CHAPTER 2

Fossil Fuels and Energy Justice

Coal, Oil and Gas

Abstract Fossil fuel systems are routinely associated with injustice. The inherently carbon-intensive nature of fossil fuels poses serious questions for the future of oil, gas and coal. This is only part of the picture. I explore, firstly, the different characteristics of each energy source, including significant differences in carbon emissions. The chapter broadens its assessment beyond carbon emissions to consider the wider energy context of resource availability, accessibility and sustainability. This includes an assessment of natural reserves, patterns of production and consumption, trade flows, price and long-term trends as well as carbon dioxide emissions. The energy justice framework is then applied to each energy source with a detailed coverage of their respective distributional, recognition and procedural global inequalities.

Keywords Energy justice · Oil and gas · Coal · Fossil fuels · Subsidies Divestment

2.1 Introduction

The energy justice framework is applied in this chapter to the context of fossil fuel sources. Fossil fuels are widely considered as the primary origins of carbon emissions in the global energy system (IEA 2016a; WB 2017a; WEC 2016a). Oil, coal and gas are the backbone of energy provision systems as set out in Chap. 1. They are often understood as a

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generic group of energy sources. This is, however, an oversimplification. For the purposes of this chapter, the primary difference of note is the comparative dimension between each source in terms of carbon emissions. Coal is the highest emitting energy source, followed by oil and then gas. This has resulted in some claiming that natural gas will play an important role in transitioning away from coal to renewable energy sources (Mackenzie 2017b; WEC 2016b). A common characteristic remains as they are all significant carbon emitters when compared to low-carbon energy sources as set out in the next chapter.

I outline in this chapter further details regarding each of these energy sources in relation to the trilemma of availability (energy security), accessibility (energy/fuel poverty) and sustainability (climate change/low-carbon agenda), before carefully considering the justice implications of fossil fuel sources. From this perspective, I seek to explore the research questions outlined in the energy justice framework. On availability, I consider where oil, coal and gas are located throughout the world both in terms of estimated reserves as well as levels of production. Some assumptions currently made in literature need to be updated. The Middle East is of course a major producer of oil for example, but South and Central America is the main region of the world where most reserves are located. For accessibility, we turn our attention to patterns of consumption, the trade flows and their resulting price of fossil fuels. I cover in some detail the interplay between oil price and the future of natural gas for example. I complete the picture by assessing the carbon dioxide emissions of oil, coal and gas, as well as outlining the major projections associated with the future these sources.

The second part of the chapter is then dedicated to an exploration of the major global inequalities directly associated with issues of availability, accessibility and sustainability. The interplay between the energy context and associated inequalities is at the heart of energy justice. The distribution of justice assesses if the location of resources, the patterns of consumption and carbon emissions are spread evenly across the world. I cover both production and consumption inequalities. By doing so, I bring our attention to a wide range of human rights violations, in both an urban setting and rural setting (primarily the former). For recognition, we consider who is misrecognised in this undoubted story of global distributional inequality with regard to all three fossil fuel sources. I raise examples from the Peruvian Amazon, sub-Saharan Africa, India as well as Europe. This chapter finishes with an assessment of the processes through which various stakeholders are given the opportunity to meaningfully improve into decisions made on fossil fuels. I conclude with some reflections on the long-term nature of fossil fuel policy structures.

2.2 Availability: Reserves, Production and Security

Oil reserves are effectively theoretical. This means that we do not actually know how much oil is available in the world—we estimate it. Statistics on oil reserves are scientifically proven by energy companies and some independent geological organisations. Within this context, the total global crude oil reserves in 2016 were understood to have fallen by two billion barrels, coming to 1697 billion barrels (BP 2016). Reserves have increased by 24% over the past decade. It is estimated that there are sufficient reserves to meet 50 years of global production (BP 2017). The highest increase in reserves is in Norway, whilst Brazil has suffered the most significant decline within this time frame. We often assume that most reserves are found in the Middle East. This is inaccurate. South and Central America is the main region of the world with the highest amount of proven oil reserves (IEA 2015, 2016c).

In the past 2 years (2016 and 2017), global oil production has exceeded the growth of oil consumption. Production grew significantly in the Middle East and North America. Whilst the most significant resources are found in South and Central America, the main oil-producing region is in fact the Middle East (BP 2016; XOM 2017). The second largest oil-producing area of the world is North America, followed by Europe driven by Norway and Russia. The global trend is a slow movement away from the Middle East since 1996, towards a proliferation of new oil producers today. In terms of availability, the battle is between those regions of the world that are currently the majority producers (e.g. Saudi Arabia) of oil against the emerging competitors such as South America and shale producers in the USA.

