low-income minority populations.[5]

Oil usage also creates risks within the more familiar, everyday environments of industrial economies. About 1.3 million people die in traffic accidents every year, while up to 50 million more are injured, mostly pedestrians and cyclists run over by cars in developing countries. The World Health Organization (WHO) reports that traffic accidents are now the world's leading cause of death among youth between 5 and 29 years of age, while a 2005 WHO study suggested that more premature deaths could result from car exhaust than traffic accidents in Europe. Kerosene lamps provide another example of the large social costs of oil-fueled technologies. A source of light for more than a billion people, kerosene lamps are also polluting, dangerous, and inefficient, causing burn injuries and respiratory diseases affecting millions and demonstrating the importance of moving up the "energy ladder" toward safer (and more affordable) fuels. Indirectly, oil-fueled mechanized warfare since World War I has made armed conflicts more devastating, especially through civilian deaths by aerial bombing and the far-flung deployment of armed forces. Arguably, many lives are also saved thanks to rapid transportation to hospital and the medical progress and equipment that oil has made possible, not to mention increased food production. Yet deaths, injuries, and disease are part and parcel of the worlds made through oil and should not be ignored. They highlight the central role oil plays in the development of livelihoods and how, in ways not often imagined, oil now sets the conditions for the possibility of life. As such, they point the way to an alternative perspective on the "true costs" of oil and a politics of oil that addresses both the "goods" and "bads" that oil can create.[6]

## Oil revenues: who gets what?

Every year, between three and five trillion US dollars change hands along the oil "value chain." About two-thirds of this money ends up with governments in oil-exporting and -importing countries in the form of taxes, while much of the rest goes to some of the world's biggest companies as profits. Oil is one of the largest revenue transfer schemes in the world: revenue is transferred from consumers' pockets to governments and corporations, and from consuming countries to oil-exporting countries. The question "who gets what?" matters because oil's production network generates striking inequalities, both between and within countries. On the consumption side, the US accounts for only 4.4 percent of the world's population, but consumes about 20% of world oil supplies and 25% of road transportation fuel, and, while consumers complain of high prices at the pump, these prices do not (yet) reflect the full social and environmental costs of oil. On the production side, whereas oil enriches some of the world's wealthiest people, it is often extracted from under the feet of the poorest. The wealth of Nigerian elites and the misery of Niger Delta populations exemplify this pattern, but it is repeated to various degrees across the world. In Angola, China, Ecuador, Iran, Iraq, and Saudi Arabia, oil is pumped in areas inhabited by often underprivileged minority populations. Very little of the oil industry's profits have so far been spent mitigating the negative impacts of oil and helping to transition from an oil economy. Instead, they have been plowed backed into the industry or dispersed to shareholders.

## *Distribution of oil revenues*

Every day, consumers worldwide spend about US$11 billion on oil products. Oil provides many different services, but for many consumers the gas station is where the politics of revenue distribution comes alive. Because gas stations are on the frontline of oil price awareness, a few display information showing that they make only a few cents of profit on every dollar in sales. Such seemingly petty earnings contrast with news headlines of massive profits among oil companies, with ExxonMobil earning US$45.2 billion in 2008 – the biggest annual corporate profit in US history at the time. Such profits, in turn, pale in comparison with the earnings of governments in the main producing countries, such as the US$262 billion collected that year by the Saudi central government on oil exports. Oil-producer governments capture on average 70% of the net revenues from oil production, varying from 40% in the US to 95% in Iran. Many governments in importing countries, and especially in Europe, also heavily tax oil products. Governments in the European Union get about 5% of their national tax revenues from fuel taxes, or about US$275 billion in 2014. French drivers often compare their car to a cash cow: taxes can account for as much as 80% of the retail price of petrol when oil crude prices are low.[7]

To answer “who gets what” from oil revenues, we break down the oil value chain into its different components (see Table 6.1). Oil production and refining costs are relatively fixed, amounting to about a dollar per gallon of gasoline. The remainder consists of government taxes and corporate profits, which vary considerably. Using a crude oil price of US$100 per barrel and average world price of gasoline of US$5.02 per gallon, costs amount to 20% of the final value, producer governments earn 33%, consumer governments 40%, and companies 7%. This distribution of revenues from endproduct sales reflects the relative power of governments, oil companies, and consumers. Producer governments justify their claim through resource ownership of a depleting nonrenewable asset, as well as compensation for damages in the case of local landowners and communities. Consumer governments point to the costs of road infrastructure, traffic accidents, and pollution. Oil companies see themselves as the rightful producers of the resource. Finally, consumers supposedly decide if oil is to be extracted, but most are price takers, in the sense that they have a limited capacity for influencing the price of oil, hooked on lifestyles and locked into infrastructures that demand a strong will and some sacrifices to opt out of.

Table 6.1 Distribution of cash flow from oil sector

*Sources:* EIA and IEA, based on US$100 per barrel and global average gasoline price; field development capital expenditures included in finding costs.

| | Percentage | US$ per barrel | US$ per gallon | US$ per liter |
|---|---|---|---|---|
| Finding costs | 5% | 11 | 0.26 | 0.07 |
| Lifting costs | 2% | 5 | 0.12 | 0.03 |
| Production taxation | 33% | 70 | 1.67 | 0.44 |
| Production company profits | 7% | 14 | 0.33 | 0.09 |
| Transportation costs | 1% | 3 | 0.07 | 0.02 |
| Refining costs | 7% | 14 | 0.33 | 0.09 |
| Retailing costs | 3% | 6 | 0.14 | 0.04 |
| Consumption taxation | 40% | 84 | 2.00 | 0.53 |
| Refining and retailing company profits | 2% | 4 | 0.10 | 0.03 |
| Total | 100% | 211 | 5.02 | 1.33 |

This assessment provides only a general snapshot, and there is considerable variation among producing and consuming countries, different oil companies, and types of oil. The oil industry also benefits from large subsidies and tax exemptions, amounting to about US$4 billion in the US. Overall, consumer governments control the largest share of oil revenues, but in effect they simply channel consumer spending through public budgets, rather than create new wealth. It is producer governments that gain the most from the oil sector, a "petrodollar" wealth from which development is supposed to flow (see Box 6.2).[8]

## *Wealthy producers?*

Volume and price are not the only determinants of "who gets what" among oil producers. Contractual arrangements, as discussed in chapter 2, matter a great deal to determine the share of operational revenues obtained by producer governments. This percentage of tax revenue relative to total revenue – the rent or "government take" – reflects in part the geological potential, costs of production, and risks taken by oil companies. As a consequence, "government take" is not easily comparable between countries or even between contracts. Yet some governments (and their populations) do better than others, with Norway, for example, capturing 75 percent of total revenue compared to 30 percent for the UK (see Table 6.2). Sharing the same North Sea Basin, the two countries have produced about the same amount of oil and gas. The UK did not seek direct equity participation in oil ventures, but Norway did and also imposed higher taxation. After 45 years of production, the UK had generated US$470 billion in revenues, about US$11 per barrel, while Norway received US$1,197 billion, or US$30 per barrel. The difference, amounting to US$727 billion, would allow the UK to repay a third of its national debt. Moreover, Norway did not spend all its oil earnings, but reinvested most of them into a savings fund (the Norwegian Pension Fund) worth US$876 billion in 2015.[11]

## Box 6.2 Petrodollars

Producer governments have long received oil revenues, but until the late 1960s this income was relatively small, due to the dominance of western companies in revenue distribution. Petrodollars were ironically born out of the context of US dollar devaluations in 1971 and 1973 that led OPEC to attempt a shift to a basket of currencies; but the 1973 oil embargo unintentionally reinforced dollar-denominated oil trading. Reacting to the huge new flow of dollars collected by oil-producing governments, US Secretary of State Kissinger vowed "to return extorted funds to our economy." To do so, the US government and lending agencies pushed petro-states to buy US-dollar denominated assets and invest in US services and infrastructures. This set a development model geared toward modernization dependent on US technologies and financial products, and ultimately on the value of the dollar itself.

Petrodollars were also recycled through US banks to low-income countries in the form of loans, tied in part as well to the provision of (overinflated and often inadequate) US goods and services – with loan pushers, or "economic hit men" as popularized in John Perkins's non-fiction book, being active in both oil-exporting and low-income countries.[9] This model of development resulted in some social benefits, but it frequently yielded massive debt overhangs and a growing gap between an oil-related elite and the rest of society.

The current oil boom is also seeing much financial recycling, although the US now channels only about a quarter of that wealth compared to three-quarters in the 1970s. Iran has demanded to be paid in euros and not US dollars following the lifting of sanctions, and Saudi Arabia is the only OPEC member staunchly defending the status quo of dollar-based oil trading over a basket of currencies, even if most countries also hold much of their reserves in dollars. Standing as an exception, Iraq was forced into a major petrodollar recycling scheme under US occupation through largely wasteful "reconstruction" schemes.[10]

Table 6.2 Government “take“ from oil revenues

*Sources:* US Government Accountability Office, “Oil and Gas Royalties,” May 2007; Daniel Johnston “Higher Prices, Lower Government Take?” *Petroleum Accounting and Financial Management Journal* (2004).

| *Country* | *Government take (%)* | *Country and US reserve type* | *Government take (%)* |
|---|---|---|---|
| Iran | 93–96 | Azerbaijan | 68–72 |
| Venezuela | 89–91 | Angola | 66–71 |
| Libya | 73–89 | US Onshore | 51–53 |
| Nigeria | 78–83 | US Shallow offshore | 48–51 |
| Norway | 73–76 | US Deep offshore | 37–41 |
| Russia | 69–72 | UK | 30–32 |

Politics, ideology, and negotiation skills also affect revenue distribution between companies and governments. Foreign governments and oil companies have toppled regimes undermining their oil interests, as in Iran, while producing governments have nationalized foreign oil ventures. Some governments are able to grow their participation and capture of revenues from the sector for long-term benefits, while others negotiate bad deals, occasionally for corrupt purposes. Short-term horizons, such as the reimbursement of massive debts or the payment of civil servants’ salary arrears, can motivate large up-front “signature bonuses” to be paid at the time a contract is awarded at the expense of future revenue flows. Government take tends to be higher in producing countries with a strong national oil industry, such as Iran and Venezuela. Yet such high shares can be deceptive, hiding inefficiencies and declining production, as well as cross-subsidies such as domestic oil consumption.

Government revenues should not be confused with the flow of benefits to citizens. As wryly noted by Human Rights Watch’s Arvind Ganesan, “the government’s ‘take’ is not necessarily the public’s ‘take’. It may *just* be the government’s take.” Oil revenues can reach people through public goods and tax rebates, but also through direct cash payments and pension funds. Very few governments directly distribute oil revenues to their citizens, a pioneer being Alaska which has handed annual payments averaging about US$1,600 to every resident since 1982. If implemented across all mineralproducing countries, cash transfers could halve the number of people living on incomes of less than US$1 per day. Yet most countries prefer to use other means of distributing oil revenues. Many authorities, such as Alberta's provincial government, prefer to slash taxes, a popular policy that kept the same party in power for 44 years, even if low taxes and lack of oil savings has put the government in debt during oil downturns. Aware that oil is running out and seeking intergenerational equity, Norway maintains heavy taxes and generous public services, while directing about 95 percent of its oil revenues to the Norwegian Pension Fund. Norway now stands as a model for escaping the "oil curse," though it benefited from favorable initial institutional and economic conditions compared to most other oil-producing countries.

## The "oil curse"

One of the tragic paradoxes of oil wealth is recurring misery. Many oil-rich countries face large economic shocks and distortions, remain under authoritarian governance, and suffer from armed conflicts. As a result, social indicators and economic performances in oil-producing countries are often below those expected from their level of income and resource endowment (see Figure 6.1). Many oil-producing countries rank well below their GDP per capita ranking in terms of the Human Development Index (HDI), the worst case being Equatorial Guinea with a rank of 41st for GDP per capita compared to 138th for HDI in 2014. Equatorial Guinea only became an oil producer in the mid-1990s which helps explain such a discrepancy, but many other factors are at work in what political scientist Terry Karl calls the "paradox of plenty."[12]

### *Debt overhang and Dutch disease*

Two of the most important economic problems facing oil-producing countries are oil-revenue volatility and impediments to economic diversification. Price volatility and fluctuations in production result in massive budgetary problems for governments and shocks to the economy. The risk is high of overspending during boom times, with governments turning to loans during bust times in the hope of better days. Most oil-producing governments ended up heavily indebted after the fall of oil prices in the mid-1980s. Some producing countries were rightly more cautious during the last boom, despite widespread belief at the time that prices would stay high, if volatile, for the next couple of decades.

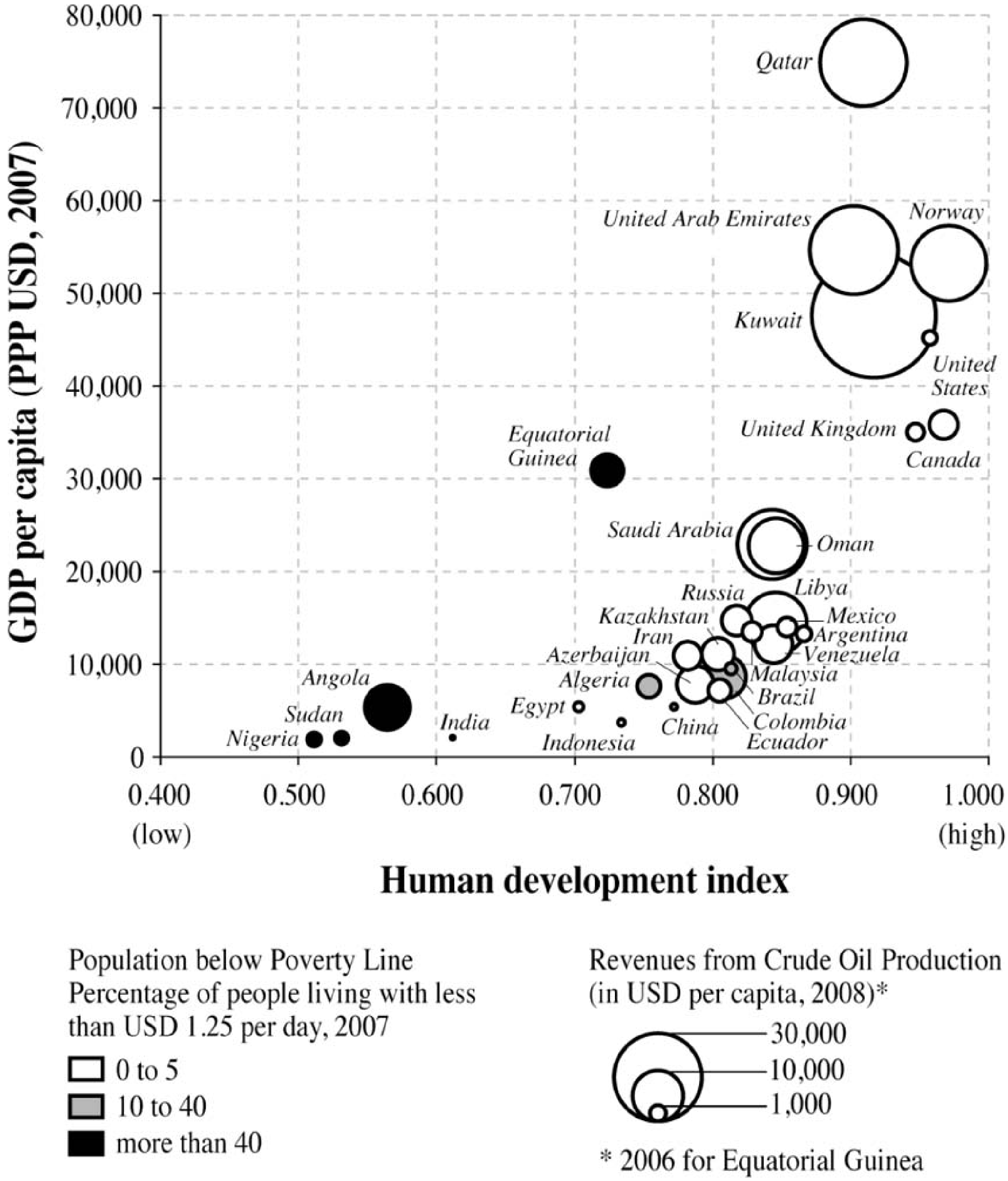


Figure 6.1 GDP, HDI, and poverty levels among oil producers

*Source: Revue internationale de politique de développement*, data from BP, UNDP, and WB.

Oil revenues also tend to result in massive economic distortions that can increase oil dependence over time. Whereas oil windfalls provide capital to help accelerate industrialization, modernize agriculture, and diversify the economy, large oil revenues tend to undermine other productive economic sectors through local currency appreciation and cheap imports. This "Dutch disease" was named after the negative impact of North Sea natural gas development on the Netherlands' industrial and agricultural sectors in the 1970s. The impact on the structure of the economy is compounded by lower opportunities for participation of women in the labor market. Oil windfalls should also help relieve poverty, but in the worst cases both poverty and inequalities rise over the long term. For example, although oil revenues increased from the 1980s to the 1990s, the percentage of Nigerians living on less than a dollar a day increased from less than a third to 70 percent over the same time period. Poverty results, in part, from the "crowding-out effect," as the oil sector encroaches on other sectors that would employ many more people than oil, and encourages economically inefficient investments (such as uncompetitive industries, prestige spending, and "white elephants"). Greater poverty and inequalities also result from the concentration of oil-revenue flows into a few hands, essentially politicians' pockets and corporate coffers. That these revenues are generated from a handful of state or foreign companies, rather than via taxation of the general population and a diversity of business sectors, facilitates secrecy and discretionary spending while reducing government accountability.

## *Governance, grievances, and corruption*

Oil wealth can have a number of negative impacts on the quality of governance in oil-producing countries. The first is its potential for enabling authoritarian forms of governance and foreign interference. Simply put, oil wealth provides rulers greater autonomy from civil society and exacerbates foreign commercial and strategic interests. A population may be better off materially under authoritarian rule and with foreign oil companies, compared to a dysfunctional democracy or mismanaged national oil company. Yet, without transparency and accountability around oil revenues and budgetary expenditures, the risk is high that authoritarian rulers and foreign companies will abuse their position. Popular revolutions or oil industry nationalizations are rarely effective solutions: popular uprisings have often given way to renewed authoritarianism (Iran), sometimes aggravated by recurring *coups d'état* as armed forces take on a greater governing role (Nigeria). Nationalizations have also been followed by punishing treatment from foreign oil companies and their powerful home governments, including the use of oil export embargoes (Mexico), or military interference (Iran). Some national oil companies have also lacked technical expertise to run efficiently, or become so close to a corrupt government as to become slush fund providers.

