10 COMING CLEAN

Financial guru Jim Cramer's dire description of the failing allure of Big Oil stocks reported in chapter 8 is no fly-by-night comment. Three telling pieces of evidence suggest that it is not only oil itself that risks becoming a fossilized relic from a bygone era. Money-spinning superstars—oil and gas companies—may also pretty soon become antiquated curios if they do not shed their skin. The energy sector weighting in the S&P 500 hit a low of 3.8 percent at the end of March 2020; after ninety-two years, in late August 2020 ExxonMobil left the exclusive Dow Jones Industrial Average index, while equity issuances by fossil fuel producers in the period 2012–2020 have lost $123 billion in value and underperformed on the MSCI All Country World Index (ACWI) by 52 percent (CTI 2021c); and in January 2021 Tesla was worth more—that is, its stock market value, even if part of it might have been a bubble, was greater—than BP, Chevron, ConocoPhillips, ExxonMobil, Shell, and TotalEnergies put together.

A world that once revolved around oil is starting to falter. For instance, the spectacular ongoing technological revolution is changing its lifeblood, energy, which was once almost exclusively produced with fossil fuels, and now renewables are playing catch-up at an unprecedented and

unexpected rate: the total installed wind and solar capacity will surpass natural gas in 2023 and coal in 2024 (IEA 2020c).

The low-carbon transition—the overall lowering of carbon emissions from socioeconomic systems—is possibly one of the most powerful narratives underpinning current thinking about societies, economies, and nature in the face of the impending climate crisis, one that requires a rapid and profound modification of attitudes, behavior, norms, incentives, and politics.

This scientific, political, and socioeconomic debate, by and large, addresses the shift from a system dominated by finite yet easily available and relatively inexpensive fossil energy to one that progressively abandons fossil sources and moves toward renewables. As pointed out in chapter 8, one approach of social sciences useful in this context is that of transition studies, which explain how different strategies and resources influence the acceptance of social forces and the departure from current state of affairs. This chapter addresses the low-carbon transition of the specific socioeconomic force under scrutiny—that is, the oil industry—from this viewpoint. The duty of decarbonization imposed on the oil industry for its moral responsibility for climate change requires that it progressively reduces and eventually eliminate fossil fuels from its products and processes, thereby modifying its hue from the old black gold to a new green. Therefore, while limiting the carbon content of processes is inscribable in the broader goals of any sector in the context of the low-carbon transition, the decarbonization of this specific industry's products—oil and gas—has a unique and distinctive feature: it is the crucial variable, the first domino in the chain, for decarbonizing the entire global socioeconomic system, and this chapter is thus specifically devoted to the investigation of this point.

In light of these considerations, this chapter does not analyze or attempt to summarize the low-carbon transition; its more unassuming aim is to investigate the conceivable development of a part of it focused on specific agents, that is, how the progressive abandonment of fossil fuels demanded of Big Oil by the duty of decarbonization can

be operationalized and implemented. As emphasized in chapter 9, this analysis is carried out in a realistic milieu of political evolution. Based on the useful four ideal-typical approaches to just transitions—status quo, managerial, structural, and transformative—Big Oil's duty of decarbonization requirements would belong to the structural reform approaches to just transitions, which entails institutional change and structural evolution through modified governance structures and broader participation (Köhler et al. 2019). As recalled in chapter 8, the unit of this analysis is at the mesolevel of socio-technical systems (Geels, Berkhout, and Vuuren 2016), which complements the macrolevel (e.g., changing the nature of capitalism or nature-society interactions, the *transformative just transition*) and the microlevel (e.g., changing individual choices, attitudes and motivations, which basically belong to the *status quo and managerial transition* approaches).

Additionally, it is worth clarifying that a broad analysis of the geopolitics of Big Oil's decarbonization is beyond the scope of this book, although relevant national and international political considerations are taken into account, especially with regard to national oil companies (NOCs). In fact, in petrostates, if decarbonization processes prevent their NOCs from generating the revenues needed to sustain the socioeconomic system, they can be disruptive and produce political instability, which triggers different geopolitical scenarios (Goldthau et al. 2019). A low-carbon transition could, for instance, decrease by 51 percent petrostates' oil and gas revenues over the next two decades (CTI 2021a) and endanger the stability of those that are not bracing for it (Verisk Maplecroft 2021). Additionally, if such a transition occurs too rapidly, migration from oil-dependent regions to Western countries can increase, thus burdening what is already a hot topic in international and national politics. Riots, further extremism, and internal conflicts could be triggered, causing the basic structure of a state to fall apart with potentially dangerous regional and global consequences. Indeed, the geopolitical implications of the low-carbon transition will be very subtle, complex, and counterintuitive: petrostates, for instance, could

temporarily profit from it, since, as demand peaks, it is the lowest-cost producers—such as the Persian Gulf NOCs—that will be able to sell their oil the longest (Bordoff 2020).