The calculation of natural gas reserves is indeed similar to that of oil. World energy companies such as British Petroleum and Exxon Mobil submit estimations of proven reserves through a range of scientific methods. Global reserves of natural gas have maintained a steady level, sufficient to meet around 52 years on current production trajectories (XOM 2017; BP 2017). The picture of natural gas reserves is extremely contrasting to that of oil. The majority of new reserves are not found in South and Central America. The new shale gas revolution in the

USA has not translated into a heavily increased expectation with regard to future gas reserves. There is, however, an expectation that this may change in the near future as new submissions on shale gas reserve finds are processed. Instead, almost half of the proven natural gas reserves are currently found in the Middle East (WEC 2016a).

Similar to oil, the location of the most significant natural gas reserves (Middle East) is not that of the primary producing region. North America and Russia account for two-thirds of natural gas production in 2016. The Middle East is the second most significant reason of the world, but it only produces around a fifth of global natural gas production. Unlike oil, natural gas production has increased by around 2.5%, both in the last 2 years and for the last 10 years. North America has indeed recorded the largest growth increment, whilst Europe and Russia have marginally declined through this period (IEA 2016c; WEC 2016a).

The global reserves of coal are also the results of estimations from energy companies. The biggest contrast with oil and gas is the length of time that call reserves will last for. Estimations expect that the total proved coal reserves are sufficient to meet over 110 years of global production (XOM 2017). Europe and Russia hold the largest proved reserves, whilst North America and the Asia Pacific region have the second largest reserves. This outlook provides an uncomfortable picture for energy. Coal is the highest emitter of CO_2. Global efforts to reduce CO_2 emissions are in sharp contrast with the fact that coal has the longest lifetime for fossil fuel sources (WEC 2016a).

Production does reflect the changing status of coal in the global energy drive towards reducing CO_2. There has been a gradual decline over the past 10 years. This decline is, however, variable in terms of location (GP 2015). Reductions are to be found in the USA, Indonesia and in a more modest fashion China. These declines are very recent, taking place primarily after 2014. For the USA, the emergence of shale gas has sped up the decline of coal. Indonesian and Chinese reductions have been proportionally minor. All these examples contrast further with that of India. Production remains extremely important in the Asia Pacific region. Future reductions will rely upon changes in policy in China, which appears to be taking place, and India, where less progress has been made (EIA 2017).

2.3 Accessibility: Consumption, Trade Flows and Price

The availability of oil, coal and gas is only part of the picture. It provides us with an understanding of the amount of reserves in each case, as well as where each source is produced. We turn our attention to consumption, trading of these sources and their price in order to get a better appreciation of the accessibility criterion.

Global oil consumption has increased over the past 10 years, to nearly double the 10-year average, with above-average growth driven by OECD countries. Growth in consumption has been well above historical averages in the USA and the EU, whilst Japan has recorded during this period the most noteworthy decline in oil consumption (WEC 2016a). Outside the OECD countries, China and India are the most significant consumers of oil. India surpass Japan during the past 10 years has the world's third largest oil consumer (CNPC 2016). The main driver of oil product consumption is transportation fuel. Demands for oil-based fuels for transportation have increased dramatically in terms of private use, with a more modest increase evident for industrial uses.

We must acknowledge the context in which oil is consumed. A key driver of oil consumption is price. In 2014, the world suffered the greatest reduction on record in crude oil price from over $100 per barrel to under $50 per barrel. Historically, the price of oil has fluctuated significantly over the past 50 years (Mackenzie 2017c). This has greatly disrupted the affordability and indeed accessibility of oil-based products. The path dependency of oil importing countries means that such changes in price have structural implications (Goldthau and Sovacool 2012). It does not, however, affect so much the major trade movements in oil. Crude oil trade has been lifted by growing exports from the Middle East, whilst Europe and China are the venues for the highest increases in imports (BP 2017). This reminds us that dependency on oil, especially for transportation uses, is structurally embedded into importing and exporting countries no matter the price.

Natural gas is considered to be a possible transitionary fuel from oil and to an extent coal, albeit carbon emitting (as explored below in further detail). Global consumption of natural gas increased after 2014. It has, however, declined over the past 10 years (IEA 2016b). The Middle East has been the region where the strongest growth rate is observable, whilst Europe and Eurasia have declined. EU countries are steady consumers of natural gas, but decline in gas consumption over the last 10 years has been experienced in Russia (IEA 2016c). Natural gas has accounted for 25% of energy consumption globally over this period (BP 2016). Iran and China have recorded the largest increase in consumption outside OECD countries in 2015/2016, whilst the USA is the fastest growing consumer of gas in the OECD (Mackenzie 2017a).