Price volatility also exacerbates governance problems. Domestically, low prices increase general grievances among the population, while during periods of high prices populations may voice demands for the state to take a greater control and/or share of oil revenues. Regionally, low prices may entice producer-country governments to divert public attention from falling revenues through war or seek resources through military conquest, while high prices may result in a combination of increased military capacity and a greater appetite for military interventionism. Internationally, low prices create few incentives among importing countries to maintain stability in oil-producing countries for the sake of affordable oil, while high prices may result in oil consumers opposing political and military support for wealthy regimes. In turn, political instability and hostilities taking place in oil-producing countries, especially major exporters, influence price movements.

The oil boom of the 1970s brought massive increases in fiscal earnings for producing countries through nationalizations, contract renegotiations, and rising oil prices. Greater financial strength and autonomy, however, created many challenges as fast-growing, overstretched, and sometimes fledgling bureaucracies faced new or increased expectations from the population and ruling elites. With the collapse of oil prices in the 1980s, states became doubly weakened. Financially, petro-states faced massive indebtedness – a "debt overhang" that resulted in part from the overoptimism and fast growth of the boom period. Bureaucratically, petro-states faced new challenges of underfunding and accompanying structural adjustments.

The mismanagement of the boom and bust cycle of the 1970s–1990s had major geopolitical dimensions and consequences. It contributed to the collapse of the Soviet Union as a drastic fall in oil revenues after the mid-1980s precipitated the need for reforms and undermined their implementation. It drove Iraq to first invade Iran in 1980 when wealthy, and then Kuwait in 1990 when broke. And it contributed to a growth collapse and deepening cycle of corruption, resistance, and repression in countries such as Algeria and Nigeria. As the oil price went down to an all-time low of US$9 per barrel in December 1998, anxiety built up that cash-starved oil exporters facing restive populations would descend into civil war if the glut in the oil markets continued. Eurasian and some of the Persian Gulf countries were the most at risk.[13]

Saudi Arabia raised the most concern, as unemployment grew and dissent became more vocal, notably among the Shi'ite minority residing in the Eastern Province, the richest oil area of the country. By 2000, even Saudi Arabia had accumulated a national debt of US$36 billion, while its GDP per capita plummeted from US$35,000 in 1980 to stagnate at around US$20,000 since the mid-1980s. In common with other oil-dependent countries, low oil revenues exacerbated domestic grievances and tensions, particularly against national authorities perceived to be unable to harness oil wealth for the benefit of people. When Saudi dissidents struck at the World Trade Center in September 2001, much of Saudi Arabia's population had been experiencing economic decline. As in other countries, oil revenues incited radical opposition and divisive identity politics even among the elite. Chief among these was Osama bin Laden, who in 1995 publicly blamed Saudi King Fahd and his "elite circle" for the poor state of the economy and their "wastefulness" in building palaces. Bin Laden also denounced King Fahd's financial backing of former ally Saddam Hussein, the lowering of oil prices "to harm Iran during the war with Saddam" and to serve western interests, useless and corrupt spending on inadequate military equipment and the payment of the coalition's bill for the Gulf War, and the "lack of serious action to find other sources for income." He denounced the US–Saudi agreement on low oil prices during the 1990s as "the greatest theft in history", estimating an annual loss of US$1,200 for every Muslim in oil-exporting Islamic countries. The Saudi regime faced serious grievances during the 2011 Arab Spring, yet it proved resilient in part by announcing the redistribution of US$130 billion from oil revenues amassed during the recent boom, through salary increases, low-cost housing, and social benefits. The Kingdom has also launched a “National Transformation Program” to reduce oil dependence, boost the private sector, and create a massive sovereign wealth fund through selling part of the national oil company Aramco. Such reforms are necessary, although they are made more challenging in a context of lower oil prices, dwindling cash reserves, and reduced public spending. They also face resistance both from some elites and the general population.

Corruption is a major problem in many oil-producing countries, generally resulting from the volume and concentration of revenues, the discretionary power of authoritarian elites, the relative absence of businesses and civil society organizations financially independent from oil rents, and the collusion of some international banks. Corruption and misguided policies in Nigeria mean that more than half the population lives on less than US$1.25 per day, despite oil government revenues of about US$550 billion since the end of the Biafran War in 1970. The late Nigerian President Abacha and his family and collaborators embezzled between US$2.3 and US$5 billion over a four-year rule, with the assistance of at least 23 banks, many from Switzerland and the UK; about US$1.2 billion was later recovered by the Nigerian government. Equatorial Guinea’s president Obiang and his family have come under repeated anticorruption and moneylaundering probes, with French courts seizing some of the assets of the president’s oldest son.

Corruption and its redistribution through political patronage is sometimes perceived to “keep the peace” through handouts to vocal opposition groups. There is often a tension, however, between local political and corporate elites capturing the share of oil revenues and local communities who see few benefits, especially in production areas where the gap between commitments by authorities to reward and compensate local populations and what they actually receive is wide – as documented for the Niger Delta, the Angolan enclave of Cabinda, or Western Siberia. More broadly, tensions frequently run high between the central government and communities in oil-producing regions who perceive themselves as the rightful owners of the oil, leading in turn to the rest of the population resenting unequal treatment.

The risk is that volatile prices will exacerbate tensions, both within countries over the redistribution of oil revenues and internationally between importing and exporting countries. Higher prices could in principle benefit poor countries that experience protracted periods of conflict, such as Angola and Sudan, through both economic recovery and greater political stability. Much will depend, however, on the quality of domestic governance and the legitimacy that governments gain through wealth redistribution. Efforts to improve governance and thus reduce the risk of corruption have so far focused on revenue transparency and accountability, including the Extractive Industries Transparency Initiative (see Box 6.3), and the more rigorous application of legislation such as the US Foreign Corrupt Practices Act (see chapter 8).

Although many oil-producing countries suffer from poor governance, including corruption, it is important to note that many governments (and individual officials) are attentive to reducing extreme poverty in order to avoid grievances and conflicts. They are less attentive to the inequalities which can be rife but frequently "invisible" because of an absence of official statistics (as for many Persian Gulf countries), or hard to detect by usual survey methods due to the extreme concentration of wealth. Governments may seek to prevent local grievances and preempt a secessionist struggle by granting local populations some autonomy and revenue compensation. Nonetheless, many countries have experienced secessionist struggles in oil-rich regions (see Table 6.3), while high debts, declining oil prices, and demands for democratization have set the context for civil wars, as in the case of the Republic of Congo in the mid-1990s.[14]

## Box 6.3 Oil revenue transparency

Calls for greater transparency in oil revenues emerged in the late 1990s as part of an anticorruption advocacy campaign by British NGO Global Witness and international financier George Soros, demanding that oil companies "publish what they pay" to governments. Motivated notably by BP's stakes in Angola and the Caspian, British Prime Minister Tony Blair launched in 2002 the Extractive Industries Transparency Initiative (EITI), a voluntary process whereby governments agree to minimal criteria of revenue transparency in order to participate and gain compliance status. The criteria require extractive companies (including state companies) to publish their payments to governments, governments to publish what they receive in revenue from companies, and an independent audit reconciling the payments and revenues to note any discrepancies. In addition, the initiative requires the active participation of civil society in the design, monitoring, and evaluation of the audits. By June 2016, the EITI had validated 31 countries, and 20 other countries were working toward compliance validation. Several countries long targeted by the initiative, including Angola (which motivated Global Witness to launch transparency initiatives in the first place), are still not participating in the initiative, but new mandatory legislations are also pushing the transparency agenda, such as the US Dodd–Frank Wall Street Reform and Consumer Protection Act which mandates the US Securities and Exchange Commission to require disclosure of payments to governments by publicly listed oil companies. More broadly, there is also growing momentum to require contract transparency and disclosure of beneficial ownership, which will assist civil society and parliamentarians to assess whether a country is getting a "fair deal" and who ultimately benefits from extractive activities, and to check if payments match agreed terms.

Table 6.3 Secessionist conflicts in oil-producing countries

| ***Country*** | ***Region and duration*** |
|---|---|
| Angola | Cabinda (1975–2002) |
| China | Xinjiang (1991–ongoing) |
| Indonesia | Aceh (1975–2005) |
| Iran | Kurdistan (1966–ongoing), Arabistan (1979–80) |
| Iraq | Kurdistan (1961–2003) |
| Nigeria | Biafra/Niger Delta (1967–1970, 2004–ongoing) |
| Sudan | South Sudan (1983–2005) |
| Yemen | South Yemen (1994) |

## Conclusion

The growing availability of cheap oil since the beginning of the twentieth century boosted economic growth for those economies that could command it. In the United States, oil first revolutionized the conditions of agricultural and industrial production in the early decades of the century, and then transformed the conditions of consumption in the immediate post-World War II years. Cheap oil was at the heart, therefore, of a modernizing economic development model. If oil has been replaced by gas and electricity in some heating and power applications, its role in transportation and manufacturing remains central to the contemporary consumerist, trade-based model of development. For both oil-exporting and -importing countries, the price of oil continues to be a critical influence on rates of economic growth.

Oil poses major development challenges for oil producers, both economically and politically. As discussed in greater detail in chapter 7, sound policies and robust institutions can help alleviate these problems. Norway has avoided some of these problems by investing oil revenues into a public pension, worth nearly 900 billion dollars in 2015, knowing that its population was aging and that oil windfalls would distort its advanced but relatively small economy. But many poor countries cannot afford to follow this “savings” approach, given the dire needs of their population. Governments must be attentive to buffering economic shocks but also invest wisely to reduce poverty, promote long-term growth, and ensure the sustained affordability of public expenditures. The catch is that oil dependence tends to foster and sustain authoritarian regimes relying on a mix of populist welfare policies, repression, and foreign support. These problems are generally exacerbated in low-income countries with high oil dependence but relatively low oil abundance generating small per capita oil revenues. Low-income oil-importing countries also face oil-related development issues resulting from high oil prices and petrodollar recycling.

The strategies mentioned above are for the short term only, given that shifting supplies, demand trends, and prices will affect oil's political economic landscape for decades to come. Two major issues arise in such a context. First is the short-term issue of oil's affordability and growing price volatility. Much of the domestic and international politics of oil revolves around the way energy markets and the geopolitical strategies of oil-exporting countries can exacerbate economic crises. "Oil shocks" are often blamed for these crises, though their origins often do not lie in the policies of oil-exporting countries but in the unsustainable fiscal and trade deficits of major importers. The 1973 oil crisis, for example, can be traced back to the end of the convertibility of the dollar to gold in 1971, itself the result of US inflationary deficit spending partly associated with the Vietnam War. The rise in oil prices from US$20 to over US$140 per barrel between 2000 and 2008 underpinned the fundamentals of tighter supplies in the face of fast-growing demand. But it was also linked to mounting US debt, US dollar devaluation, and the wars in Afghanistan and Iraq. Betting on sustained Chinese growth and seeking shelter from a depreciating US dollar, financial markets invested massively in primary commodities, including oil, thereby further increasing prices and volatility. Oil exporters saw major revenue windfalls resulting from these two crises. However, history indicates that the ability to turn such windfalls into longer-term development gains is mixed.

The second issue relates to the longer-term prospects of oil availability. As further discussed in chapter 7, oil may need to be reserved for economic sectors where it is hard to substitute by placing, for example, a much higher value on the chemical diversity of hydrocarbons than on their combustible properties: burning the essential building blocks of chemical engineering may one day seem as short-sighted as clearing tropical forests rather than harnessing their biodiversity. Pricing can help address such sector prioritization, and the ethical issues surrounding the allocation of oil, by moderating the tendency for consumption (and $CO_2$ emissions) to rise as a result of low prices. Governing oil for development is also about increasing the affordability of fuel where it can play a critical role in poverty alleviation, such as poor populations in rural areas.

Oil-fueled development now faces the dual challenge of volatile oil prices and climate change, both of which call for an alternative to hydrocarbon-fueled growth. The underperformance of many oil-exporting countries in the wake of the 1970s' oil boom also points to the challenge of securing development from this extractive sector. The price picture, climate change, and the "oil curse" need not lead to fatalism, however. The oil intensity of growth is decreasing in many economies, there is growing awareness about climate change, and international policies are seeking to address the institutional challenges of oil dependence on a more systematic level. For optimists, oil helped build the modern economies from which smart energy alternatives are beginning to emerge. For pessimists, the continuing prominence of oil will expose countries to the violence of volatile prices, environmental pollution, and climate-related extreme events for decades to come. From this perspective, the economic, social, and environmental costs and injustices of oil will continue to mount before an eventual "end of oil" forces those dependent upon it to hastily restructure their economies and adopt alternative developmental paths responding to new energy constraints. Either way, change is required: policy makers and consumers thus face the option of enacting changes now and reducing the costs of a delayed transition, or upholding the status quo and facing its long-term consequences. As we discuss in the following two chapters, a number of institutions and initiatives can help ease the necessary transition. By starting the process of change rather than deferring it, and working across multiple sites, these initiatives can help ensure that developing beyond oil does not sharpen inequalities and aggravate environmental impacts.[15]

# Notes

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5. Statistics from Baker Hughes, CIA *World Factbook*, EIA, Greenpeace, National Academies, World Health Organization, and M. R. Raupach et al., "Global and Regional Drivers of Accelerating $CO_2$ Emissions," *Proc. Natl. Acad. Sci. USA* 104(24) (2007): 10288–93.

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# CHAPTER SEVEN
# Governing Oil

Oil is still a fuel without equal, yet its dominance is assailed from every quarter. More oil is being produced, refined, and sold than ever before but the rules of the game are changing. First, the need to decarbonize the global economy is increasing pressure to shift away from fossil fuels. In the 1970s, oil used to account for about half of all greenhouse gas emissions attributable to fossil fuels. Although its relative contribution has subsequently declined to about a third, total oil-related emissions have grown over 40 percent since the 1970s, so that oil remains a major contributor to climate change. Oil companies have been called upon for some time to account for the emissions of greenhouse gases associated with producing, refining, and transporting oil. They are now being asked to bear responsibility for the "ultimate downstream" or backstream – the fate of the carbon dioxide and other pollutants produced by fuel combustion. The Paris Agreement on climate change should progressively reshape the energy sector as the 195 signatory states implement agreed cuts on carbon emissions. However, honoring their commitment to limiting "the increase in global average temperature to below 2°C above pre-industrial levels" will leave producing countries and oil companies with "unburnable" reserves. Climate commitments, then, have the potential to create "stranded assets" raising thorny budgetary concerns for countries dependent on oil production and export for revenue, and strategic planning and corporate valuation issues for oil companies and financial firms (see Box 7.1).[1]

## Box 7.1 Oil governance and the Paris Agreement on climate change

The United Nations Framework Convention on Climate Change adopted in Paris on December 12, 2015 represents a global commitment to reduce greenhouse gas (GHG) emissions. The Paris Agreement is potentially a "game changer" for the oil industry, if countries follow through on their promises and adhere to the principle of progression, which requires them to increase their efforts over time. Sharp reductions in oil demand and more drastic regulations on the carbon footprint of fuels could lead oil-producing countries and some companies to end up with "stranded assets" – oil reserves or investment projects included in financial evaluations that would prove "undevelopable" as a result of market or regulatory changes. Yet, with each country setting its own voluntary contribution to reduce GHG emissions, with each initial commitment insufficient to limit temperature rise below 2°C, and no enforcement mechanism, the Paris Agreement is relatively weak.

Perhaps in recognition of this fact, the oil industry appears to be adopting a "business as usual" approach, as seen with Exxon forecasting that 80 percent of global energy consumption would still come from fossil fuels by 2040. Most oil industry players have now recognized anthropogenic climate change and its negative impacts, and many oil companies have supported the Paris Agreement. If skepticism and resistance to climate regulation characterized the industry's historic response, the new strategic move of a number of leading international oil companies is to advocate a solution combining a global carbon price and technologies of carbon capture and storage. This would position the industry as a carbon manager and prolong the use of fossil fuels, although with a rebalancing away from coal and toward gas. This approach allows the industry to justify production growth on the argument that future technical solutions will deal with future emissions. Yet, despite some progress, global carbon pricing has proved difficult to extend and implement at a global scale, while research for capturing carbon from vehicle emissions faces major challenges. Should the Paris Agreement prove a more effective approach than the 1997 Kyoto Protocol, the oil industry may be better advised to shift toward a broadly defined role of an emission-free energy provider, rather than intensifying its current role as a peddler of carbon.

Second, growth in conventional oil production has stalled, and the iconic firms of Big Oil have steadied their reserves only by moving heavily into either gas and/or nonconventional oil. New production is coming increasingly from lower-quality reserves, in more technically demanding environments, and from settings which present complex social and political dynamics. Meanwhile, the growth of the "rising powers" (such as India, China, Indonesia, Brazil, South Africa, and Turkey) and a rapid expansion of the global middle class has shifted the geography of consumption over the past two decades, with non-OECD consumption now representing about 60 percent of global demand. Rapid changes and higher uncertainties in oil markets have contributed to highly volatile prices, a major concern for companies, governments, and consumers. High prices during 2005–14 made the fuel unpopular, unsettling some of the conditions that give oil its immense cultural power and creating economic and political conditions more conducive to change. Lower prices for oil and petroleum products, however, have since improved public opinion about the industry: in the US, the oil and gas industry went from a low of 15 percent positive opinion in 2008 to about 35 percent by 2015.[2]

Third, the performance of the industry is increasingly scrutinized, not only in terms of contribution to climate change and other forms of pollution but in relation to broad political and social grounds, including ties with authoritarian regimes, corruption, and developmental failure. The oil sector is thus feeling the pressure as it responds to a growing diversity of demands and stakeholders. Many consumers loathe the idea of their gas money ending up in the coffers of corrupt and oppressive oil-funded rulers, or paying for troops to either support or bring down these regimes. Local populations and advocacy organizations, meanwhile, are increasingly demanding change and calling the industry to account.

Fourth, competition is rising, both within the industry through new oil sector processes (e.g. enhanced recovery) and the growing number of major firms operating internationally, as well as outside the industry through improved technologies (e.g. increased and cheaper battery storage). The implications of these pressures, however, are unclear. There is no consensus on whether oil's primacy will be lost, at what speed this might happen, what the consequences may be for producing and consuming countries as well as, more broadly, for geopolitics and the global economy. In some of the most cataclysmic accounts, major consuming countries will fight over the last reserves while experiencing domestic economic upheaval and social unrest. Meanwhile, exporting countries facing depletion may experience the decline (if not collapse) of their economies, while the few remaining major producers will seek to assert their autonomy in the face of mounting foreign interference. Under optimist scenarios, demand reduction and fuel switching will draw oil's "Age of Plenty" to a close. The most environmentally and socially contentious oil projects will be dropped, a new post-carbon economy will renew prosperity, and the geopolitical significance of oil-rich regions such as the Persian Gulf will slowly decline as innovations in transportation and more widespread unconventional exploitation diversify supply. Business-as-usual scenarios predict that technological progress and commercial incentives will sustain a long undulating plateau of relatively constant oil production until the end of the twenty-first century, with unconventional sources of oil taking a larger role. In the context of uncertainty over the future of oil, this chapter sets out to explain how oil can be governed.