Following the decline in oil prices, natural gas prices have declined significantly throughout the world since 2014 (Mackenzie 2016). The new gas prices are a direct outcome of increased supply, led by the USA and Asia (Mackenzie 2017c). This resulted in a recent decline in natural gas trade movements in 2014. This picture has reversed in 2015 and in 2016. Pipeline shipments have increased by 4%, especially with regard to exports from Russia and Norway. There were also very large increases in that pipeline imports in Mexico and France (WEC 2016a). In addition to pipelines, natural gas is also traded through conversion into liquefied natural gas. LNG trade has increased globally by around 2%. Export growth has been experienced in Australia and Papua New Guinea, whilst higher imports have been observable in Europe and the Middle East (Mackenzie 2017b).

The Paris climate change agreement has now formally recognised the requirement for the world to move away from coal. In reality, India and Indonesia are continuing to increase their consumption of coal. Its global primary energy consumption share is still around 29% in 2016. Emerging economies such as India are propping up global energy dependence on coal (Mackenzie 2017a). The broader picture is more optimistic with regard to reducing dependence on this energy source. Overall, global consumption has reduced by around 2% over the last 10 years. The most significant decline in consumption has been in the USA, by almost 12% in 10 years, and China, by a more modest 2% during this time frame (Mackenzie 2017b).

The price of coal has also declined for the fourth consecutive year (Mackenzie 2017a). However, this is not the same pattern as we observed with oil and gas. For the latter, significant increases in hydrocarbon resources through most notably hydraulic fracturing have driven price changes (WEC 2016a). For coal, a lack of demand has led to the decline in price (BP 2017). The pricing of this energy source is different to the global singular (in terms of regional variation) price structure of oil and gas. We have regional differences in price structure reflecting Europe, USA, Japan and Asia. European prices have reduced by half since 2011, reflecting the change in attitude towards his source. For Japan and Asia, the drop in price during this period was around half of the European price decline (Mackenzie 2017a). In brief, coal is concerned, traded and priced according to the regional variation in perspective towards this energy source today and in the future.

2.4 Sustainability: Carbon Dioxide Emissions and Long-Term Trends

Our global energy system must significantly reduce the use of coal if sustainability is to be a key priority (Karlsson 2012). It remains the most significant emitter of CO_2 emissions (IEA 2016a). It continues and is still projected to rise in terms of its contribution to global emissions (EIA 2017). This does not mean that we should neglect the contribution made by oil and gas. In order to get a clearer picture, this section outlines the key statistical context for understanding the contribution of fossil fuels to global CO_2 emissions. It then details briefly what we can expect in the future.

Oil accounts for 34% of the global CO_2 emissions originating from energy sources. Since 1971, oil has witnessed a decline in percentage share of global CO_2 emissions from accounting for almost 50% of emissions in total at that time (IEA 2016a). This is almost a decline by a third in percentage share to the present day. This decrease was due to the move away in developed economies from oil as a fuel for combustion, towards a source for transportation and a wide range of products (Bridge and Le Billon 2013). Out of the ten thousand million tonnes of CO_2 emitted, only around 10% of these is used for electricity and heating generation. Three-quarters of this total is dedicated to transportation primarily by road (IEA 2016a).

The position of oil as a global energy source is therefore linked intimately to the future of transportation (Bridge and Le Billon 2013). This not only relies upon the development of electric vehicles, but also more substantially the future of oil price. It is expected that the price will settle on around $80 per barrel, with substantial fluctuations due to structural changes in the sector (Mackenzie 2017c). Demand continues to fall and is becoming increasingly sectoralised in transport, whilst supply increases. Uncertainty remains whether these structural changes amount to a re-balancing of the market, or if oil is on the decline over the long term

(WEC 2016b). China has been responsible for around 60% of global oil consumption growth (Mackenzie 2017a). It is now entering a less energy-intensive stage in the development. This factor might be crucial to the future restructuring of oil demand as limited to transportation and oil products.

Around a sixth of CO_2 global emissions is represented by natural gas (IEA 2016a). Since 1971, gas has remained a marginal emitter of global CO_2 emissions when compared with coal and oil. It has undergone a minor increase from around 15% to 21% today (IEA 2016c). From the 6000 million tonnes of CO_2 emissions, electricity and heating account for over a third. The second biggest emitter of natural gas usage is manufacturing industries and construction. A useful gauge for understanding the variation in CO_2 emission across fuel type is CO_2 emissions per kilowatt hour. The figures vary depending on each country as technologies differ significantly. Taking the global figures, coal emits an average of 944 gm of CO_2 per kilowatt hour. The average for oil is 788 grams, whilst gas comes in at only 453 grams (IEA 2016a).

In the context of fossil fuels, natural gas is the primary transition fuel for moving away from the carbon-intensive hydrocarbons of oil and especially coal (Kopp 2015). This fuel source has an important role to play in replacing carbon-intensive fuels or backing up the integration of renewables. With China and the Middle East as the main centres of gas demand growth, this fuel has witnessed consumption increasing by almost 50% in the last 10 years. Gas prices are already low in North America and elsewhere as conventional and unconventional supplies increase (Mackenzie 2016). The first threat to a rising position for gas is the capital-intensive pipelines (often leading to additional methane gas leakages) needed to deliver future gas supplies (Nathan et al. 2013). The second barrier to growth is of course renewable energy in a developed world context, and coal as a cheaper form of electricity and heating supply for the developing world (Schackmann 2013).

In terms of primary energy supply, coal has a similar share of global CO_2 as oil (29% to oil's 31%). However, the actual contribution of coal to global CO_2 emissions doubles when we take into account combustion. This means that coal leads to almost half of global CO_2 emissions (46%) originating from energy sources (IEA 2016a). Whilst oil has reduced its percentage share of global CO_2 emissions, coal has increased from 37% in 1971 to almost 50% today. Since the Kyoto agreement in the late 1990s, coal as the most significant emitter of CO_2 has increased from 85,000 million tons to almost 15,000 today (WEC 2016a). It has been adopted as one of the primary fuel sources for combustion in terms of both electricity and heating supply, amounting to three-quarters of CO_2 emitted. Manufacturing industries and construction are the second most significant emitters of CO_2 for coal (IEA 2016a).

The story of the last 15 years (and until very recently) has been dominated by growth for this energy source. It has increased its share from 23% in 2000 to 29% today. The next 15 years is likely to deliver a different picture (BNEF 2016; BP 2016; GP 2015; IEA 2015; WEC 2016b; XOM 2017). At least, this is what is expected by the majority of energy analysts in an era of global agreements on carbon reduction. The fuel that led to 45% of the increase in global energy demand over this period is estimated to amount to only 10% in the next 15 years (BP 2017; XOM 2017). The developed world is set to reject this energy source if projected policy trajectories take place as expected (WEC 2016b). The attention in the sector is firmly concentrated on China as a slow decline is projected (Mackenzie 2017a). This remains uncertain when considering the high dependence that it has on coal today. The primary opportunity for this fuel source remains technological developments in capturing CO_2, which is currently too expensive (Freese 2003; Osborne 2013).

2.5 Distributional Justice and Fossil Fuels: Where Produces, Consumes and Emits Carbon?

The geographical location of fossil fuels is associated with multiple levels of distributional inequality (Bridge and Le Billon 2013). This section concentrates on the injustice of where fossil fuels are located, in terms of both suffering the consequences of related production processes and lacking access to reserves. The third level of distributional inequality highlighted involves an assessment of injustices that can develop in relation to where CO_2 emissions originate from and are attributed to.

2.5.1 Where Are the Resources Located?

There is an inbuilt system of injustice throughout fossil fuels in that abundant resources are often located remotely from those regions that require them for production. Unlike modern renewable technologies such as wind or solar, the geological presence or absence of fossil fuels is not evenly dispersed throughout the globe. Two forms of distributional inequalities emerge for all three fossil fuels in relation to (1) mining and (2) consumption (as covered in the next subsection). The first relates to those parts of the world that have fossil fuels, whilst the latter is an inequality suffered by those that do not—at least proportionally. Nigeria is a classic example of the first form of distributional injustice and often used as an example of the resource curse (Acey 2016; Adekola et al. 2015; Ako 2009). International organisations drive mining-related activities with little regard for local sensitivities such as environmental protection, community livelihoods or the needs of localities (Hennchen 2015).