At the moment, the governance of oil – by which we mean the set of rules and organizations that guide how decisions over oil are made and the inclusion (or exclusion) of different stakeholders in those processes – is fragmented and incoherent, consisting mostly of a diverse range of institutions such as financial markets, and a patchwork of organizations with mandates focusing on the vested interests of their members. Furthermore, the prevailing institutions and mechanisms for governing oil are ill-matched to the new challenges at hand. Some hoary challenges of governance endure – such as matching oil supply and demand (the focus of both OPEC and the IEA) – but such concerns are now surrounded by a host of others that define the "new geopolitics" of oil (as we discuss in chapter 8). The goal of governance now should be to shape the future of oil in ways that reduce price volatility, improve oil's contribution to development in producing countries, and ensure transition to a more diverse and less harmful energy system.

Most governments consider oil to be a strategic commodity, one that links economic development and national security like no other – even if oil is paradoxically one of the most abundant and freely traded resources. Many governments are highly dependent on oil revenues, whether through export revenues or fuel taxes, and wary of popular reactions to oil price volatility. With some of the largest corporations in the world, the three trillion-dollar oil industry can influence both oil-fueled dictatorial regimes and money-driven electoral democracies. Consumers have a sense of entitlement about oil and see little way out of their "addiction." So how to govern oil rather than be governed by it?

## Addressing the oil governance deficit

Oil governance institutions are thinly developed at the international level, particularly so given the size of oil trade and the diversity, importance, and rapid evolution of issues associated with the oil sector. We argue here that the current institutions are not up to the job as both the oil production network and expectations about how it should perform (for whom, over what timescale) are changing in significant and enduring ways. The absence of a proactive governance regime can be attributed to four factors, all of which are evolving. The first one is ideological, and concerns the divide between those who believe energy investment, prices, and demand should be left to the virtues of the market, and others – by far the largest group historically – who believe that national sovereignty and government action are key to energy security (see Table 7.1). The views of economic liberals came to dominate during the 1980s and 1990s, when low prices and resource plenty pushed the energy privatization and liberalization paradigm. The 2008 financial crisis demonstrated that markets could lead oil prices to reach unaffordable levels for many people, and then collapse to such low levels that many oil development projects were suspended for at least a year, resulting in pro-cyclical effects that exacerbated price volatility and supply uncertainty. As prices rose and supply security concerns have increased over the past decade, the arguments of interventionists (e.g. US "stabilization forces" in the Gulf) and isolationists (e.g. "drill, baby, drill" of the 2008 Republican campaign) seeking to maintain oil governance within a unilateral or sovereign sphere have made a comeback. Yet neither market forces, isolationism, nor unilateral policies alone will succeed in achieving the goals of securing environmentally and socially sustainable energy. Cooperative international strategies are required and the views of reformers need to gain further ground.

Table 7.1 Main positions on oil governance

*Source:* Adapted from M. E. S. Said, "Global Civil Society: Oil and Activism," in H. K. Anheier et al. (eds), *Global Civil Society 2004/5* (Sage, 2004, pp. 76–93).

| ***Categories*** | ***Main perspectives and policy positions*** |
|---|---|
| Interventionists | Access to oil is strategic and requires unilateral interventions, including support for local regimes (even if authoritarian as long as allied) and hardened supply security infrastructure |
| Isolationists | Dependence on foreign oil is costly and can only be resolved through energy independence (even at the cost of greater environmental impacts) |
| Liberals | There is no oil curse and market mechanisms can address oil shortages and climate change |
| Reformers | Cooperative institutions can help resolve complex challenges and international tensions over oil |

Most governments have been eager to maintain sovereignty over energy issues, yet sovereign control has been fast shrinking as a result of increasingly global energy markets and the need to address oil's many social and environmental impacts. The mid-twentieth-century tradition of state monopolies on energy delivery, itself largely the result of the "natural monopoly" created by the huge capital costs of utility infrastructures, is increasingly giving way to private operators. Even the "national" oil companies are increasingly coming under extra-jurisdictional forms of governance, whether through public listings on foreign stock exchanges or reputational exposure to NGO campaigns. Paradoxically, governments are thus more in need of effective international energy governance, yet they remain wary of the implications of international governance instruments that would limit their control over energy policy – whether these deal with subsidies, access to resources, or the protection of a domestic energy industry.

The rules of the World Trade Organization (WTO) do not specifically deal with the energy sector, despite its significance in global trade, and although basic WTO rules should apply to the energy sector, it is rarely the case. Several key oil and gas producers, including Algeria, Azerbaijan, Iran, Iraq, and Libya, are still in the accession process. Negotiations over energy services began in 2000 and exclude resource ownership issues. There is a consensus around the importance of a WTO Framework Agreement on Energy that would help coordinate a shift toward clean energies, without countries fearing trade sanctions. Such an agreement would not only aim at reducing $CO_2$ emissions, including by reducing consumption subsidies, but also at making clean energy more affordable. Critics fear a further privatization and liberalization that would undermine sovereign control over energy issues and increase disparities in energy access.[3]

A second reason for the lack of proactive governance is the temporal and spatial disjunctures between consumers, politicians, and the corporate sector. While oil markets are global and oil supply is shaped over decades by the rate and pattern of investment, politicians and consumers operate under local considerations and over short time spans. Constrained by electoral cycles and populist policies, some politicians seek to win votes by cutting taxes, and regard gas prices at the pump as a barometer of popularity and confidence in the economy. Proactive intervention to reshape consumers' habits (or gas prices) is subject to political disincentives that have not, to date, been surmountable in most countries.

The third factor is geopolitical. The global oil economy is frequently perceived as a zero-sum game – a "battle for barrels" as Duncan Clarke puts it – whereby producers and consumers compete for a larger share of the oil pie. This perspective is driving countries such as China to increase "equity oil" from overseas fields, underpinning an agenda of “oil independence” in the US, and causing OPEC countries to maximize revenues rather than optimize a long-term production/consumption balance. As we have shown in previous chapters, the geopolitics of oil are complex and interdependent. There is still too little international cooperation to bring about meaningful reductions in oil consumption and more sustainable models of development. In the absence of a global and cooperative approach, market prices and unilateral state interventions (including through the use of “equity oil” as supply insurance, consumption subsidies as instruments of regime survival, and oil embargoes as foreign policy tools) will continue to create anxieties and tensions.

The fourth reason why governance institutions are poorly developed relates to the character of the wealth generated by the oil sector. Attracting foreign investment and accessing markets are two major drivers of participation in international institutions. Yet oil-exporting countries rarely face these economic pressures as they can readily attract oil investments and access oil markets. As a result, oil-exporting countries tend to be less cooperative internationally across a broad range of issues and institutions. On the corporate side, oil companies tend to favor self-interested bilateral arrangements with individual host governments. As explained below, they frequently leverage their massive profits, organizational size, and transnational character to insulate themselves from outside pressures to integrate “externalities” and seek instead to exert political influence to bolster their interests. Even national oil companies supposedly responding to the priorities of their “home government” often constitute “a state within a state,” with their own budget, hierarchy, and security. Such insulation can make them “self-serving,” with policies that do not always serve the public interest and employees enjoying benefits of which other civil servants may only dream. Oil companies mostly exert their influence through hundreds of millions of dollars spent on political lobbying and electoral campaign funding. For example, Shell and BP reportedly spent around US$15 million and US$9 million respectively in the 2012 US election cycle. To this can be added, for example, the US$40 billion spent annually on advertising by the car industry to promote vehicle sales and use. Such influence affects regulatory processes. Oil firms in the US have lobbied for years against emissions reductions to mitigate climate change impacts. Now, in the post-Paris context, a number of large integrated oil firms are seeking to shape climate policies by actively promoting national and regional carbon taxation policies and an international framework for linking them together. Six European companies (BP, Shell, Eni, Total, Statoil, and BG Group) proposed this measure in the run-up to Paris. Several other companies (including ExxonMobil) have subsequently come out in favor of a carbon tax, lobbying political representatives in the US and elsewhere in support of this position. A carbon tax favors integrated oil and gas companies with a significant portion of gas in their portfolio (because of its lower greenhouse gas emissions relative to oil), and would shift some of the burden of mitigating climate change onto consumers. Within the US, however, it is opposed by most independent (i.e. non-integrated) upstream oil producers and refining companies. Oil companies have also lobbied around international accounting standards, with the industry successfully capturing regulatory process to ensure that new regulations on financial disclosure that would help pinpoint tax evasion and corruption merely codify existing industry practice. Genuine corporate altruism is a rarity, and this is why governance institutions – ranging from mandatory regulations to market incentives and consumer values – have such a key role to play in reshaping the oil production network and improving its impacts. The debate over corporate social responsibility (CSR) is informative, here, with many oil companies at the forefront of accusations of environmental and human rights abuses. While CSR has evolved from a tool deployed to compensate and "pacify" local communities in production areas, it is now scaling up to governance issues in host countries and global environmental and financial responsibilities. The playing field among oil companies is far from level, given their diverse sizes, relative influence, and exposure to reputational risks, while the effectiveness of accountability processes in producing and consuming countries remains generally weak. Beyond the reinforcement of "voluntary" norms and the capacity of civil society to hold companies to account, this requires broad mandatory instruments backed by stringent enforcement.[4]

## Oil governance actors and institutions

The future of oil will emerge from the interaction of three broad groups of actors: the oil companies and financial firms controlling investment and production decisions, international organizations and governments of exporting and importing states, and civil society organizations (CSOs) demanding change and seeking to hold corporations and governments to account. For most of the twentieth century, oil companies and governments dominated oil governance processes. There were primarily three issues that defined governance in this period: market share and prices in conditions of oversupply; security of supply in the face of market failures as a result of adverse geopolitical and natural disaster events; and access to sovereign resources. For the most part, governments and companies engaged international oil governance as a zero-sum game in which access to oil (and oil markets) underpinned economic growth, political clout, and military power. Oil security may be a global affair that no country can single-handedly address, yet nationalist agendas and commercial competition have dominated public policy and markets. Most governments have treated energy policy as a sovereign matter, cooperating only in their self-interest and generally along the lines of core producer or consumer groups. The formation of OPEC in 1960 – and its actions a decade later – demonstrated the potential of cooperation among states to transform the international political economy of oil. The formation of the International Energy Agency (IEA) in 1974 likewise showed how states – in this case, OECD countries – could work together on a common agenda around oil. Yet OPEC and IEA also sharply demonstrate the limits to cooperation, both within each organization – as demonstrated by the distortions or non-observation of production quotas within OPEC – and between them. Each represents a different end of the oil production network, and they operate as restricted-access producer and consumer clubs that, for the most part, look after the interests of their members. Given the international governance vacuum, the IEA has gone beyond its initial mandate of protection against supply shock to serve as a major information provider and forum on a broad range of energy issues, including efficiency and sustainability – yet there is a need to broaden its membership (to include Brazil, China and India) and mandate to make it more effective.

Besides OPEC and IEA, multilateral approaches to energy governance have been relatively slow to emerge and most are focused on treaties seeking to facilitate capital flows and investments. With the end of the Cold War, the European Council launched the Energy Charter Treaty (ECT) to engage former communist countries and focus on energy efficiency and environmental aspects of energy security. In force since 1998 and frequently beset by conflicts over Russian gas flows to Central and Western Europe, the ECT remains a Eurasian club whose signatories agree to rules on investment, trading, and transit issues. Bernard Mommer, Venezuela's one-time representative to OPEC and a critic of these recent multilateral deals, derisively describes them as part of "a grandiose framework of international trade and investment treaties, an attempt to create one global economy united by free trade and free investment [in which] mineral resources would be subject to the global sovereign: consumers."[5] Yet, in practice, many free trade agreements have created exceptions where oil is concerned. The North American Free Trade Agreement in 1994, for example, prohibits governments from interfering with the "normal functioning" of energy markets, but excluded Mexico's nationalized oil sector from liberalization and opening to private investments.

The transformation of the oil sector over the past two decades has helped reshape the international oil governance landscape. It has created a broader energy agenda that encompasses a greater concern for the environment and sustainable forms of development in oil-producing countries, and includes major new oil importers. It has also driven the emergence of several new international organizations (see Table 7.2). The International Energy Forum (IEF) serves as the broadest oil governance initiative by organizing the world's largest gathering of energy ministers, while a new International Renewable Energy Agency (IRENA) is charged with promoting a rapid transition to renewable energies. These two international energy institutions – IEF and IRENA – are hosted and chiefly sponsored by oil and gas producers (Saudi Arabia and the United Arab Emirates), and both are outside the UN which, for some, raises questions of representation and legitimacy.

With both the IEA and OPEC Secretariats on its executive board and major other energy players such as China, India, and Russia among its 73 members, the IEF acts as the (still informal) conduit for negotiations between oil and gas exporting, importing, and transit countries. The IEF also involves major energy companies through its International Energy Business Forum (IEBF), but representation of low-income countries and civil society organizations remains limited. Given its links with the IEA and especially OPEC, the IEF is mostly a "fossil fuel" organization focused on market outlooks. Concrete policy outcomes remain essentially limited to the application of the "transparency" and "reliability" principles on oil data through the Joint Organizations Data Initiative. Backed by the G20, and collaborating with the other agencies in their respective domains, the IEF could become the core institution of international cooperation on oil governance and energy more broadly, but it remains for now a "soft institution" promoting informal dialogue rather than negotiation or arbitration. IRENA has rapidly matured since its inception in 2009, reaching a membership of about 178 states by 2016. The organization is mostly focused on assisting countries in their transition toward renewable energy through information exchange, policy forums, market reforms, clean energy corridors, and improving access to renewable energy for low-income populations.[6]

Table 7.2 Oil- and energy-related international initiatives and organizations

*Note:* Acronyms not listed in this chapter include WPC: World Petroleum Congress, IPC: International Petroleum Council, GCC: Global Climate Coalition, GGFR: Global Gas Flaring Reduction initiative.

*Sources:* Websites of organizations by mid-2011.

| *Organizations* | *Creation* | *Mandate* | *Members* |
|---|---|---|---|
| WPC | 1933 | Dialogue among stakeholders, especially intra-industry exchanges | 60 countries and numerous professionals |
| IPC | 1944 | Foster an international agreement for the "orderly development of the international petroleum trade" | US and UK, but failed |
| OPEC | 1960 | Price control through oil-production quotas | 12 producing countries |
| IEA | 1974 | Supply security among OECD members | 28 countries |
| GCC | 1989 | Prevent actions seeking to reduce GHG emissions | Mostly US oil and auto industry |
| IEF | 1991 | Meeting of Energy Ministers from producing, consuming, and transit states | 87 countries |
| ECT | 1994 | Facilitate energy cooperation among Eurasian states | 51 member countries, 24 observer countries |
| UNFCCC | 1994 | Climate change mitigation and adaptation (including via Kyoto Protocol, 1997) | 195 member countries or parties |
| US–UK Voluntary Principles | 2000 | Reduce risk of human rights abuses by security forces protecting production sites | 6 countries, 18 companies, and 8 NGOs |
| GGFR | 2002 | Reduce gas flaring from oil production | 22 countries, 19 companies, 5 IGOs |
| EITI | 2003 | Revenue transparency | 28 producing countries |
| UN-Energy | 2004 | Promotion of energy access, renewable energy, and energy efficiency | World Bank and UN agencies |
| IRENA | 2009 | Adoption of renewable energies | 148 countries |

## ***Widening the circle: civil society organizations take on oil***

By the early 1990s, civil society organizations increasingly brought environmental and social issues to the forefront of the oil governance agenda, though more often in the form of event-focused protests, boycotts, or advocacy campaigns than a systematic drive to change policy. Several prominent actions by local communities put corporate social responsibility and indigenous rights on the agenda, such as the struggles of the Ogoni people in the Niger Delta in the mid-1990s and U'Wa in Colombia. An international campaign initiated in the late 1990s against the construction of the Baku–Tbilisi–Ceyhan (BTC) pipeline denounced both the geopolitical motives of this energy supply infrastructure (seeking to bypass Russia and Iran) and its human rights and environmental impacts. Prominent campaigns in the first two decades of the twenty-first century included attempts to stop the exploitation of oil in the Arctic and tar sands in Alberta, and bring about greater transparency and accountability in oil-revenue flows through the Publish What You Pay campaign. As we describe in chapter 4, NGOs and activist organizations have also taken to task the philanthropic role of oil companies in the arts and sought to counter the cultural "lock-in" of petroculture. This groundwork, along with mounting evidence of an "oil curse" and the many problems associated with oil mismanagement, broadened the international oil governance agenda to include a diverse range of issues including climate change, corruption, and human rights.

Some companies have responded to these campaigns, with European oil corporations often the first to do so. Shell agreed in 1995 on the need to prepare for a transition to renewables. BP's CEO acknowledged the growing scientific consensus on climate change in 1997 and sought to express the need for an energy shift by rebranding the company from "British Petroleum" to "Beyond Petroleum" in 2001. In contrast, companies such as ExxonMobil continued to lobby against GHG emission reduction measures, most notably through the Global Climate Coalition (GCC) – a US-dominated industry lobby set up in 1989 – and despite contrary evidence from their own scientists. Deactivated in 2002, some of the lobbying activities of the GCC against emission cuts are now pursued by the American Petroleum Institute, the lead US industry association. The industry as a whole has focused on better managing emissions from upstream and midstream operations to lower its polluter profile, developing alternative fuels and energy sources to diversify its portfolio and help legitimize any "green" credentials and, in some cases, helping consumers to offset their emissions. Yet the industry has also maintained old lobbying habits, as demonstrated in the case of the Keystone XL pipeline – planned to link the tar sands in Alberta to the US Gulf Coast refining and shipping complex – which saw the pipeline company and the Harper government in Canada unsuccessfully hard-sell the project to US authorities in the face of widespread public opposition, and later sue the US government for US$15 billion in compensation under the North American Free Trade Agreement. Groups lobbying for the industry have also not hesitated in misrepresenting issues, vilifying opponents, and using the cover of dubious "grassroots organizations" for their public relations ventures seeking to promote carbon-intensive fuels.[7]

Faced with growing accusations of complicity in human rights abuses, oil and mining companies worked in the early 2000s with human rights NGOs and the US and UK governments to curb the risk of abuses by security forces protecting extractive ventures by defining good practices through the Voluntary Principles on Security and Human Rights. The World Summit on Sustainable Development (WSSD) in 2002 provided the context to launch several initiatives, including the Global Gas Flaring Reduction (GGFR) partnership between governments, oil companies, and the World Bank. On that occasion, British Prime Minister Tony Blair also called for greater transparency in oil-revenue flows, leading to the creation of the Extractive Industries Transparency Initiative (see chapter 6).