The Arctic region is another example of mining-related distributional inequalities. The Yamal Peninsula in north-western Russia has been subject to the most substantial natural gas-related my activities in the region instigated by Gazprom (Pika and Bogoyavlensky 1995). Unlike the Niger Delta, this area is much less populated resulting in lower levels of controversy and focus. It has, however, been connected with speeding up climate change through disrupting highly sensitive ecosystems despite mitigation efforts (McCauley et al. 2016). The example of coal mining in pastureland in southern Chile offers an example whereby fossil fuel reserves are often located near indigenous lands (Bustos et al. 2014). All three examples bring to our attention the inequalities that are generated through mining activities taking place across the world. They lead to increased levels of conflict in Nigeria, ecosystem damage in the Arctic and indigenous land destruction in Chile.

2.5.2 *Where Does Consumption Take Place?*

A focus on the extraction industries only provides part of the picture. The consumption of fossil fuels for electricity, transportation and heating use is also connected to similar levels of distributional inequality. The need to distribute these resources from the extraction points to areas of the world that are highly demanding generates transnational inequalities. Burton and Stretesky (2014) demonstrate that significant human rights violations have taken place in transport. Residents suffer the impact of the railway transportation of fossil fuels along the US–Canada corridor. Hricko et al. (2014) assess the health impacts of residents living near freight rail yards associated with the transportation of fossil fuels. They find that the increase in energy-related trade has led to lower income and ethnic minority residents suffering from diesel-related cancers.

Largely urban-based residents in the USA (McKenzie et al. 2016; Chakraborty 2009; Marshall et al. 2014) and other European nations (Kopp 2015; Frantal and Novakova 2014) have suffered correlated increases in air pollution due to fossil fuel-producing industries. Karlsson (2012) argues that even the statist regime of China is unable to resist the production of harmful fossil fuels and highly urban areas despite highly significant air pollution. As indicated above, the main polluting industries are no longer restricted to powerplants, especially outside emerging countries such as China or India. Transportation of all types generates the most notable inequalities in terms of air pollution (Chakraborty 2009; Demaria 2010; Kuhling 2008; Sobotta et al. 2007). This means that highly populated areas such as cities are increasingly sensitive to fossil fuel-related air pollution. The traditional phased or zonal model of old traditional powerplants where only those who lived in close proximity where in danger has been transplanted by pollution- and health-related consequences for everyone. From this perspective, new spaces of distributional inequality are increasingly transcending individual places.

2.5.3 Where Emits Carbon Dioxide Emissions?

Fossil fuels are intimately linked with carbon dioxide emissions. As explored above, coal is emerging as the primary driver of CO_2, followed by oil and then gas. The producer, rather than consumer, remains at the centre of distributional inequalities with regard to fossil fuels (Cotton et al. 2014). In order to get a flavour of the distributional inequalities generated in this area, we must consider the three major uses of these energy sources which drive production. In terms of electricity, the poorest nations of the world are effectively locked into coal-based electricity due to its historically low price (Freese 2003). The ability to emit less carbon in this sector is still determined by affordability (Fitzgerald 2012). The emerging economies including China, India and Brazil are forced into high-carbon electricity systems. We must attempt to rectify this global inequality by incentivising low-carbon electricity generation within these contexts.

Heating and transportation do not reflect a similar division in terms of emerging economies versus developed nations. These two sectors remain highly carbonised, irrespective of wealth creation or investment power.

As populations rise in emerging economies, a similar division may appear but not to the same extent (BNEF 2016). The distributional inequalities in heating are driven by access to natural gas (Mena-Carrasco et al. 2012). The growth in LNG has resulted in exporter countries experiencing a substantial demand for the product as carbon-intensive economies seek to replace coal with gas (Hogselius 2013; Austvik 2016; Boersma 2015; Locatelli 2015). A recent high-profile example of this dependence appeared with regard to the Ukraine in 2014 where Russia imposed restrictions (Van de Graaf and Colgan 2017). Inequalities with regard to transport are even starker. The dominance of oil in all forms of transport means that dependence is inevitable for the foreseeable future, leading to the institutionalisation of fossil fuel systems.

2.6 Recognition Justice and Fossil Fuels: Who Does Not Benefit, Have Access or Emit Carbon?

An initial attempt to understand the distributional inequalities of fossil fuels risks a deeper misrecognition of underlying injustices. For this reason, we must look deeper into how inequalities are distributed globally. This means that we must consider identifying which parts of global society do not benefit from fossil fuels, or more generally do not have any access to them and lastly recognising who is not involved in emitting carbon.