The results of voluntary schemes have been mixed, however, with critics pointing to the lack of enforcement mechanisms, the limited participation of worst-offending parties, and the “insurance” role against reputational risks that such schemes offer to oil companies in return for little accountability. The UN-Energy mechanism was set up in 2004 to help implement energy-relevant recommendations of the WSSD and the UN Commission on Sustainable Development. Acting as an inter-UN agency coordination body with the collaboration of the World Bank, it seeks to foster greater energy access for the poor, renewable energy, and energy efficiency. Its main potential is in defending the interests of low-income countries that are poorly represented in other institutions, although direct representation would be preferable – rather than via UN specialized agencies and the World Bank. Preexisting international oil-related organizations have also broadened their mandate, with (for example) the International Energy Agency integrating climate change issues following the 1997 Kyoto Protocol, and being mandated in 2005 by G8 leaders to provide advice on energy policy issues linked to climate change. OPEC took an even more guarded approach to resist emission reductions that, from its perspective, would put an “inequitable” burden on its members, stating in 2009 that reductions need to account for “the historical responsibilities of developed countries, the principles of equity and of common but differentiated responsibilities, and fully taking into account the overriding priority of economic and social development and the eradication of poverty." Outside the adoption of the UNFCCC by its members, OPEC's first concrete move was the creation in 2007 of a US$750 million research fund for carbon capture and sequestration.[8] OPEC is worried about discriminatory tax policies negatively affecting oil markets and would only accept climate change-related taxation that would be imposed "on all forms of energy – not just oil – according to their carbon content," a position that would look at life-cycle carbon content, even for renewables.[9]

## The (real) politics of oil governance

In their efforts to maximize profits, oil companies have to account for the respective (and often conflicting) interests of their home government and host authorities. Reciprocally, home governments are often eager to facilitate lucrative ventures by their domestic oil companies which, especially if these are state-owned, can improve energy security and foster other foreign policy goals. Resource diplomacy is thus a major element of foreign policy. Host authorities, in turn, have to ensure that oil companies maximize fiscal returns and do not "sit on their concession." As mentioned above, this tripartite game is complicated by international and domestic civil society groups eager to put human and environmental rights before profits. This combination of profit motive, political sovereignties, and rights concerns has given rise to a governance model that seeks constructive engagement, for example, through the Extractive Industries Transparency Initiative (see Box 6.3).

If international cooperation is crucial to improving energy security and socio-environmental outcomes, many oil policies remain within the domain of domestic governance (see Table 7.3). There, too, major forces are at work. Chief among these is the influence that oil companies and national authorities can bring to bear on each other. Three areas are of particular concern: the influence of oil companies on foreign policy; the protection of corporate interests by domestic governments; and the impact of host governments on oil companies.

### *Oil and foreign policy*

Oil contracts are signed by companies with host governments and typically last for two to three decades, if not more. This means that oil is highly politicized and enters into bilateral agreements over extended periods where it faces the vagaries of political changes and economic cycles. Oil companies generally assume that whoever is in power will need the revenues; but “expropriations” have frequently occurred, and sometimes become a matter influencing foreign policy. If IOCs, and especially NOCs, can generally count on the support of their home government to win and keep contracts, they do not always share the same foreign policy interests. IOCs have the greatest challenges (there are also opportunities) with interventionist governments such as that of the US – the imposition of economic sanctions being a main point of contention. US companies have lobbied hard to prevent or lift embargoes barring them for extended periods from Iran, Sudan, and Libya – to cite only the main ones. They have mostly done so through USA*Engage, a lobbying group formed in 1997 by the National Foreign Trade Council to facilitate trade and corporate investments in countries under sanction, dictatorship, or with a dismal human rights record. US company Gulf Oil (now part of Chevron) was eager to keep pumping oil from Angola, even after a socialist government took power after independence in 1974. The US government opposed this and froze tax revenues owed by Gulf to the new government for two years. In the end, however, it rescinded its ban in the face of growing international recognition of the new regime in Luanda and turned to financing armed opposition through the CIA.

Table 7.3 Oil governance: main goals, activities, and organizations

| ***Goals*** | ***Activities*** | ***Main organizations*** |
|---|---|---|
| 1. Security of energy supply and demand | • Managing petroleum reserves to buffer energy shocks (e.g. strategic reserves)<br>• Energy market information sharing (e.g. Joint Organizations Data Initiative) and analysis (e.g. World Energy Outlook)<br>• Addressing transit route disputes and pipeline politics (e.g. Iraqi Kurdistan exports)<br>• Managing long-term investment issues | IEA, OPEC, IEF, IRENA |
| 2. Economic development | • Reducing energy poverty and managing fuel subsidies<br>• Facilitating technology transfer and cooperation<br>• Managing long-term investment profitability and macroeconomic stability | UN-Energy, WB, WTO, Regional development banks |

| ***Goals*** | ***Activities*** | ***Main organizations*** |
|---|---|---|
| 3. International security | • Addressing the links between oil, international arms purchases and warfare<br>• Addressing sea piracy that targets oil tankers<br>• Reducing and mitigating terrorist attacks on pipelines and energy infrastructure (e.g. cyberattacks) | UN Security Council, Regional security organizations |
| 4. Environmental sustainability | • Facilitating cooperation on global climate change (e.g. fuel quality standards)<br>• Developing alternative liquid fuels (e.g. biofuels)<br>• Reducing pollution deriving from energy production (e.g. gas flaring, spills)<br>• Facilitating carbon pricing policies | GGFR, IEA, IRENA, UNFCC, WB |

| *Goals* | *Activities* | *Main organizations* |
|---|---|---|
| 5. Domestic good governance | • Improving domestic governance of oil sector and revenue stream (e.g. regulatory reforms, capacity building)<br>• Addressing human rights violations associated with extractive industries | IEA, WB, EITI, NRGI, US-UK VP |

Oil companies can push for their home governments to assist in opening up access to oil fields and winning contracts. There is a long tradition of "resource diplomacy" among the home governments of oil companies. Initially pursued through "gunboat diplomacy" and the enthronement of local potentates (so-called "puppet governments"), support for oil companies has mostly given way to a mix of strategies ranging from military and diplomatic support, to bilateral aid and active policy of "noninterference," in effect supporting local regimes against both domestic and external threats. The US, France, and Britain have a long tradition of interventionism, including through military force, as discussed in chapter 5. The US administration liberalized all sectors of the Iraqi economy during its occupation, with the exception of the oil industry. While IOCs were extremely keen to access Iraqi's giant oil fields, there was simply too much legal uncertainty in granting contracts during the formal US occupation and too much Iraqi political opposition to privatizing the two Iraqi NOCs. Even attempts to impose production-sharing agreements (PSAs) met with stiff and successful opposition by Iraqi unions and parliamentarians after these were rightly understood as privatization in disguise. Oil companies ended up having to bid for service contracts earning them comparatively low fees – between 1.3 and 7.5 dollars per barrel – like in most other Persian Gulf countries. Conditions for IOCs under Saddam Hussein had been better – but at that time US and UK oil majors had no access. After US and UK taxpayers spent respectively a total of US$806 billion and US$15 billion for the war in Iraq between 2003 and 2011, the two largest contracts went to ExxonMobil (West Qurna Phase I, 2.3 mmbd) and BP (Rumaila, 2.85 mmdb). Western governments successfully pushed to open up oil and gas reserves in Algeria, following a decade-long civil war, and cozied up to Gaddafi's regime in Libya in a mutually – if relatively brief – profitable agreement over financial compensation for the 1988 Lockerbie bombing, anti-terrorism collaboration, and access to oil fields.[10]

Finally, contractual stability is key for oil companies making huge investments in decades-long ventures. But, as prices rise, host authorities may hope for a larger share of revenues than set by initial contracts. The recent price hikes have generated such demands in many countries, most often in the form of a windfall tax. Oil companies have also sought the support of their home government to ensure stability and to cancel (or compensate for) expropriation by host authorities. International political risk insurance, including that provided by national export credit agencies, offers some limited coverage. Home governments can also seek to leverage their military presence and bilateral aid, the latter being statistically proven to reduce the risk of expropriation.[11] Home governments called upon by oil companies may find the price of intervening on their behalf too high, however, or simply be unable to exert effective leverage. In the context of rising international tension with Nazi Germany, Roosevelt did not want to take the risk of alienating the Mexican government, despite its nationalization of US oil companies in 1938. Following the nationalization of ExxonMobil's assets in Peru in 1968, the US government refrained from taking a hard line with the Peruvian government after being lobbied by hundreds of other US businesses present in Peru and wary of a potential backlash. Most recently, home governments have been frequently called by oil companies to pass bilateral investment treaties that help stabilize their contracts, especially with regard to expropriation in the form of tax increases or asset nationalization. Such treaties facilitate the seizure of overseas assets belonging to host authorities (or their national oil companies). Furthermore, while most contracts include international arbitration clauses in case of conflict, home governments are often called in by oil companies to advise and, where possible, to put pressure on host authorities.

## *Oil and domestic politics*

Oil constrains domestic politics on energy transition in oil-importing states. The degree to which oil is structurally embedded in national, urban, and personal economies means that large proportions of the electorate are exposed to changes in oil prices. This takes a number of forms, but it is around fuel prices for transportation that this exposure becomes clearest. Actions that increase prices risk a strong rebuke from the electorate. The decision to exclude transportation from Phase 1 of the European Emissions Trading Scheme in 2005 reflects this political sensitivity. In many countries, policy choices over fuel taxes, transport infrastructure, and land-use planning have been influenced by the supremacy of cars as a tool and object of economic development. As persuasively argued by political scientist Matthew Paterson drawing on the US experience, states generally promoted the car over its competitors because "of the state's structural role in promoting accumulation, . . . of the consequences of interstate competition, the importance of a car industry for development, and in some instances the car industry's connection to a state's war-making capacities." The lobby of oil, car, and construction companies has been very successful in persuading policy makers, notably in the UK where its proposed plans were readily adopted by the government after World War II. In the US, freeways recycle fuel taxes and keep them away from financing competitors, in contrast to France where road transport competes with the national railroad and most highways are toll roads.[12]

Ironically, it was bicycles that paved the way to the dominance of automobiles: in the UK, cycling lobbyists obtained the improvement of roads, while the decision of activist judges in the US to deny the right of cities to regulate the use of bicycles set a precedent that would later enshrine the freedom of the automobile. Cyclists have fought their way back into the city since the late 1970s in Europe and more recently in the US. City councillors and planners have pushed back against cars, promoting walking and cycling as more socially and environmentally friendly alternatives, and constraining the spaces and speeds allotted to cars. Again, higher-density land-use planning, mixed development, car-free city centers, cycling lanes, hefty car registration fees, and high fuel taxes subsidizing alternative transportation have allowed European countries, and to a lesser extent Canada, to push much further than most US municipalities in challenging the dominance of the car.

Transportation and land-use policies are two significant areas where oil's economic and political power constrains the scope for political action. Others include the regulation of oil production and refining, and the growth of energy markets. The limits of regulation were dramatically exposed by BP's *Deepwater Horizon* blowout and oil spill in the Gulf of Mexico in the spring of 2010. The incident has its roots in reforms for offshore oil leasing first undertaken in 1982 during the Reagan years. The reform resulted in a tenfold decline in fees collected by the federal government and a centralization of regulation and fee collection into a single bureau – the Minerals Management Service (MMS). In 1995, in response to low prices and the squeezed margins of oil producers, Congress passed the Outer Continental Shelf Deep Water Royalty Relief Act that suspended all royalty payments for five years at depths greater than 800 meters. Designed to spur domestic production, this rewarded companies that drilled in deeper water within the five-year window. The result was to lower government take, increase risk-taking behavior on the part of oil companies, and assign regulation of the industry to the branch of government charged with generating revenue by selling leases. Errors in the MMS-approved BP Oil Spills Response Plan suggest the MMS failed in its due diligence, while shortcuts were apparently taken during drilling to save time and money. The blowout that killed 11 crew members and became the largest oil spill in US history was not simply a technical failure but a result of corporate practices focused narrowly on short-term cost management combined with pro-development government regulations carried out by a federal agency facing conflicts of interest (e.g. tax collection) and regulatory capture (e.g. its own scientists being reportedly asked to alter assessments unfavorable to project development). So why has the political process failed to deliver better oil? The apparent political infeasibility of raising fuel taxes, for example, touches upon several cherished ideologies, such as that of "small government," "freedom to roam" (by car), and "market prices." Many critics have also pointed at the political influence potentially exerted by the oil industry through lobbying and political campaign funding.

According to the Center for Responsive Politics, the oil and gas sector spent a billion US dollars on lobbying between 1998 and 2010. The oil and gas industry also has a clear political skew when it comes to supporting presidential and Congressional electoral campaigns, with 75 percent of total sector contributions going to Republican candidates. Despite the industry not being the prime political contributor, ranking only twelfth, critics of Big Oil and former US President G. W. Bush, such as Antonia Juhasz in her book *The Tyranny of Oil*, like to argue that the "oil industry got what it paid for: an administration that has arguably gone further than just about any other in American history to serve Big Oil's interests through deregulation, lax enforcement, new access to America's public lands and oceans, subsidies, tax breaks, and even war." Even with a Democratic majority in Congress after 2006, a bill attempting to eliminate US$16 billion in oil tax breaks to fund renewables ultimately died. A study of political donations by the Center for American Progress found that members of Congress who had voted against the bill had received four times more campaign contributions from the industry than those who voted in favor.[13]

But times may be changing for the oil industry. In the US, three successive Acts since 1991 have sought to rebalance transportation modes. More federal funds are being plowed into transportation alternatives, including walking and cycling, which increased from US$5 million a year in 1990 to about a billion dollars by 2009 (including stimulus funds). After more than two decades of relative deregulation – the result, in part, of intense lobbying to cut costs in order to maintain profits during the doldrums of the 1990s and a pro-industry administration in the 2000s – regulations, including limits on new drilling in environmentally sensitive areas, came back under Obama. The industry also faced more stringent application of some regulations. The Foreign Corruption Practices Act, established in 1977 but long ignored, led to US$1.2 billion in settlements and fines being imposed on oil companies between 2007 and 2010.[14] Elected in 2016, Trump vowed to rollback regulations and nominated a pro-industry cabinet, including ExxonMobil CEO Rex Tillerson as Secretary of State.

## *Producer influence on oil governance*

With volatile oil prices and depleting resources, what will be the influence of oil producers in the governing of oil? Part of the answer can be seen in the growing dominance of NOCs in oil production: producer states are eager to maintain as much control of their oil resources as possible. But this is not the case everywhere, especially in low-income countries with technologically and financially challenging oil fields. In such circumstances, producer governments have generally been more amenable to IOCs (or NOCs), opening their reserves and accepting a lower government take. Nationalizations can have various motives, sometimes overlapping, including increasing government revenues from the sector (especially if contractual terms prevent production increase during low price periods, or do not maximize government share during high prices), taking a popular policy decision to rally support from the population, or gaining political leverage over the US. Companies have responded to threats of expropriation and changes in contracts by suspending expansion of production, as Chevron did in 2002 following Kazakhstan's request to rewrite its 1993 PSA. With a few exceptions, such as Saudi Arabia, Russia, and Venezuela, producer countries have limited leverage over international policy unless spare capacity is low or producer companies cooperate.

Rising oil revenue does not automatically translate into political dominance. International political assertiveness can be forcefully confronted and lead to a pariah status, as in the case of Saddam Hussein's regime and, increasingly, Iran. Many producers are eager to develop or integrate into regional or international governance structure to assert a growing role. Qatar has pursued this strategy very successfully, gaining a degree of influence far beyond its relative size (and even its economic importance) through channeling some of its oil and gas revenues through influential media outlet Al-Jazeera, the hosting of numerous international events (including on progressive oil governance such as the EITI Global Conference), the facilitating of peace talks, and siding militarily with NATO and Libyan insurgents against Gaddafi. As mentioned above, Saudi Arabia and the United Arab Emirates are the host and main backers of three of the four most prominent energy governance institutions (OPEC, IEF, and IRENA). At a regional level, Angola is supporting and hosting the Gulf of Guinea Commission, counterbalancing its more militaristic interventions in neighboring countries such as the Republic of Congo or Côte d'Ivoire. If current reserve estimates are to be trusted, the countries with the largest reserves – many of them in the Persian Gulf – may come to further dominate the market as many smaller producers lose their net exporter status. The main question will thus be what kind of politics these better-endowed countries adopt, whether oil markets will benefit from their domestic stability, and how major importers will react to any supply disruptions. These questions are of course not new, the main new variable being the conduct of China and the deterrence that it may exercise in the type of interventionism that has affected the region for the past century.[15]

## Conclusion

A series of oil governance institutions have developed over time to regulate the critical issues of the day, such as supply security, price, and market access. Until the mid-1990s, the international governance system consisted mostly of three relatively small clubs. The first and oldest is the club of international oil companies, the Seven Sisters, or Big Oil. Although competitive, companies do collude and generally have the same "industry" interests in mind, making it the most cohesive if informal of the three clubs. The second club, OPEC, consists of "developing" oil-producing states, which is now mostly dominated by middle- to high-income Persian Gulf monarchies and dictatorships, which adopted a Third World rhetoric to break the hold of the IOC's club on their resources. Finally, there is the IEA, the club of rich oil-consuming states that seeks mostly to ensure oil supplies by breaking the hold of OPEC through coordination and holding large supply stocks but has come to take on a broader role in energy governance. Although these clubs are marked by competition, both between them and within, they have on the whole cooperated to achieve energy security in a narrow sense: oil could pollute and finance dictatorships, but as long as it would flow at a reasonable pace and price, few club members would bother to challenge the system. These clubs have now lost part of their relevance due to relatively new and cross-cutting issues, such as sustainability, human rights, development, and climate change. The growing weight of economic players like China, India, and Brazil is also questioning the relevance of the restricted membership of these institutions.

The legacy of this system is still in place: the IEF remains an "informal" club through which energy ministers meet. Official sovereignty, and thus supposedly individual interests, are preserved, thereby allowing the most powerful states to still dominate in the absence of a formal collective and representative decision-making process. This system is showing strains, however. Some oil companies, for example, have been parting from the club on certain issues, seeking to build or mend their reputation and market share through good deeds, as seen in the case of climate change or revenue transparency.

One of the major drivers for this shift has been the effectiveness of a number of civil society movements and advocacy campaigns which, from the early 1990s, successfully moved issues such as indigenous rights, environmental protection, or corruption onto the oil governance agenda. Part of that effectiveness relied on broader shifts in the processes and agenda of international governance, the end of the Cold War and institutionalization of environmental sustainability constituting an important watershed. Other factors have included the mounting scientific evidence on climate change and growing evidence of the economic and political challenges of resource dependence, as well as increasing recognition of conventional oil depletion. The governance game and players have also been changing: demand is shifting from western OECD members to Asian consumers; NOCs are internationalizing and directly competing or collaborating with IOCs on a global rather than a domestic level; and different constituencies and ethical priorities are represented, including through the more frequent participation of civil society organizations in negotiations.

While the current context requires international cooperation, a rapidly changing oil sector and volatile prices mean that countries are cautious and remain protective of their sovereignty over energy policy. Some key economies, such as China, are reluctant to promote and adopt broad multilateral agreements on energy based on free trade principles, such as a future WTO Framework Agreement on

Energy. Countries like China do recognize the limits of bilateral agreements and are interested in adopting multilateral agreements, most notably with respect to transit. They remain tempted, however, to craft their own regional intergovernmental agreements in order to limit the extent of their commitments and the implications that such free trade agreements could have on the control of their domestic oil production and distribution sectors, as well as for bilateral agreements already passed.

On this basis, three main governance reforms are currently at play. The first is the further institutionalization of the IEF with decision-making power backed by the UN General Assembly and supported by the G20. Inclusive of civil society, grounded in clear principles and objectives for energy security and sustainability, and with a fair collective and representative decision-making process, such an organization could help bring about the cooperation needed to smooth the transition in the interests of both consuming and producing countries. This process will be slow, and in the meantime the current patchwork of organizations can work together through ad hoc projects that will foster greater trust and cooperation.

The second reform concerns market governance through international standards and coordination of market regulations and reporting standards for accounting to reduce price volatility and foster better governance of oil revenues. The third governance reform concerns the political lobbying and influence of the oil industry which needs to be adequately circumscribed, or effectively counterbalanced by those advocating alternative energy systems and modes of transportation. In the following chapter, we turn to some of the specific policy priorities that oil producers, consumers, and governance institutions have to address.

# Notes

1. On stranded assets, see, for example: R. Baron and D. Fischer (2015), "Divestment and Stranded Assets in the Low-Carbon Transition." Background paper for the 32nd Round Table on Sustainable Development, 28 October, 2015, OECD Headquarters, Paris; A. Ansar et al. (2013), "Stranded Assets and the Fossil Fuel

Divestment Campaign: What Does Divestment Mean for the Valuation of Fossil Fuel Assets?" Stranded Assets Programme, Smith School of Enterprise and the Environment, University of Oxford.

2. Figures from Gallup, see "Americans' views of oil and gas industry improving," August 24, 2015. Available online at http://www.gallup.com/poll/184784/americans-views-oil-gas-industry-improving.aspx.

3. See T. Cottier et al., "Energy in WTO Law and Policy" (World Trade Institute, 2010).

4. C. L. Cortese et al., "Powerful Players: How Constituents Captured the Setting of IFRS 6, an Accounting Standard for the Extractive Industries," *Accounting Forum* 34(2) (2010): 76–88.

5. B. Mommer, *Global Oil and the Nation State* (Oxford University Press, 2002), p. 178.

6. Forced to resign in 2010, IRENA's first director-general argued that a number of countries, including the US, Japan, Australia, and to a lesser extent the UK, did not want to see an effective renewable energy agency emerge or preferred the IEA to retain that authority. See "Hélène Pelosse: j'ai été contrainte de démissionner [I was forced to resign]," *Le Monde*, October 30, 2010. The US supported IRENA in part because of the UAE bid to host it; see Wikileaks, cited in A. Florini, "The International Energy Agency in Global Energy Governance," *Global Policy* 2 (2011): 40–50. IRENA Work Programme and Budget for 2016–17: Report of the Director-General, A/6/4, January 17, 2016.

7. On Keystone and the tar sands, see A. Nikiforuk, "What the Keystone rejection really reveals," *The Tyee*, January 19, 2012; C. Hiar, "Higher spending doesn't prevent rejection of Keystone XL project," IWatch, January 25, 2012; F. G. Hayden, Conflicts in the Licensing Process of TransCanada's Keystone XL Pipeline, 2011, Economics Department Faculty Publications. Paper 74, http://digitalcommons.unl.edu/econfacpub/74; on the case of the tar sands' public relations machine and the Canadian government, see M. Price, "On the trail of ethical oil's secrets," *HuffPost*,

November 28, 2011; G. Dembicki, "Big oil and Canada thwarted US carbon standards," *Salon*, December 15, 2011; http://deepclimate.org/2012/01/13/ethical-oil-political-connections-part-1-conservatives-go-newclear/.

8. J. Barnett, "The Worst of Friends: OPEC and G-77 in the Climate Regime," *Global Environmental Politics* 8(4) (2008): 1–8; Abdalla Salem El-Badri, "OPEC Statement to the United Nations Climate Change Conference (Cop15) – Copenhagen, December 2009" (OPEC, 2009); statement on taxation is from "OPEC and the Environment," 2010. Available online at www.opec.org.

9. BP quit the GCC in 1996 and Shell followed in 1998. On API lobbying, see C. Carroll, "API Praises Congressional Action to Rein in EPA and Calls for President Obama to Work with Growing Bipartisan Coalition" (API, 2011). The oil industry spent US$58 billion in the US between 2000 and 2008 on emission reductions; see www.api.org/ehs/climate/new/companiesaddress.cfm. A. Gillies, "Reputational Concerns and the Emergence of Oil Sector Transparency as an International Norm," *International Studies Quarterly* 54(1) (2009): 103–26.

10. V. Vivoda, "International Oil Companies, US Government and Energy Security Policy: An Interest-Based Analysis," *International Journal of Global Energy Issues* 33(1/2) (2010): 73–88. USA*Engage does not openly disclose its membership which extends far beyond oil companies; see www.usaengage.org. On Iraq, see G. Muttit, *Fuel on Fire: Oil and Politics in Occupied Iraq* (Bodley Head, 2011); C. Avery, "Iraqi Oil Industry" (IAS Group, 2010). On US military spending in Iraq, see A. Belasco, "The Cost of Iraq, Afghanistan, and Other Global War on Terror Operations since 9/11," in *RL33110* (Washington, DC: Congressional Research Service 2011) – or US$856 billion (constant 2010). The main western companies in Libya are ENI, Wintershall, Total, ConocoPhillips, Repsol-YPF, Hess, Suncor, and Occidental. The post-Gaddafi government stated that oil contracts will be reviewed but expected most to be honored.

11. S. Guriev et al., "Determinants of Nationalization in the Oil Sector: A Theory and Evidence from Panel Data," *Journal of Law,*

*Economics, and Organization* 27(2) (2011): 301–23; G. Joffé et al., “Expropriation of Oil and Gas Investments: Historical, Legal and Economic Perspectives in a New Age of Resource Nationalism,” *Journal of World Energy Law & Business* 2(1) (2009): 3–23; J. Stroebel and A. Van Benthem, “Resource Extraction Contracts under Threat of Expropriation: Theory and Evidence,” USAEE/ IAEE Working Paper (Department of Economics, Stanford University, 2010). Military presence includes permanent bases and defense agreements, as in the case of France in Gabon. For statistical evidence on the positive effect of aid on reducing expropriation risk, see E. Asiedu et al., “Does Foreign Aid Mitigate the Adverse Effect of Expropriation Risk on Foreign Direct Investment?” *Journal of International Economics* 78(2) (2009): 268–75.

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13. Bush citation from A. Juhasz, *The Tyranny of Oil: The World’s Most Powerful Industry – and What We Must Do to Stop It* (HarperCollins, 2007); R. Gramling and W. R. Freudenburg, “A Century of Macondo: United States Energy Policy and the BP Blowout Catastrophe,” *American Behavioral Scientist* (2011): 1–28. On MMS, see I. Urbina, “Inspector General’s Inquiry Faults Regulators,” *New York Times*, May 24, 2010.

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# CHAPTER EIGHT
# Better and Beyond: The Future of Oil

The "end of oil" is nigh: so goes the popular theme. Yet it is much too soon to write an epitaph for oil. Right now, more than one trillion barrels of oil are available underground for extraction. With unconventional oil reserves coming online, liquid hydrocarbon production looks set to "plateau" rather than peak and rapidly decline. Above ground, the extraction and combustion of oil are firmly embedded in the fabric of modern societies – via political patronage and the social power of automobile, construction, and financial corporations, in the geographies and materials of the built environment, and in cultural norms of consumption. Oil looks set to be with us for some time to come. But it is precisely because oil has a future that we need to be concerned. In this concluding chapter, we consider oil as part of a broader "global energy dilemma" – the problem of how societies that have developed around and through fossil fuels must now find ways to ensure affordable and reliable sources of energy while also reducing the emission of carbon dioxide and improving the developmental impact of oil for producing countries. We describe this as oil's "new reality," and consider the strategies by which states and other parties might seek to respond. We discuss how these strategies might be deployed differently in oil-producing and -consuming countries. In the final section, we highlight four priorities that must be addressed through better governance of the oil production network. The goal of such governance is to make oil *better* – that is, to improve the performance of oil's global production network on economic, social, and environmental criteria. In the longer term, however, the goal should be to move *beyond* oil by decoupling it from society's demand for energy.

In writing this book, our objective has been to show how wresting value from the earth's resources is not only a tricky business, but also one that is necessarily political because it brings together a complex range of different actors and interests. Firms, states, and civic society organizations may have some common objectives, yet they are frequently also in competition – over control of resources, the distribution of value from production, the availability of supply, the share of revenues from oil development, and the distribution of oil's environmental and social costs. We introduced the framework of the global production network to characterize these actors and their interrelations and account for the ways in which oil is socially organized. We also showed, by reference to oil's rich history, how the organizational structures through which oil is extracted from the earth and shuttled through economies are changing in significant ways. Some of the actors may have the same names, but today's global oil industry is not that of the 1950s' Seven Sisters or the 1970s' resource nationalism. Such changes are, in part, the result of a "global shift" in the center of gravity of the world economy. They also are related to changes in the resource base to which the oil sector is ultimately tethered.

Our objective has not been just to show how the global oil industry is changing. Rather, we have wanted to explore its implications, and show how many of these changes ramp up the economic, social, and environmental challenges that have been long associated with the hydrocarbon age. Among these are: the development of new and often dirtier or riskier reserves; the promotion of sustainable economies and broad-based development in oil-producing countries; the volatility of prices; a mismatch between supply and demand aggravated by the fast-rising oil consumption of "emerging" economies and exporting states; and the accumulation of carbon dioxide in the atmosphere. As evidence of these challenges mounts, the global production network for oil appears to be out of step with social demands. Oil, it can be said, has failed in significant ways and must engage this "new reality."

## Oil's new reality

The main implication of the new reality is the ongoing reorganization of the oil production network as a function of geological, geo-economic and geopolitical shifts – namely the depletion of the resource base, the shift of economic weight to Asia, and a more interdependent "multipolar" world. These changes, together with an increasingly complex set of social demands, have exposed a “governance deficit” around oil. Today, the “politics of oil” is increasingly about the way states, companies, and civil society organizations negotiate a solution to this governance deficit and, in so doing, determine the future of oil.

Oil continues to be integral to contemporary models of economic growth. In the early years of the twenty-first century, growing demand exposed the diminishing availability and accessibility of the so-called conventional oil that has been the bedrock of the industry for most of its 150 years. The erosion of surplus raised prices and reduced affordability, shifted oil from a commodity (obtainable in the marketplace) to a strategic good (where market mechanisms alone are insufficient for procuring the resource), and, at the same time, created additional volatility through scope for speculation. Economic growth in countries like China, India, Brazil, and Russia is indicative of an emergent world political order that is less defined by the economic and political power of the US, of which the emergence of state-owned, transnational oil firms – like PetroChina and Petrobras – is a particularly powerful expression.

Meanwhile, efforts to address the shortfall in supply and secure oil in an increasingly competitive market have required accessing unconventional oil (bitumen) or conventional oil in unconventional places, in part because the bulk of the world’s conventional oil reserves are controlled by national oil firms (predominantly in the Middle East). The governments of these countries can therefore control the rate at which conventional oil is produced and they have been unwilling – or unable – to increase production. New supply, therefore, is typically harder to get and of poorer quality, so that the supply gap is increasingly being filled by dirtier and costlier oil extracted in riskier operating environments. As firms push into these environments, the long-standing social and environmental challenges of extraction and development are made visible – as with BP’s *Deepwater Horizon* oil spill, GHG emissions from tar sands, and oil-related conflicts in Iraq or South Sudan. Increasingly, oil firms are being held to account for their performance on social development, human rights, and the protection of the environment. At the same time, growing oil demand – combined with falling energy grades, due to higher energy costs of extraction and the additional energy needed to upgrade heavy, sulfur oils to transportation fuels – means that the oil production network is responsible for a large and growing quantity of $CO_2$ emissions. The acceptability of oil is therefore increasingly in question.

## Responding to the new reality

The new reality is complex, and past experience indicates that societies respond to such crises in a range of ways. We identify here seven potential state-level strategies in response to oil's new reality. As we go on to show, these are not mutually exclusive and they involve strategic action at different geographical scales.

- *Liberal markets*: open up national oil reserves to foreign investment and lower barriers to trade in oil and oil services through multilateral treaties on investment and trade (e.g. ECT, NAFTA).
- *Neo-mercantilist resource control*: strategic partnering between an importing state and an exporting state to lock in privileged access to oil via infrastructure and development deals and "equity oil" contracts which give the investing partner – often a national oil company from an importing state – the right to take or market oil (e.g. investments by China's state oil firms in Africa).
- *Oil welfare*: subsidized oil production and consumption through royalty and tax relief for oil producers, deregulation of working practices, removal of environmental restrictions on access, low fuel taxes, and rejection of carbon pricing (e.g. the US under Bush Jr or Trump).
- *Socioeconomic adaptation*: addresses supply constraints and climate change through public policies and community initiatives that build resilience to market shocks, drive the decarbonization of energy systems, and reduce demand (e.g. Transition Towns Movement; Cuba in the early 1990s).
- *Technological innovation for energy transition*: investment in the development and application of alternative energy sources that substitute for oil in major markets, via a mix of public

policies and private sector commitments (e.g. hydrogen highways).

- *Predatory militarism*: reshapes accessibility through force, using either clandestine means (e.g. Iran's 1956 *coup d'état*) or military force (e.g. Japan in the 1940s; Iraqi invasion of Kuwait).
- *Totalitarian retrenchment*: authoritarian allocation of remaining oil supplies and top-down decisions over lifestyles and livelihoods (e.g. North Korea in the 1990s).

This stylized spectrum of responses suggests some very different potential outcomes. Much is at stake in how collectively we respond to the new realities of oil. In practice, we can expect a mix of responses that will vary from country to country. Such geographical variation will reflect country characteristics, including the nature of its political regime and the historical experience of its population, as well as the degree of exposure to supply and price risks and to the environmental externalities of the oil production chain (for regional scenarios, see Table 8.1). Furthermore, there will also be variation within countries in how regions and municipalities choose to respond. In the US, the most likely scenario in the short term at the federal level is a continuation of oil welfarism (involving low taxation for consumers, continued oil production subsidies, and the opening of environmentally sensitive acreage). Elements of a liberal markets approach are likely to remain under President Trump (around infrastructure development and regional market integration with Canada, for example), although is likely to take the form of bilateral rather than multilateral trade and investment deals. Recent experience suggests, however, that market integration and support for current demand norms ("the American way of life") may be supplemented with bouts of predatory militarism (in Colombia, Venezuela, and the Persian Gulf). At the same time, there are initiatives at state and municipal level in the US around socioeconomic adaptation and federal subsidies and incentives to encourage substitution (e.g. biofuels) and technological innovation. Europe's current strategy centers on a combination of market liberalism (via the Energy Charter Treaty, and also via the EU Emissions Trading Scheme), elements of regional strategic partnering (e.g. the EU–Russia Energy Dialogue), and technological innovation and rollout – particularly around alternative fuels and engine technologies in the transport sector. There are also national-scale efforts at socioeconomic adaptation (e.g. national energy transition policies in Holland and Germany) as well as city-based and corporate initiatives for adapting to climate change and improving oil resilience. Europe is also engaged in limited predatory militarism (in Libya and the Persian Gulf, for example). East Asia is likely to see a combination of technological innovation (such as electric vehicles), liberalism, and limited socioeconomic adaptation and some possible predatory militarism in the China Seas, with China continuing to opt for neo-mercantilism through bilateral treaties for supply access and multilateral ones for transit. Most low-income countries are likely to turn to socioeconomic adaptation, with some risk of militarism.

Table 8.1 Adaptation strategies for selected regions

*Sources:* Based on J. Friedrichs, "Global Energy Crunch: How Different Parts of the World Would React to a Peak Oil Scenario," Energy Policy 38(8) (2010): 4562–9.

| | *Liberalism* | *Neo-mercantilism* | *Oil welfarism* | *Socio-economic adaptation* | *Technological innovation* | *Militarism* | *Totalitarianism* |
|---|---|---|---|---|---|---|---|
| North America | ✓✓ | ✓ | ✓ | | ✓ | ✓ | |
| Latin America | | ✓ | | ✓✓ | | | |
| Europe | ✓ | | | ✓ | ✓✓ | ✓ | |
| Eurasia | | ✓ | ✓ | ✓ | | | ✓ |
| East Asia | | ✓✓ | | ✓ | ✓ | ✓ | |
| South Asia | ✓ | ✓ | | ✓✓ | ✓ | | |
| Southeast Asia | ✓ | | | ✓✓ | | | |
| Middle-East North Africa | | ✓ | ✓✓ | | ✓ | ✓ | ✓ |
| Sub-Saharan Africa | ✓ | ✓ | | ✓ | | ✓ | |

**✓✓*:* very likely, ✓*:* likely. A more detailed assessment would require country-by-country analysis.**

The new reality of oil creates particular challenges for oil producers and exporters which face a different set of challenges around price, security, and development via oil. They need to balance export and domestic demands, particularly where domestic economic growth absorbs much export capacity (e.g. Indonesia, Iran, and Saudi Arabia). Such choices between domestic and export demand may be constrained by trade agreements. Oil-exporting states have recently begun to question the security of demand. Uncertainty over demand arises from fluctuations in economic growth and technological and policy shifts in the transport sector and, over the longer term, from the prospect of an expansion of carbon legislation beyond Europe. The impacts on oil demand could be considerable: OPEC models indicate a difference of around 12 million barrels per day between high- and low-growth scenarios out to 2040. Beyond investing in enhanced oil recovery to get more oil from aging reservoirs, oil exporters are likely to open up new fields, increase strategic partnerships with consumer countries (e.g. downstream deals between Saudi Aramco and PetroChina), and make efforts to grow the non-oil sector and diversify the economy "beyond oil." Producers with strong national oil companies are most likely to pursue neo-mercantilist strategies, protecting access to domestic reserves and limiting foreign investment to oil services. Producers with low-capacity NOCs – such as Kazakhstan and Azerbaijan – are likely to pursue liberal market strategies that continue to see them open to investment in the upstream and downstream sectors. Oil exporters also face distinctive challenges on climate change, via its potential for demand destruction and the question of whether those who extract oil from the ground should bear some responsibility for the "custody" of carbon down the full length of the production network, including the "backstream" phase that currently sees carbon dioxide accumulate in the atmosphere. OPEC's position has long stressed the historical responsibility of developed economies for carbon emissions, yet in the wake of the Paris Agreement it has also recognized that all countries are committing to reducing emissions. Other oil producers may voluntarily decide to limit extraction and forswear oil – as with the Yasuni–ITT proposal in Ecuador (see Box 8.1) – particularly if they are able to generate alternative revenue streams by leaving "the oil in

## Box 8.1 Swapping "oil for nature" in Ecuador

The Yasuni–ITT initiative in Ecuador sought to forgo the development and production of oil resources in part of the Ecuadorian Amazon in exchange for international funding (US$3.6 billion) equivalent to about half their value. The estimated reserve of 900 million barrels of heavy crude oil in the Ishpingo-Tambococha-Tiputini oil field within the Yasuni National Park amounts to about 20 percent of Ecuadorian proven oil reserves, and ten days of world consumption. Proposed in 2007 by Ecuadorian President Correa as part of a larger policy shift away from oil-export dependence, the initiative received some support from several European governments. However, after less than US$350 million was pledged and only US$13million collected, President Correa cancelled the initiative in 2013, opting instead to allow oil companies to drill. The failure of Yasuni–ITT occurred in the context of weakened financial markets following the 2008 financial crisis, and the government's parallel strategy of simultaneously deepening Ecuador's international petrorelations. The latter included licensing Russian oil companies to explore with Petroecuador, agreements to repay loans from Chinese development banks in oil, and constructing a new oil refinery. Although the Yasuni–ITT initiative may not have achieved its goal, its significance lies in the explicit recognition that serious efforts to move beyond oil will require keeping reserves in the ground. Forgoing development of the reserves would have meant locking in emissions from the oil's combustion equivalent to over 400 million tons of $CO_2$, an amount roughly 15 times Ecuador's annual emissions. This "supply side" approach to mitigating climate change – an attempt to consciously strand fossil fuel assets – was also one of the first attempts by a so-called "petro-state" to become an "eco-state" through carbon emission reduction financing that associates biodiversity conservation with indigenous rights.[1] the soil." There will, then, be a diversity of responses to the new reality as some states seek to maintain commitments to oil while others look for security and economic opportunity by reducing their dependence. Collectively, these different adaptation strategies will reconfigure the geographies of uneven development associated with oil's global production network.