2.6.1 Who Does Not Benefit from the Resources?

This is a different question to access. It is more focused upon material benefit from the resources, rather than having access to them or indeed suffering as a result. For fossil fuels, the most common debate in this area is the lack of benefit that exploited communities receive from the destruction caused by mineral extraction. Martinez et al. (2007) details such a case in the Peruvian Amazon where oil and gas has been extracted since the 1970s. Some recent studies of this case have shown extremely high blood lead and cadmium levels. Despite over 30 years of extraction, local communities have not benefited from hosting such activities in contrast to the rising profits of the company involved. Martinez-Alier (2014) argues that this lack of benefit has given rise to what he refers to as the "environmentalism of the poor" whereby such communities face a constant struggle to preserve their own livelihoods against mining companies, land grabbing and oil and gas exploitation without material recompense.

The focus in such local contexts is placed upon the lack of benefit for communities in producing or net exporting countries. We must also be aware of the absence of benefits for communities who are placed within net importing national contexts. The inequality is not as place specific, based upon the lack of recompense for land grabbing, mismanagement or destruction. It is rather determined by levels of affordability. Benefits from the resource are constrained by the ability of an end-user to pay for the product (Bouzarovski and Petrova 2015). The fluctuations in oil price as covered above mean that levels of affordability can shift dramatically. This is given rise to what has been termed as the fuel poor—meaning the section of society that spent more than 10% of its income on energy (Snell et al. 2015). Fossil fuels from this perspective have created institutionalised energy logics of inequality based upon ability to pay. We must recognise this reality and act accordingly to minimise its impact.

2.6.2 Who Cannot Access?

Fossil fuels continue to dominate the global supply of electricity, accounting for 68% of electricity production (IEA 2016c; WB 2017b). Access to electricity is one of the primary global challenges facing society. An estimated 1.2 billion, 16% of the global population, did not have access to electricity in 2015 (WEC 2016c). The highest share of this population exists in sub-Saharan Africa, Asia and India, and primarily in rural areas. Modern renewable energy investments, including wind, are targeted in Asia. Around one billion people have gained access to electricity since 2000 in the developing areas of Asia, reducing by half the number of people without electricity (IEA 2016b). The inequality that we must be most mindful of is surely the lack of progress in renewable energy expansion in sub-Saharan Africa. Projections also suggest that India will not improve much in this regard either (BNEF 2016).

Access is therefore different to benefit. It is more absolute. It should be presented as a human right for every individual in the world (Sovacool et al. 2016). Cosmopolitan justice, as a cornerstone of energy justice, demands that we need to reframe our understanding of access from a national context to thinking more explicitly on a global level (Heffron et al. 2015). Moving beyond electricity, heating and cooking fuel should of course be part of this picture. On current trajectories, natural gas is the best placed transitionary fuel to replace existing toxic traditional biomass. The OECD finds that 49% of developing countries are still relying upon traditional biomass as a cooking fuel, which has serious health implications for the user (IEA 2016c). This is particularly stark within Africa, where the proportion is closer to 70% (IEA 2015). Providing access to cleaner sources of fuel must be an imperative if the energy justice framework is to be taken seriously.

2.6.3 Who Does not Emit?

There are a few places in the world that are not implicated in the emissions of CO_2 from fossil fuels from electricity generation, heating and above all transportation. The interest for energy justice is not to reveal how we can spread it a norm of avoiding emissions. For now, energy projections suggest that this would be unrealistic (BNEF 2016). The framework reminds us that decreasing emissions is a central objective. We should therefore recognise not only those who pollutes, but also those who do not—and how they achieve this. There is firstly the intergenerational argument (Emil Hess and Ribeiro 2016). Emerging economies are increasingly in need of energy sources, often leading to the conclusion that they will emit more than those economies that can afford not to (Alexander 2016). From this perspective, we must not fall into the trap of believing that those who do not emit today did not in the past. Such tensions were observable in the Paris climate change agreement (Lyster 2017).

From an intragenerational viewpoint, affordability must secondly be considered when reflecting upon who is not emitting (Neher 2016). Low-income countries as classified by the World Bank share a lower proportion of carbon emissions per capita. Middle-income countries have a much higher proportion because of the significantly higher demand of carbon-intensive low-priced fuel. Higher income countries are also elevated due to consumer demands, rather than industry (WB 2017a, c). The primary driver for emissions intragenerationally is therefore growth related. The diffusion of low-carbon-emitting technologies is the responsibility of higher income countries that can afford the research costs and intellectual property rights. Recognising why emissions are low is equally as important therefore as who generates them.