## Four priorities

The new reality of oil sets four main priorities for oil governance: reducing price volatility, matching oil supply and demand, transitioning to low-carbon energy sources, and addressing the "oil curse." The order of these priorities and their potential impacts will vary for different countries and social groups, and over time. High-priority measures should not only include those tasks that can be rapidly achieved, but also those that have longer-term effects. Chief among these is the stock of vehicles: low-mileage gas guzzlers purchased today will exacerbate relative demand growth for 10 to 15 years. Prioritization also needs to consider equity dimensions: similar efforts cannot be demanded from poor countries as from rich ones. Reducing rural poverty remains a priority for many countries, with hydrocarbon-based rural transportation having an important role to play.

### *Reducing price volatility*

Oil prices are volatile, yet price variations can be tempered. For much of the 1990s, OPEC largely succeeded in maintaining prices within the range of US$22–28 per barrel. Yet such policies can only work if there is spare capacity to meet supply disruptions or rapid demand growth, if the US dollar holds its value, and if speculators do not dominate financial markets. This proved not to be the case after 2003. OPEC tightened supplies while few non-OPEC fields were put online, Asian demand boomed, the US dollar declined against gold and the euro, and by 2008 speculators held half of oil futures positions compared to 20 percent prior to 2002. Price volatility flared most acutely during 2008–9 when prices reached US$147 in July 2008, before plunging to US$37 within six months, rebounding to US$113 by March 2011, before bottoming at US$26 in February 2016. Fear of future turbulence – and its economic and political consequences – is now a feature of oil markets.

These conditions have led many governments to look into preventive measures. In 2008, an emergency meeting brought together the OPEC, IEA, and IEF Secretariats and energy ministers to address the price crisis. The "Jeddah Meeting," however, resulted in familiar calls for investment in production, closer cooperation among oil companies, and greater market transparency, but few concrete outcomes; the host, Saudi Arabia, increasing production by only 200,000 barrels per day as a goodwill gesture, was interpreted by some as evidence that the "Central Bank of Oil" had already reached maximum capacity. Heads of state at the G20 summit in 2009 committed to improving transparency in energy markets, to reinforcing producer–consumer consultation, and to strengthening market supervision. Mandated by the G20, the Task Force on Commodity Futures Markets of the International Organization of Securities Commission is working toward a central registry of trades for the financial oil market. In the US, the Dodd–Frank Wall Street Reform and Consumer Protection Act (2010) had a similar goal: to increase transparency and reduce volatility risks by requiring public disclosure and trading through clearinghouses. This would prevent traders in over-the-counter (OTC) markets from taking large speculative positions without the knowledge of other traders. Implementation of these measures faces much opposition, reflecting a long history of efforts at deregulation on the part of financial and energy companies (see Box 8.2). Other potential initiatives include stricter regulation of oil markets; improving the accuracy, immediacy, and frequency of statistics on oil stocks, flows, and investments (e.g. JODI); harmonizing oil taxation; and controlling demand. Reducing price volatility is also of interest to producers. Price volatility is very damaging to their economies' growth, posing major problems for public budgets and investment planning in both the public and private sectors. Although most analysts agree that moderate oil prices are likely to rebound over the medium term, prices remain volatile and vulnerable to a major economic crisis, as demonstrated in 2009. Savings funds can buffer price shocks, with excess revenue over price benchmark being earmarked for such funds. Yet many governments have found it difficult to resist spending windfalls, later exposing themselves to large deficits when prices collapse and foreign direct investments decline. Governments, like companies, can also hedge prices through long-term contracts.

The goal of reducing price volatility, however, will also be enhanced by better matching demand to supply. The role played by some OPEC members in driving the sharp drop in oil prices during 2014–15, and their subsequent inability or unwillingness to correct prices upward after a larger than expected decline, signaled for many the unreliability of the organization in maintaining stable prices and balancing the interests of all parties. Seeking to regain its market share, deter the further growth of unconventional oil, as well as weaken Iran and Russia, Saudi Arabia could rely on a US$720 billion reserve built during the boom to cushion the impacts of the bust. Yet the maneuver has proved brutal to oil-dependent economies and unsettling for markets.[3]

### Box 8.2 Deregulation and oil price speculation

The ability to speculate on oil prices increased with the deregulation of energy derivatives. In 1992, Enron and eight other energy and financial companies lobbied the US Commodities Futures Trading Commission Chairwoman Wendy Gramm, who successfully pushed to allow energy contracts to be traded outside of regulated markets and be exempt from anti-fraud provisions of the Commodity Exchange Act. Wendy Gramm went on to sit on Enron's board of directors five weeks after the approval of this loophole and joined the Mercatus Center, a conservative economic think tank founded by Koch Industries who had lobbied her along with Enron. Her husband, former Texas GOP Senator Phil Gramm and a recipient of Enron campaign donations, maneuvered to pass further energy trading deregulation in December 2000, despite recommendations to the contrary by the President's Working Group on Financial Markets in 1999. The legislation facilitated the growth of an alternative US derivatives market – Intercontinental Exchange (ICE) – created seven months prior to the bill by several of the original energy companies. ICE then purchased the London-based International Petroleum Exchange in 2001 (now ICE Futures Europe) and shifted it to its electronic quotation system. By 2011, ICE Futures Europe boasted of hosting the trade of half of the world's crude and refined oil futures contracts.[2]

## *Reducing demand and supply*

Supply constraints around conventional oil, the rapid growth of new oil consumers, and the environmental risks associated with continued oil consumption and supply growth in unconventional sources mean new thinking is required if demand and supply are to be reduced in a balanced way. Continuing the twentieth-century practice of expanding supply to meet demand not only presents very significant economic and political obstacles, but is also now carbon-constrained. A slowdown in demand growth is possible, whether via prolonged economic recession, high market prices, increased fuel taxes, or the use of consumption quotas. Demand destruction is already happening in Japan and many European countries, and more recently in the US; the major challenge is the pace of demand growth in China, India, and major Middle East oil exporters.

To keep pace with demand, up to US$1 trillion of investment is needed every year. Mobilizing this financing is not only environmentally counterproductive, but it is also difficult, given its sheer size, the relative uncertainty of exploration and oil prices, and the pattern of reserve control and opposition to unconventional oil production. Most reserves are under the control of national governments who were eager to increase revenues through price rather than volume, but are now competing for market share. Furthermore, NOCs dominate the supply market and, while they often benefit from the support of their home government, they still often need the collaboration of IOCs to more easily access capital markets. As discussed below (see p. 249), a set of constraints and incentives could also help redirect some of these investments to reducing demand and shifting to alternative fuels. Given the unwillingness of many oil producers to move in that direction, a strong measure likely to face much resistance from the oil industry is to increase the taxation of oil companies while capping prices. Another approach is to increase fuel taxes at the consumer level and redirect revenues toward the reduction of demand. Production increases also face environmental and other regulatory constraints on access which have come under criticism from all but progressive reformers – especially in the US. Yet opening up many of these remaining reserves would have only a marginal impact on oil availability and affordability while entailing major social and environmental costs.

To reduce demand, higher fuel efficiency and fuel taxes are needed. Shifting to 42 mpg cars in the US could save 3 mmbd. Fuel efficiency can be improved on conventional vehicles through more efficient engines and power trains (e.g. turbo-charged gasoline, diesel, hybrid electric-gasoline), better transmissions (e.g. continuously variable transmissions), improved aerodynamics and rolling resistance, lower weight, and smaller size. Halving fuel consumption by new vehicles in the US from 21 mpg to 42 mpg by 2035 is feasible, while maintaining similar performance and without jeopardizing safety;

additional costs of 20 percent would be recouped within about five years through fuel savings if oil prices go back up to about US$70–80 per barrel. Greater fuel efficiency may motivate additional travel, but increased mileage through this “rebound effect” is generally less than 10 percent. Fuel efficiency alone, however, will only buy limited time as the number of vehicle users increases. Greater efficiency can also result from a shift to more efficient modes of transportation such as mass transit. Each additional mile of public transport use can save three to seven passenger miles in a car, due to more direct travel routes (think bus lanes), trip chaining, ownership of fewer cars per household, and an increased preference for higher-density residential areas.

Fuel efficiency works in synergy with prices: higher fuel prices reduce fuel demand, especially over the long term. This “price elasticity” means that higher taxes can reduce oil consumption and carbon emissions, but they work best over the long term. Price increases can result from changes in both the market and taxation. But markets send mixed signals, as people hope for a return to “low prices”, as the oil market did in 2014. Increased taxation offers the advantage of a longer time horizon, especially if rising tax rates are instituted over time. Europe would possibly be consuming twice as much oil if it had followed the US approach of low fuel taxes since the 1960s. Within the current context of low oil prices and recent growth in domestic production, the US needs to take the counterintuitive step of curtailing consumption, and a gasoline tax remains the single most effective solution. Although the “tight oil” revolution has sharply reduced US oil imports, US consumers still ultimately pay a high price for cheap gas because of poor fuel economy standards and limited investment in mass transit, with their dollars largely ending up in the coffers of oil company shareholders and exporting countries, rather than their government and public services. As importantly, US consumers are again exposing themselves to the next surge in oil prices that will bring deep “pain at the pump.” China in the meantime is seeking to avoid the US pathway to oil consumption dependence by progressively increasing fuel taxes, mandating stricter fuel efficiency, and promoting electric vehicles. Higher fuel prices need not hurt households: fuel tax revenues can be redirected to public transport services or fuel allocation schemes or broader forms of support benefiting low-income families. Iran, for example, set up an innovative system with a monthly (household) allocation of 132 liters at a subsidized price and additional consumption at full market price plus hefty taxes. By contrast, western consumers swipe air miles cards rather than fuel ration cards, their purchases rewarded with a flight's worth of free jet fuel. Such commercial logic flies in the face of current concerns. Even with major efficiency gains, sustainable transportation practices imply travel restraint and a departure from the trends that have seen annual distance traveled per capita increase tremendously over the past five decades.

Oil addiction and car obsession are already widely recognized, and the time of selective prohibition may be approaching. Will the fate of the car industry follow the path of tobacco, with restrictions on advertisement and limited access to public space? By the early 1970s, cigarettes ads had been banned from TV and radio in the US. Three decades later, tobacco advertising is internationally prohibited through the World Health Organization's Framework Convention on Tobacco Control. The global auto industry spends about US$40 billion per year on advertising to push its products, a third of which is spent on television. Advertisements focusing on car speed are prohibited in the UK. Cars are banned from some school zones to entice children to walk more but also to reduce accidents and improve air quality. Several cities, such as London, Stuttgart, and Paris, have a congestion charge or low-emission zoning regulations that limit car access to downtown areas. In 2011, the European Transport Commissioner unveiled a plan to ban conventionally fueled cars from cities by 2050; a plan that spurred comments of "insanity" and "greenwash grandstanding" by carmakers and driver associations. Yet several cities such as New Delhi have already banned the registration of new diesel cars, while others pledged banning (e.g. Madrid, Mexico, Paris) or heavily taxing (e.g. London) their use. In 2016, the lower house of the Dutch parliament adopted a motion to ban sales of new petrol and diesel cars by 2025, and the governments of Austria, India, and Norway were considering doing the same. A long-term priority is to shift away from fossil fuels and reduce transportation needs through improved urban planning, cultural change, and a re-localization of some production processes.[4]

## *Decarbonizing transportation fuels*

If oil-related governance in the "Age of Plenty" was mostly about controlling oil prices and supplies, it is now also about decarbonizing oil and moving to alternative energies. Decarbonizing oil is a major challenge. The industry is already reducing some of the emissions associated with oil production, including through the use of carbon capture and sequestration techniques developed as part of enhanced oil recovery that involves injecting carbon dioxide into oil reservoirs. Selection criteria guiding investment in oil production can consider relative GHG emissions and avoid those with the highest contribution. Much more can be done to capture emissions from refining using conventional technologies. However, about 80 percent of the emissions from the fuel cycle come from final combustion. Post-combustion emissions can be reduced through more efficient and cleaner combustion, but carbon dioxide remains a necessary end product of the reaction. Current carbon capture technologies cannot be applied to mobile sources and so decarbonizing vehicle emissions requires new technologies that are still in their infancy.

Fuel alternatives to oil include natural gas, biofuels, and hydrogen, as well as electricity. Of the three liquid fuels, only hydrogen has the potential to move beyond fossil fuels if generated through a renewable energy source. Natural gas can substitute for gasoline and is already available in many countries as a transportation fuel and is also used to upgrade unconventional oil, such as Alberta's bitumen. Biofuels are often presented as an environmentally friendly alternative to fossil fuels. Yet current modes of production are fossil fuel-intensive and, when cultivated on cleared land, often release much more GHG than they save compared to gasoline. Furthermore, first-generation biofuels, such as ethanol from corn, place major pressures on water resources, farmland, and food production. Second-generation biofuels, including crop residues and wood by-products, offer a more viable option but remain difficult to process and their allocation to fuel transportation undermines their contribution to soil quality.[5] Hydrogen is by far the cleanest liquid fuel, as it only emits water vapor, but like electricity it is only an *energy carrier* that requires primary energy inputs. Hydrogen vehicles are also less efficient than electric vehicles.[6]

Clean forms of energy with a flow rate equivalent to 95 mmbd are hard to come by. Hydrocarbons could provide a clean energy source under conditions where concentrated production facilitates carbon capture and where a non-emitting energy carrier – hydrogen or electric battery – is used at the point of consumption. Energy produced in excess of demand (surplus energy) is limited but includes, for example, idle electricity during off-peak periods. Global hydropower output represents only about 10 mmbd, nuclear power half that, while wind and solar are increasing but still marginal. Geothermal energy could provide a long-term option due to continuous base-load power, minimal visual impacts, and a small environmental footprint. Current geothermal systems, however, release GHG gases sequestered in underground reservoirs. Tax reforms that shift profits from fossil fuels to the development and rollout of cleaner fuels are needed to accelerate this transition.[7]

Moving beyond oil still appears a lofty goal, but the oil industry is being increasingly “disrupted” by new policies, growing sales of electric vehicles, and new modes of car sharing. In 2005, the Swedish government appointed a commission to reduce the country’s dependence on fossil fuels by 2020. The government motivated its initiative by arguing that “the price of oil affects Sweden’s growth and employment . . . [while] the extensive burning of fossil fuels threatens the living conditions of future generations.” The commission recommended phasing out heating oil, reducing oil-based transportation fuels by half and industrial uses by up to 40 percent. Forest products, low-energy housing, and information technology would also contribute to reducing oil dependence. The incoming government did not take on these recommendations, but the objectives have found an increasing number of followers, especially with regard to the transportation sector. With the world’s highest fuel tax and low-cost hydroelectricity, Norway already has strong incentives in place to shift to electric vehicles. Authorities added free parking, access to bus lanes, and no congestion charges. Vehicle acquisition cost, around US$30,000 for a small car, is the main obstacle – even if running costs are only a tenth of those for a gasoline car. Although Norway’s homegrown electric vehicles company – THINK – filed for bankruptcy in 2011, all-electric cars constituted 18 percent of new sales by 2015. That same year, 330,000 electric vehicles were sold in China, just above 1 percent of total vehicle sales, but nearly three times as many as in the US. Worldwide, electric vehicles are revving up but have a long way to go: accounting for just 0.1 percent of worldwide car sales in 2015, the key market for electric cars was nonetheless growing at 60 percent per year. By 2015, Nissan had sold about 200,000 of its LEAF electric car, making it the best-selling model worldwide. Tesla had sold 107,000 of its luxury sedan Model S, and received pre-orders for 400,000 of its Model 3 within two months of its launch in March 2016, for a total expected sale value of US$14 billion. Purchases of electric cars have so far been fueled by tax incentives, low profit margins in conventional auto-sales, and the willingness of customers to pay a premium. It will be growing competition between car manufacturers and a lowering of battery costs that will propel the electric car into the mass market. Competition grew from just a few companies offering electric and plug-in hybrid cars in 2008 to more than a dozen by 2016, with about 80 models available in 2017. Battery costs have already dropped from US$1,000 to $400 per kilowatt hour between 2010 and 2015. If costs can reach about $200–300, electric cars could represent about 35 percent of global new car sales by 2040. The effect would be to take 12 mmbd of oil off the market. A more likely scenario, however, will see higher electric car adoption occur, along with continued growth in the sale of conventional automobiles. The net effect will be to expand the total vehicle fleet and put more cars on the roads, unless efficient car-sharing practices and other cultural changes (around home–work commuting, for example) occur alongside electric vehicle sales.[8]

One of the main obstacles to shifting beyond oil is that many people are stuck within the current petroculture and existing infrastructures, including deficient public transportation, widely spread suburban housing, and “nonresidential” downtown areas. Several alternative models exist in North America, such as New York and Vancouver. As an old North American city, New York grew up before the automobile industry reshaped America and only one in two households currently has a car. Similarly, but as a very *new* city, Vancouver learned from the mistakes made elsewhere. The West Coast city planners banned city highways, densified the population through residential high-rises in the downtown core and laneway houses in suburbs, intensified public transport, and privileged cycling lanes over car traffic in key locations such as bridges. It is now the only Canadian city where the car ownership rate and average automobile commuting distance are falling. Unsurprisingly, Vancouver is also rated among the most "liveable" cities in the world, although people still having to commute by car *into* and not simply *within* the city often have a different opinion. The most viable option to connecting low-density suburbs to core areas without long-distance car commuting is electric light railways, to which suburbanites connect through bike paths and park-and-ride. A large part of Holland consists of residential villages linked with city centers through dense railroad, extensive bike lanes, and large bike storage facilities at stations. Light railroad infrastructure can be built onto the median of existing highways, but funding often requires large public investments. Other technological solutions include smart grids covering the city and its periphery to recharge electric vehicles.