2.7 Procedural Justice and Fossil Fuels: How We Make Production or Consumption Decisions

Inequalities exist in the processes through which various stakeholders are given the opportunity to meaningfully input into decisions made on fossil fuels (Acey 2016; Ayling and Gunningham 2017; Ikelegbe 2005; Orta-Martinez and Finer 2010). We must consider the full range of injustices from production to consumption as well as from the formal to informal, in order to understand how we might go about producing long-term effective solutions.

2.7.1 How Are Production Decisions Made?

The fossil fuel industry is based upon an assumption that production decisions form around whether resources are available or not. When geological research is completed, a nation or region that finds such resources are then involved in encouraging through a wide range of subsidies (both direct and indirect) their exploitation for both financial and material gains (Lin 2014; Riedy and Diesendorf 2003). This logic contrasts distinctly with modern renewable energy sources, as will be detailed in the next chapter. Decisions are perceived to be normatively driven as a response to carbon emissions, whereas fossil fuels are understood to be driven by what is commonly understood to be the resource curse (Frantal and Novakova 2014). Nations and communities become fixated with the potential rewards. Within this context, nation states and multinational companies are drivers of production decisions, rather than local communities or even national electorates.

Existing literature suggests that the ways in which decisions are made in the fossil fuel industry reflect a distinctly opaque and non-participatory framework (Kohli and Menon 2016; Higginbotham et al. 2010; Cotton et al. 2014). Stretesky and Lynch (2011) produced a comprehensive study of procedural violations across the USA between 2002 and 2008 with regard to the coal industry. In reflecting upon 110 coal strip mining operations, their results suggested that residents were routinely ignored in the decisions to either establish or expand operations. They stated further that job creation is understood to be the trade-off for a community in accepting infrastructural developments. This finding is replicated in other locations and in relation to both gas and oil. McKenzie et al. (2016) assessed the actions of oil and gas companies in relation to residents in Colorado. Despite associated health consequences, local communities welcomed infrastructure in their areas precisely because of job creation.

Production decisions on oil and gas are driven by multinational companies and nation states, but often accepted by communities on the basis of increased employment prospects. This means that the level of engagement that we see with modern renewables such as wind energy is not as required with fossil fuels. If high-carbon fuels continue to benefit from the perception of economic rationalities, a normative drive is underway as an attempt to re-balance communities towards accepting and demanding lower carbon forms of energy. This has been referred to as the divestment movement. Finley-Brook and Holloman (2016: 1666) state that "fossil fuel divestments are an important catalyst of an energy revolution". Divestment is effectively the selling of assets linked to specific oil and gas firms (Ayling and Gunningham 2017). Within the context of my argument, it is an important shift in production decisions on fossil fuels as it tackles the normative angle in the need for society to move away from high-carbon sources. It is only one mechanism (Apfel 2015). We can expect similar tools to emerge in order to shift fossil fuel production decisions from economic rationality to broader normative questioning in communities.

2.7.2 How Are Consumption Decisions Made?

Fossil fuel divestment is of course a tool for influencing both production and consumption. I view this more in production as it is primarily targeting the objective that we do not produce electricity, heating or transport fuel through fossil fuel resources. Instead, we should leave them in the ground (Linnenluecke et al. 2015). On consumption explicitly, the end-user remains comparatively impotent on a global scale. As we will see in the next chapter, this factor contrasts distinctly with renewables where we do have the possibility as an end-user to influence our provision. For fossil fuels, this is not as easy. The infrastructure needed to develop fossil fuels is inherently large scale and highly technical. This means that we are forced to accept a position of either provider or user. The provision of fossil fuels determines almost entirely our consumption decisions in this case. In developed economies, we do have options to select non-fossil fuel tariffs through paying potentially a little more (Che et al. 2017; Kalkbrenner et al. 2017). For the majority, this is not possible. In the fossil fuel world, decisions on energy sources remain restricted to price considerations. Alternatively, end-users can engage in energy efficiency schemes in an attempt to reduce fossil fuel use when it dominates energy provision (Vidoza and Gallo 2016). As I will argue later, low-carbon energy sources, especially modern renewables, offer a more empowering position for the end-user.