The links between low-density housing, the "subprime" mortgage market, and vulnerability to oil price hikes was illustrated by the 2007–8 financial crisis. The maintenance of low-density zoning rules, often a result of neighborhood homeowner associations, pushed both housing prices up and people further away from city centers. The result was a housing bubble fed by deceptively low-interest mortgages, exposing people to the double shock of rising interest rates and oil prices. Beyond city planning and transportation policies, a number of social movements have emerged to build "post-cheap oil" alternative communities, lifestyles, and livelihoods. These integrate notions of resilience, localism, and a low-carbon footprint. One recent example that has replicated itself with some success is Transition Towns, which seeks to foster local civil society innovation to reduce oil dependence. Started in 2005 in the UK, the initiative – now renamed Transition Network – had been taken up by community groups and municipal councils in more than 1,100 towns in 43 countries by 2013. Activities are focused on increasing local sourcing of goods, including food, construction materials, and jobs. As shown in Figure 8.1, one of the long-term priorities for North American cities should be to increase population densities in urban areas: tripling density to about 8,000–10,000 persons per square kilometer would bring a fivefold reduction in GHG emissions from ground transportation.[9]

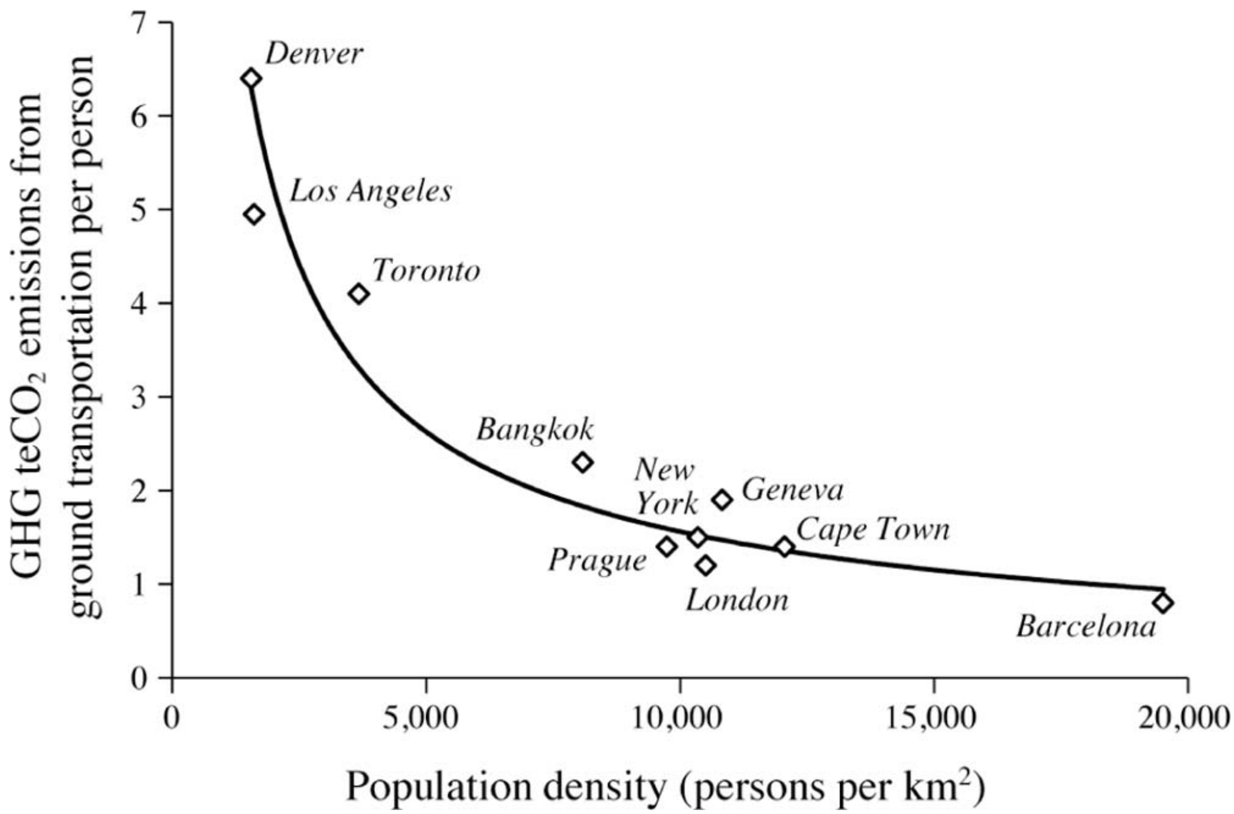


Figure 8.1 Urban population densities and ground transportation emissions per capita

*Source:* Adapted with permission from C. Kennedy et al., “Greenhouse Gas Emissions from Global Cities,” *Environmental Science & Technology* 43(19) (2009): 7297–302. Copyright © 2009 American Chemical Society.

## ***Preventing the oil curse***

There is little doubt that oil will be around for decades. It is thus crucial to mitigate the negative environmental and social impacts of oil extraction and to ensure that populations in producing countries benefit from the remaining years of wealth transfer from importing countries. Addressing the economic and institutional challenges faced by many producing countries will improve development outcomes and help prepare producing countries for a post-oil context by diversifying their economies and opening their political institutions so as to attenuate the shocks of revenue decline. It will also reduce supply and transit disruptions resulting from domestic unrest and disastrous foreign interventions.

The so-called resource curse is not a given. Rather, it is the result of historically grounded relations between, often uneasy, western corporate and governmental interests, as well as ambitious assertions of international sovereignty and often brutal domestic rule. Improving the quality of institutions, soundness of policies, and corporate conduct can improve outcomes. There is now a better understanding of processes at work, which some initiatives are seeking to address. The Natural Resource Charter, for example, attempts to create better decision processes within the value chain, so that oil wealth can bring about improved developmental outcomes. Following the oil commodity chain and revenue flows, the first set of policies promoted by the Charter centers on prospecting and award licensing: publicly funded prospecting can help governments have an idea of what they are selling to companies. Public bidding of oil blocks is a must to ensure that returns are maximized through open competition and corruption risk minimized through transparent procedures that involve little discretionary power. Operations need to be properly regulated, with environmental and social impacts prevention and mitigation mechanisms to avoid conflicts with local communities and strict metering and cost monitoring to prepare for taxation. Tax collection needs to be based on competent evaluation, with independent verification of company payments and government receipts, as promoted by the Extractive Industries Transparency Initiative (EITI). Auditing and stricter enforcement of abuses by both companies and governments all along the revenue stream are crucial, especially with regard to transfer mispricing on the tax assessment side and embezzlement on the part of officials on the expenditure side. Finally, revenues must balance allocations to savings, current expenditures, and long-term investments – with spending prioritizing sustainability, poverty alleviation, and long-term growth – outside of the nonrenewable resource sector.[10]

International efforts to avoid the challenges of oil wealth have been put to the test in Chad. Taking place under a dictatorial regime in one of the world's poorest countries, the Chad–Cameroon Oil and Pipeline project was certain to attract both domestic and international criticism. Eager to reduce reputational risks, the ExxonMobil-led project consortium obtained the backing of the World Bank in 2000. Leveraging its donor status, the World Bank in turn obtained an agreement from the Chadian government to commit most of the revenues to poverty reduction programs and to accept independent revenue monitoring. The World Bank also oversaw an environmental impact mitigation program. The scheme has been held up as a pioneering effort and a model for future oil development. Yet the scheme was soon confronted by the realities of a bankrupt and militarized regime that came under renewed attacks from Sudan-supported rebels in 2003 and 2006. The regime of Idriss Déby rescinded on the agreement with the World Bank and the law on petroleum revenues it had passed, allocating more funds to defense. The World Bank attempted to put pressure on the government by suspending non-humanitarian aid to the country, but to no avail. By 2010, Chad produced about 120,000 barrels per day, generating around US$2 billion in government revenue, ten times the amount of taxes collected by the government before oil started flowing from the Doba fields to the Cameroonian port of Kribi. If the scheme demonstrated its limited benefits for the population, it proved sufficiently successful to sustain ExxonMobil's tenure.

In Sudan, no such process came to support Canadian investments in the development of oil fields and the construction of a pipeline to Port Sudan on the Red Sea. Advocacy campaigns and the risk of delisting on the US stock market led the Canadian company Talisman to divest in 2003, selling its share to the Indian NOC, Oil and National Gas Corporation Videsh Ltd (OVL, ONGC's international arm). The Chinese NOC leading the consortium – CNPC – also faced criticisms, but while the Canadian government had conducted an investigation into allegations of Talisman's complicity in human rights abuses and war crimes, the Chinese government intervened repeatedly to protect its NOC and prevent sanctions from being imposed on the regime in Khartoum. The birth of South Sudan as a result of the 2011 referendum set new challenges, as the northern government controlling the only export pipeline and refineries imposed a pricey compensation scheme for the loss of southern oil fields, with the southern government abruptly ending production only to restart within months in the midst of bankruptcy, widespread accusations of corruption, and a renewed civil war between southern armed factions. The Chadian and Sudanese oil projects demonstrate the motives and limits of governance interventions in poor and conflict-affected countries.

Donor agencies and international NGOs face many challenges to address the "oil curse." The Norwegian government plays a leading role through its Oil for Development program in terms of funding, capacity building, and technical assistance. Partnering with Revenue Watch Institute, a leading NGO on resource revenue accountability, this Norwegian program has helped run bidding processes and support local civil society organizations to reduce opportunities for corruption. The impacts of these programs alone are very often limited, as seen in the case of South Sudan where the Norwegian initiative had much invested. Oil wealth too frequently insulates producer governments from both external and domestic pressure. A strong and independent local civil society is often required, while national champions among top bureaucrats and politicians can help supersede the vested interests of political, bureaucratic, and corporate circles. Even then, electoral cycles often disrupt the pace and direction of reforms, as suggested by the rollback in oil-revenue transparency, and accountability during the late rule of Nigerian President Obasanjo, who had been an early champion of the EITI. Addressing the major challenges associated with dependence on oil wealth is a major imperative: first, populations in many oil countries will benefit more from their oil wealth and see fewer economic and political distortions; second, stronger institutions and a diversified economy will facilitate the transition to post-oil that many countries are expected to experience in the coming two or three decades, improving the chances for long-term prosperity rather than debt and poverty; and third, by helping to lessen the risk of disruptions to production and supply, it will help to reduce price volatility.

## Conclusion

Our account has sought to capture the emergence of a "new geopolitics" of oil. Conventional accounts of the geopolitics of oil situate oil at the center of a territorially based, zero-sum game in which states struggle over access to resources and markets. In contrast, we have stressed the network character of oil production, and the new realities that are reshaping its organization and geographies. In doing so, we have pointed to an apparently intractable challenge: efforts to sustain supply in the face of rising demand exacerbate the economic, social, and environmental problems already associated with capturing, producing, and consuming oil. There is, then, we conclude, a critical problem of governance. The world lacks an effective platform to negotiate the place of oil in a long-term energy future. The two main institutions, OPEC and IEA, remain largely hampered by their respective roles as producer and consumer clubs, and emergent structures like IEF and IRENA are also closely tied to producer roots. There are a number of ad hoc initiatives on key issues, such as revenue transparency with the EITI, but such fragmented approaches face a high risk of long-term failure when poorly institutionalized and only driven by voluntary participation. Their reliance on effective civil society organizations to bring about accountability for misused oil revenues, for example, does not account for the relative weakness of such organizations in authoritarian oil-rich states.

In the short-to-medium term, the challenge for actors all along the production network is to make oil better – that is, to improve oil's capacity to deliver social development, to disable its links to militarism and violence, to accelerate the decoupling of oil from greenhouse gas emissions, and to find ways to organize oil along lines that are fairer and more just for those who bear oil's costs, including the long-term impacts of carbon emissions. Making oil "better" might sound a modest proposition, but it is nothing of the sort. It recognizes that oil now consistently underperforms on broad social objectives and that ultimately it should be society at large that grants firms and industries their "license to operate," a license that is conditional on perceived contributions to social goals. In the longer term, the task is to find ways to move beyond oil. This will involve action now to accelerate oil's exit from the transportation sector of the economy and curb energy demand. Given the proliferation of oil throughout modern life, policies to "disembed" oil will have broad range and reach, including policies on urban design, the funding of public transportation, the economic restructuring of oil-exporting countries, and the allocation and pricing of carbon.

Strategically, the choice between better oil and beyond oil is a false one. First, pursuing better oil need not undermine efforts to move beyond fossil fuels. Any desirable shift toward alternative fuels has to be part of a broader transition toward economies that are more socially just as well as toward lower carbon, characterized in part by increasing the availability of energy services to the poor. Second, the most likely geopolitical scenario is that some countries will continue on the pioneering path of post-oil transition, while others – limited by their economic capacity or political ability to undertake such a shift – will remain at the mercy of a problematic resource. The "great transition" beyond oil, in other words, will in practice be a divergence between the "oil-free" and the "oil-fueled." The good news is that such a partial and geographically uneven transition may reduce some of the supply constraints and market risks for the oil-fueled. The bad news is that removing such constraints will sustain oil consumption and remove some of the pressure to improve oil's record. For these reasons, we need to remain committed to "better oil," while actively working toward a future "beyond oil."

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10. F. Al-Kasim et al., "Shrinking Oil: Does Weak Governance and Corruption Reduce Volumes of Oil Produced?" (U4, 2010). Natural Resource Charter, www.naturalresourcecharter.org/ and P. Collier, *The Plundered Planet: How to Reconcile Prosperity with Nature* (Penguin, 2010); M. Humphreys et al., *Escaping the Resource Curse* (Columbia University Press, 2007); I. Kolstad et al., "Mission Improbable: Does Petroleum-Related Aid Address the Resource Curse?" *Energy Policy* 37(3) (2008): 954–65.

# Selected Readings

Oil is among the most storied resources. There are numerous accounts of the industry's history and the central and problematic role oil has come to play in economies of the global North and South. Here we highlight only a small selection. Readers seeking a more extensive presentation of the technical and financial aspects of the oil industry (chapter 1) will appreciate Morgan Downey's *Oil 101* (Wooden Table Press, 2009). Brian Black's *Crude Reality* (Rowman & Littlefield, 2014) provides an overview with rich anecdotes. For a historical and comparative perspective on the significance of oil and the machines it powers, see major contributions by Vaclav Smil: for example, *Energy at the Crossroads: Global Perspectives and Uncertainties* (MIT Press, 2005); *Energies: An Illustrated Guide to the Biosphere and Civilization* (MIT Press, 2000); and *Prime Movers of Globalization: The History and Impact of Diesel Engines and Gas Turbines* (MIT Press, 2010). A now "classic" treatment of the industry's history and main figures is Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (Free Press, 1991). Both Yergin's *The Quest: The Global Race for Energy, Security and Power* (Penguin, 2011) and Tom Bower's *Oil: Money, Politics, and Power in the 21st Century* (Grand Central, 2009) offer sequels. For a detailed account of Exxon, see Steve Coll's *Private Empire: ExxonMobil and American Power* (Penguin, 2012).

The state of global oil reserves has been a long-running concern. "Peak oil" articulates this concern as an imminent – and permanent – reduction in annual production due to geological constraints: see Colin Campbell and Jean Laherrère, "The End of Cheap Oil," *Scientific American* (March 1998): 80–5; Kenneth Deffeyes, *Hubbert's Peak: The Impending World Oil Shortage* (Princeton University Press, 2008); and, for a more hyperbolic account, Richard Heinberg *The Party's Over: Oil, War and the Fate of Industrial Societies* (Clairview Books, 2005). For a biophysical analysis of the energy surplus from oil and its implications for economic and political power, see Charles Hall and Kent Klitgaard, *Energy and the Wealth of Nations: Understanding the Biophysical Economy*

(Springer, 2011). For critical rebuttals of peak oil, see Leonardo Maugeri, *The Age of Oil: The Mythology, History, and Future of the World's Most Controversial Resource* (Praeger, 2006); and Robin Mills, *The Myth of the Oil Crisis: Overcoming the Challenges of Depletion, Geopolitics, and Global Warming* (Praeger, 2008). Duncan Clarke's *The Battle for Barrels: Peak Oil Myths and World Oil Futures* (Profile Books, 2007) argues that the future of oil will be determined "above ground" by geopolitics rather than "below ground" by geological limits. *Oil Panic and the Global Crisis: Predictions and Myths* (Wiley-Blackwell, 2010) by Steven Gorelick provides a detailed yet accessible assessment of oil reserves and the peak oil debate.

For an application of the global production network concept to oil (chapter 2) which provides links to the theory and history of the concept, see Gavin Bridge, "Global Production Networks and the Extractive Sector: Governing Resource-Based Development," *Journal of Economic Geography* 8(3) (2008): 389–419; see also Peter Dicken, *Global Shift: Mapping the Changing Contours of the World Economy* (Guildford, 2015), chapter 12. Lisa Margonelli, *Oil on the Brain* (Random House, 2007), provides a great journalistic account. A fascinating analysis of the hybrid relationships between internationalizing NOCs and IOCs is undertaken by Nana De Graaff, "A Global Energy Network? The Expansion and Integration of Non-Triad National Oil Companies," *Global Networks* 11(2) (2011): 262–83. The former Secretary-General of OPEC, Francisco Parra, offers an insider's perspective on politics between major oil exporters and importers between 1950 and 1990 in *Oil Politics: A Modern History of Petroleum* (I. B. Tauris, 2010). On the history of resource nationalism, see Paul Stevens, "Resource Nationalism and the Role of National Oil Companies in the Middle East: History and Prospects," *Journal of World Energy Law and Business* 1(1) (2008): 5–30. On the association of oil with the "body politic" and the politics of oil-fueled development in Venezuela, see F. Coronil, *The Magical State: Nature, Money and Modernity in Venezuela* (University of Chicago Press, 1997). Research by Amy Myers Jaffe and colleagues at the James Baker III Institute for Public Policy at Rice University examines the evolving relationship between IOCs and NOCs and its implications for the geopolitics of oil. For a systematic analysis of contemporary national oil companies, see David Victor et al. (eds), *Oil and Governance* (Cambridge University Press, 2012) and Valérie Marcel and John Mitchell, *Oil Titans: National Oil Companies in the Middle East* (Brookings Institution Press, 2006). Luke Patey's *The New Kings of Crude: China, India, and the Global Struggle for Oil in Sudan and South Sudan* explores in detail the most interesting case of the involvement in Africa by oil companies from the "rising powers" (Hurst, 2014). On the impact of globalization on the changing character of (rentier) oil states in the Middle East, see Matteo Legrenzi and Bessma Momani (eds), *Shifting Geo-Economic Power of the Gulf: Oil, Finance and Institutions* (Ashgate, 2011). On the evolution of oil development in Venezuela, see Miguel Tinker Salas, *The Enduring Legacy: Oil, Culture, and Society in Venezuela* (Duke University Press, 2009), and Luis Giusti, "La Apertura: The Opening of Venezuela's Oil Industry," *Journal of International Affairs* 53(1) (1999): 117–28.