2.7.3 How Long Term Are the Policy Structures?

The most significant barrier to transitioning towards a low-carbon society is the long-term nature of not only policy structures but also the associated mining, power generation, distributional and transmission systems that have been developed by fossil fuels since the post-World War II era (Atalla et al. 2017; Faehn et al. 2017). As we will see, the older low-carbon technologies such as nuclear or hydro benefit from a similar well-established status within a range of nation states. This factor is dwarfed by fossil fuels, where policy structures and associated networks are not restricted to individual nation states. There, structures and networks are institutionalised on a global level underpinned by a wide range of direct and indirect subsidies (Riedy and Diesendorf 2003). The influence of OPEC may be dwindling as an international organisation with the onset of new shale gas producers (Van de Graaf 2017; Ramady and Mahdi 2015), but the industry itself remains embedded in the nation state (el Mallakh 2016; Ghanem 2016). We must firstly consider the oil and gas companies themselves.

Four of the top 10 listed companies in the Fortune global 500 list belong to oil and gas in 2016—China national petroleum, Sinopec group, ExxonMobil and British petroleum—the same number as almost 10 years ago which have included Frontier Oil Corporation, Conoco Phillips and Chevron (Rogers and Ethridge 2016; Decarlo et al. 2016). Taking ExxonMobil as an example, the company has a publicly listed total assets accumulation of over $330 billion, with an operating income of almost $1 billion. First solar is the largest renewable energy company. Its total assets amount to $7 billion with an operating budget of around half a billion dollars. The operating budget is less striking than the difference in total assets. This reminds us of the substantial network that multinational companies benefit from.

Considering the wealth (in terms of both income and assets) of multinational companies, nation states have developed energy policies that reflect the dominance of oil and gas in the sector (Suranovic 2013). The fossil fuel that is most under pressure in terms of their policy structures is coal (Culver and Hong 2016). The drive for low-carbon energy is putting significant pressure on national policy structures on coal (Cao 2017). Net exporting countries such as Australia continue to resist change (Connor 2016). Within a European context, nation states have largely adopted a dismantling approach towards coal (Lysack 2015), with the notable exceptions of Germany and Poland. The high-carbon nature of this energy source has driven many nations to position it as the fall guy in the fossil fuel mix. This observation demonstrates that the long-term nature of policy systems and associated networks is not immune to change (Larter 2008). We do not yet see the same process in relation to oil and gas on a global scale. But perhaps this is not far away.

2.8 Summary—The Dominance of Suppliers and Associated Logics of Injustice

The coverage of availability, accessibility and sustainability has allowed us to establish the main global inequalities associated with fossil fuels. In terms of distributional justice, there is an inherent system of injustice that relates to all three sources insofar as the resources are usually located remotely from the regions that require them for production and consumption. This creates a world of suppliers and users, leading to inbuilt inequalities. Consumers are placed remotely from where the real damage can take place—such as environmental destruction, land grabbing and general resource mismanagement. They can also suffer more directly from urban-based power generation requirements where infrastructure is found to be sited in cheaper areas of the city, often coinciding with lower socio-economic parts of society. I also supplement this distributional perspective with an explicit consideration of carbon emissions. This brings to our attention the need to think spatially as above, but also temporally where intergenerational injustices can occur. These observations contrast in part with alternative low-carbon energy sources, which are covered in the next chapter.

An assessment of recognition justice presented a deeper understanding of the distributional inequalities outlined above in the context of fossil fuel sources. The distinction between benefit and access is important. Regarding the former, distributional inequalities do not simply lead to a lack of access. Successive communities continue to miss out on broader opportunities beyond energy access. This relates mostly to those affected by mining, but also consumers in more advanced economies who must suffer institutionalised energy logics of inequality based upon an ability to pay. For the latter, a global energy system driven by high-carbon sources has been unable to deliver for 16% of the global population and is directly contributing to premature deaths through heating and cooking fuel shortages. I also add the explicit dimension of carbon emissions. In addition to similar intergenerational justice concerns as above, we need to also consider the intragenerational inequalities of mis-recognising a lack of carbon emissions as an achievement when others cannot afford to (even if they wanted).

Procedural injustices are also evidenced in both production and consumption decision-making. Local communities are overlooked in terms of production. They do not have a role in directly deciding upon their means of energy generation within a high-carbon context. Multinational companies and governments continue to hold the right and responsibility for energy provision in the fossil fuel system. A plethora of examples alludes to the lack of systematic meaningful engagement processes between provider and consumer. This has led, in terms of consumption, to resistance. A notable current example of this is the fossil fuel divestment movement as outlined above. The global desire to move away from carbon-intensive fossil fuels is, lastly, hindered by a well-established long-term governance structure which is propped up by embedded logics of global mining, large-scale power generation, transnational distributional and transmission systems. The apparent demise of coal provides some hope. We wait to see its consequences for the rest of the fossil fuel sector.

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