On embedding demand for oil within industrial societies (chapter 3), car culture and the political economy of automobility, see Matthew Paterson's excellent *Automobile Politics: Ecology and Cultural Political Economy* (Cambridge University Press, 2007). For a discussion of factors shaping car-centric cultures and strategies for changing course, see Daniel Sperling and Deborah Gordon's *Two Billion Cars: Driving towards Sustainability* (Oxford University Press, 2009). On the petrochemical industry and plastics culture, see Susan Freinkel, *Plastic: A Toxic Love Story* (Houghton Mifflin Harcourt, 2011); and Jennifer Gabrys, Gay Hawkins, and Mike Michael (eds), *Accumulation: The Material Politics of Plastic* (Routledge, 2013). For a rigorous theoretical account of the "production of scarcity" in the face of abundance, see Mazen Labban, *Space, Oil and Capital* (Routledge, 2008); on market making, see work by Matthew Huber, including "Enforcing Scarcity: Oil, Violence and the Making of the Market," *Annals of the Association of American Geographers* 101(4): 816–25; and Paul Sabin, *Crude Politics: The California Oil Market, 1900–1940* (University of California Press, 2005).

For analysis of the evolution of oil pricing, see work by Robert Mabro including "The International Oil Price Regime: Origins, Rationale and Assessment," *The Journal of Energy Literature* 11(1) (2005): 3–

20. Bassam Fattouh (and colleagues) at the Oxford Institute for Energy Studies provide detailed analysis of historic and contemporary pricing mechanisms and the influence of financialization: for example, “An Anatomy of the Crude Oil Pricing System,” OIES Working Paper 40 (available via the OIES website). For an analysis of the increasing role and influence of financial actors and financial motives on oil markets, see Angelos Gkanoutas-Leventis’ Spikes and Shocks: *The Financialisation of the Oil Market from 1980 to the Present Day* (Palgrave 2017). On the “tug of war” between producers and consumers over price and the role of OPEC within the global oil market, see Øystein Noreng, *Crude Power: Politics and the Oil Market* (I. B. Tauris, 2006).

Oil as a way of life (chapter 4) is explored in the rich collection of essays assembled by Hannah Appel, Arthur Mason, and Michael Watts in *Subterranean Estates: Life Worlds of Oil and Gas* (Cornell University Press, 2015). Contributors build on a tradition of ethnographic inquiry to examine how oil shapes the experience of life, and what it means to live, along the production chain. Oil’s impress on contemporary cultural politics, and the contrast between oil and an earlier era of coal, are central to Tim Mitchell’s *Carbon Democracy: Political Power in the Age of Oil* (Verso, 2010). Matthew Huber’s *Lifeblood: Oil, Freedom, and the Forces of Capital* (University of Minnesota Press, 2013) offers a penetrating account of the oil industry’s role in producing the contemporary neoliberal political subject. Based on the US experience, his account focuses on the cultural frameworks of meaning associated with expanding oil consumption in the twentieth century and a growing understanding of the “good life” as simultaneously a “self-made” life. Lisa Breglia’s *Living with Oil: Promises, Peaks, and Declines on Mexico’s Gulf Coast* (University of Texas Press, 2013) charts the economic and cultural experience of growth and decline of Mexico’s aging supergiant oil field, Cantarell. For an interesting historical account of Big Oil’s efforts to counter popular perceptions of the industry as a social menace in the first half of the twentieth century, see Roger Olien and Diana Davids Olien, *Oil and Ideology: The Cultural Creation of the American Petroleum Industry* (University of North Carolina Press, 2000).

Elana Shever's *Resources for Reform: Oil and Neoliberalism in Argentina* (Stanford University Press, 2012) explores the social and emotional bonds created between middle-class employees and the state oil company during Peronism. Her account explores how oil work is integral to workers' sense of self, and how the "affective" dimensions of oil work (and expectations of oil consumption among the poor) shaped responses to the privatization of Argentina's state oil company. Flora Lu, Gabriela Valdivia, and Néstor Silva's *Oil, Revolution, and Indigenous Citizenship in Ecuadorian Amazonia* (Palgrave, 2016) explores the cultural bonds between oil, citizenship, and the state in the context of Ecuador. The historical role of labor unions in shaping the political economy of oil runs through Myrna Santiago's *The Ecology of Oil: Environment, Labor, and the Mexican Revolution, 1900–1938*, which provides an environmental and labor history of the nationalization of Mexico's oil sector in the 1930s. Charles Woolfson, John Foster, and Matthias Beck's *Paying for Piper: Capital and Labour in Britain's Offshore Oil Industry* (Mansell, 1997) offers an exhaustive account of industrial relations in the North Sea oil sector, and the offshore safety regime that emerged in the wake of the *Piper Alpha* oil platform disaster. On racial tensions within US oil camps in Saudi Arabia and the defeat of progressive Saudi groups that consolidated US ties with the House of Fahd, see Robert Vitalis's *America's Kingdom: Mythmaking on the Saudi Oil Frontier* (Stanford University Press, 2006).

The question of oil security (chapter 5) is traditionally viewed through the state-centric lens of international relations. The questions international relations pose remain central, but other perspectives on the (in)securities created around and through oil have emerged that unsettle the equation of security with a "national" frame of reference. *The Routledge Handbook of Energy Security* (Routledge, 2011), edited by Benjamin Sovacool, provides a broad and nuanced range of perspectives. Daniel Moran and James Russell's edited collection, *Energy Security and Global Politics: The Militarization of Resource Management* (Routledge, 2009), examines contemporary strategies of producer and consumer states and the emerging political challenges to the market-based allocation of oil. Discussion of energy security criteria and assessments can be found in Bert Kruyt et al., "Indicators for Energy Security," *Energy*

*Policy* 37(6) (2009): 2166–81, and Andreas Loschel et al., "Indicators of Energy Security in Industrialised Countries," *Energy Policy* 38(4) (2010): 1665–71. The *New Energy Security Paradigm* of the World Economic Forum and CERA (2006) broadens the energy security concept at a policy level. John Mitchell, *The New Economy of Oil: Impacts on Business, Geopolitics and Society* (RIIA and Earthscan, 2001), remains one of the most encompassing discussions of the industry, emphasizing oil's acceptability rather than availability alone. Kristian Coates-Ulrichsen, *Insecure Gulf: The End of Certainty and the Transition to the Post-Oil Era* (Columbia University Press, 2011), provides a detailed analysis of the sources of instability among GCC countries; while contributions to *Oil States in the New Middle East: Uprisings and Stability* (Routledge, 2015) discuss responses by petro-states to the Arab Spring. For a critical analysis of the militarized approach of the US to oil security, see Garry Leech, *Crude Intervention: The US, Oil and the New World (Dis)order* (Zed Books, 2006), and Doug Stokes and Sam Raphael, *Global Energy Security and American Hegemony* (Johns Hopkins University Press, 2010). On the violence of neoliberalism and US decline, see Retort, *Afflicted Powers: Capital and Spectacle in a New Age of War* (Verso, 2005).

Michael Ross provides the most thorough analysis of oil dependence and development failure (chapter 6) in *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton University Press, 2012) and covers much of the extensive literature on the "resource curse," including Thad Dunning, *Crude Democracy: Natural Resource Wealth and Political Regimes* (Cambridge University Press, 2008), and Terry L. Karl, *The Paradox of Plenty: Oil Booms and Petro-States* (University of California Press, 1997). In *Carbon Democracy* (Verso, 2010), Timothy Mitchell provides a stimulating reflection on the effects of fossil fuels on democratic politics, arguing that coal strengthened democracy and social progress through the leverage coal miners (and other coal-related workers) exerted on the economy, but oil had a weakening effect through its lower labor intensity and the migration of oil production overseas. Robert Engler's *The Politics of Oil: A Study of Private Power and Democratic Directions* (University of Chicago Press, 1961) is still one of the most influential critiques of the oil industry and its influence over society. Mahmoud El-Gamal and Amy Myers Jaffe take a detailed look at relationships between energy market cycles, Middle East geopolitics, and financial markets in *Oil, Dollars, Debts and Crises* (Cambridge University Press, 2010). On oil and food, see Dale Allen Pfeiffer, *Eating Fossil Fuels: Oil, Food and the Coming Crisis in Agriculture* (New Society, 2006); Julia Wright, *Sustainable Agriculture and Food Security in an Era of Oil Scarcity* (Earthscan, 2008); and David Pimentel and Marcia Pimentel, *Food, Energy, and Society* (CRC Press, 2008).

Joan Martinez-Alier (with colleagues at the Universitat Autònoma de Barcelona) has developed an influential framework for assessing the ecological distribution conflicts associated with extractive economies (based in part on the experience of oil); see *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation* (Edward Elgar, 2002); see also the EJOLT project (www.ejolt.org). Anthropologists, geographers, and political ecologists have explored the ways in which livelihood strategies, corporate activity, and state institutions combine in different ways along the oil production network: *Crude Domination: An Anthropology of Oil* (Berghahn Books, 2011), edited by Andrea Behrends and other researchers at the Max Planck Institute for Social Anthropology; also Tobias Haller et al. (eds), *Fossil Fuels, Oil Companies, and Indigenous Peoples* (Lit Verlag, 2007). On extractive conflicts in Latin America, including oil and gas, see Anthony Bebbington (ed.), *Extractive Industries, Social Conflict and Economic Development: Evidence from South America* (Routledge, 2012); for an anthology of work on environmental justice and oil and gas development in Russia and the Caspian, see Julian Agyeman and Yelena Ogneva-Himmelberger (eds), *Environmental Justice and Sustainability in the Former Soviet Union* (MIT Press, 2009); see also Michael Bradshaw, "A New Energy Age in Pacific Russia: Lessons from the Sakhalin Oil and Gas Projects," *Eurasian Geography and Economics* 51(3) (2010): 330–59.

Michael Watts has theorized oil's multiple creative/ destructive political economies, drawing upon the appalling environmental and social record of oil in the Niger Delta, and the dire implications of a petro-state's "failed modernization" for those who live around, through, and despite oil: see, for example "Petro-Insurgency or Criminal Syndicate?," *Review of African Political Economy* 114

(2008): 637–60; “Empire of Oil,” *Monthly Review* 58(4) (2006): 1–16; “Anatomies of Community,” *Transactions of the Institute of British Geographers* 29 (2004): 195–216; and “Petro-Violence: Community, Extraction, and Political Ecology of a Mythic Commodity,” in Nancy Peluso and Michael Watts (eds), *Violent Environments* (Cornell University Press, 2001), pp. 189–212. For an incisive critique of representations of violence and criminality in oil-production areas, see the work of Anna Zalik, such as “Protest as Violence in Oilfields: The Contested Representation of Profiteering in Two Extractive Sites,” in S. Feldman et al. (eds), *Accumulating Insecurity* (University of Georgia Press, 2011). For a wide-ranging indictment of the violence of oil-based “development,” see Peter Maas, *Crude World: The Violent Twilight of Oil* (Knopf, 2009), and for an extensive elaboration of the call to end oil trade produced in authoritarian and corrupt regimes, see Leif Wenar, *Blood Oil: Tyrants, Violence, and the Rules that Run the World* (Oxford University Press, 2015). On oil and armed conflicts, see Philippe Le Billon, *Wars of Plunder: Conflict, Profits and the Politics of Resources* (Hurst and Oxford University Press, 2014). For a nuanced analysis of opposition to petroleum in Ecuador and the complex imbrications of oil with class, regional, and national identities, see G. Valdivia, “Governing Relations between People and Things: Citizenship, Territory and the Political Economy of Petroleum in Ecuador,” *Political Geography* 27(4) (2008): 456–77; and Suzana Sawyer, *Crude Chronicles: Indigenous Politics, Multinational Oil, and Neoliberalism in Ecuador* (Duke University Press, 2004). For a captivating account of the politics of tar sands development in Alberta, see Andrew Nikoforuk’s *Tar Sands: Dirty Oil and the Future of a Continent* (Greystone Books, 2010). ‘*First World Petro-Politics: the Political Ecology and Governance of Alberta*’, edited by Laurie Adkin, provides a critical survey of conflicts around oil and gas development in the province (University of Toronto Press, 2016).

In *The Politics and Institutions of Global Energy Governance* (Palgrave, 2010), Thijs Van de Graaf provides an insightful analysis of the evolution of energy governance, from the “Seven Sisters” cartel to the International Renewable Energy Agency. *Global Energy Governance: The New Rules of the Game* (Brookings Institution Press, 2010), by Andreas Goldthau and Jan Martin Witte, discusses options for improving energy security through better governance (chapter 7). On the re-politicization of energy policy, see Dieter Helm (ed.), *The New Energy Paradigm* (Oxford University Press, 2007). Readers interested in the evolution of the International Energy Agency can turn to the IEA's former legal counsel Richard Scott's *The History of the International Energy Agency: The First 20 Years*, and a subsequent volume by Craig Bamberger available on IEA's website. Sylvia Karlsson-Vinkhuyzen's "The United Nations and Global Energy Governance," in *Global Change, Peace and Security* 22(2) (2010): 175–95, provides a detailed account and explanations for the slow progress of energy governance through the UN system, especially the reluctance of member states to forgo sovereign energy policy. The role of the G8 in global energy governance, its articulation with energy-related organizations, and explanations for a performance below expectations is provided in Dries Lesage et al., *Global Energy Governance in a Multipolar World* (Ashgate, 2010). Jon Skjaerseth and Tora Skodvin provide an early, detailed inquiry into oil companies' engagement with climate policy in *Climate Change and the Oil Industry* (Manchester University Press, 2003). Suzana Sawyer critically deconstructs a Chevron media campaign in "Human Energy," *Dialectical Anthropology* 34 (2010): 67–75.

For an entry to the growing literature on post-oil transition (chapter 8), see Peter Newman, Timothy Beatley, and Heather Boyer on strategies for decreasing vulnerability to oil shocks in *Resilient Cities: Responding to Peak Oil and Climate Change* (Island Press, 2009). Opportunities for China in relation to transport policy are discussed in Kelly Gallagher, *China Shifts Gear: Automakers, Oil, Pollution, and Development* (MIT Press, 2006). For proposals that seek to cut off carbon at source and "keep the oil in the soil," see Nnimmo Bassey, *To Cook a Continent: Destructive Extraction and the Climate Crisis in Africa* (Pambazuka Press, 2012); and Pamela Martin, *Oil in the Soil: The Politics of Paying to Preserve the Amazon* (Rowman & Littlefield, 2011). In *Sustainable Fossil Fuels: The Unusual Suspect in the Quest for Clean and Enduring Energy* (Cambridge University Press, 2005), Mark Jaccard sketches a climate-conscious energy future in which oil has a substantial role; while in the context of a supposed new era of (unconventional) oil abundance and concerns for climate change, Alex Epstein puts forward a *Moral Case for Fossil Fuels* (Portfolio, 2014).

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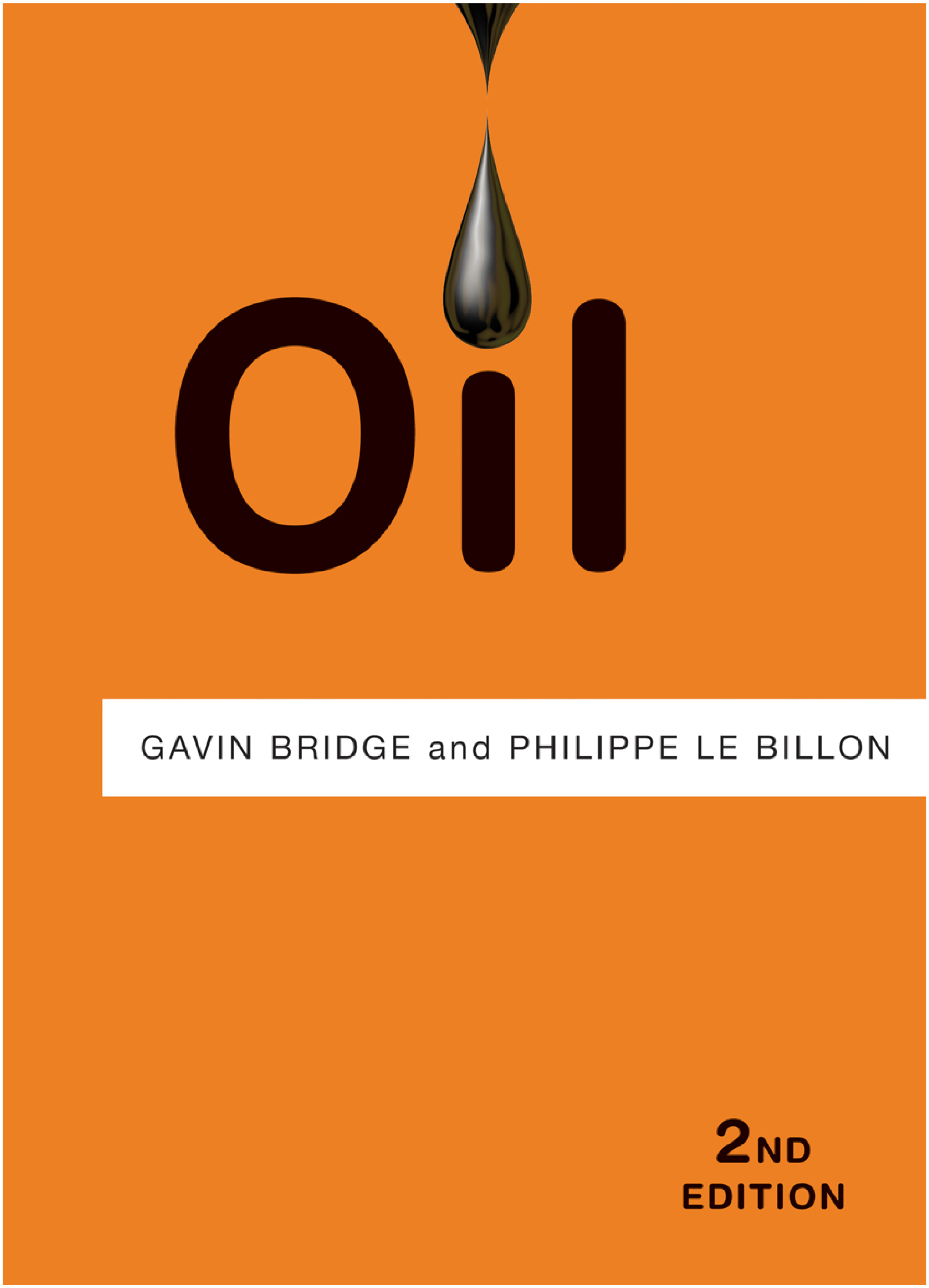
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