Focusing exclusively on the decarbonization of Big Oil is no mean feat, given the overall complexity and implications that it would have on national, regional, and global socioeconomic systems. For instance, the oil industry must substantially cut combined production to keep emissions within international climate targets while fighting for survival in an ideally more carbon-conscious world. To throw a few statistics in, the seven largest investor-owned oil companies (BP, Chevron, ConocoPhillips, ENI, ExxonMobil, Shell, and TotalEnergies) must reduce their production by 40 percent by 2040 if they want to stay below the International Energy Agency's (IEA) *"beyond 2 degrees" scenario* (IEA 2019b).

At any rate, downsizing an industry with $16 trillion worth of capital and at least ten million employees, which has already consumed up to 2019 roughly 82 percent of the 2,810 $GtCO_2$ total carbon budget for a 50 percent chance of success of staying below 1.5°C of global warming (CTI 2019b), requires a *herculean effort*. An even greater effort may be required, since many countries rely on substantial oil rents to finance public services (World Bank 2019), twenty-three countries get more than 50 percent of their export income from fossil fuels (Ross 2019), and some fossil fuels should nonetheless be supplied in the future, as certain products—mainly petrochemicals (e.g., plastics for medical use)—and industrial processes have yet to or cannot be decarbonized.

At the same time, while the IEA reports that in 2019 oil and gas industry fossil fuel capital investments in energy were 99.2 percent of the total compared to a mere 0.8 percent of those in renewables and carbon capture and storage (IEA 2020b), evidence confirms that the world's fifty biggest oil companies plan to flood the planet with an additional seven million barrels of crude oil per day over 2020s, since they have projected an increase in their production of more than 35 percent

between 2018 and 2030, a much sharper intensification than in the past (Watts, Ambrose, and Vaughan 2019). This will be coupled by the envisaged inordinate amount of shale oil and gas, in line with the decade-long bonanza that, despite the spectacular unprofitability of these extraction techniques, saw the opening of 245,000 wells in the United States alone between 2009 and 2019 (Kelly 2020). New oil production is furthermore expected from Brazil, Canada, Guyana, and Norway (the Scandinavian country awarded sixty-one offshore exploration rights to thirty oil companies in January 2021), which are projected to add one million barrels per day to the currently produced eighty million starting from 2020 (Krauss 2019), while Russia and Suriname led new oil and gas discoveries in 2020. Such investments privilege fossil fuel reserves that can be productive in a short span of time rather than developing expensive far-flung reserves, given the expected long-term downward trend of fossil fuel prices and the possibility that they eventually become stranded (Jaffe 2020).

Additionally, the industry seeks to ensure a carbon-intensive future by expanding production of plastics (Corkery 2019): the IEA calculates that petrochemicals will account for almost half of the growth in oil demand up to 2050 (IEA 2018). But despite oil and gas companies betting on plastics, its demand may soon peak too as the economy begins to move from a linear to a circular plastic system (CTI 2020b).

In the face of the enormity and complexity of the challenge of decarbonizing the oil industry's processes and products, a colossal enterprise fraught by contrasting powerful interests and political and economic struggles, a managed decline of the industry is paramount. This chapter, building on the analysis conducted so far in the book, will attempt to frame the task within the requirements of the duty of decarbonization by first exploring the so-called lock-in dynamics in current fossil fuel–intensive behaviors and patterns as well as the agents of destabilization and instruments for escaping such carbon lock-ins. The chapter will then go on to explore the operationalization and implementation of the duty

of decarbonization for the top twenty oil and gas companies. Finally, the closing section puts forward a pathway for orchestrating the industry's decarbonization efforts to become Big Green.

BIG OIL AND CARBON LOCK-INS

Based on the considerations carried out in the previous chapters of part III, it is quite straightforward to assume that a low-carbon transition is mostly a political and moral issue rather than simply a technological or institutional one whereby hegemony, power dynamics, distribution of and access to resources, and more generally matters of political economy as well as moral considerations about vulnerable people, groups, and communities are critical (Patterson et al. 2018). Political authorities, especially governments, have not so far cleared the path for the low-carbon transition; quite the contrary, they continue to back the fossil fuel industry through, for example, subsidies and support for oil and gas infrastructure (Roberts et al. 2018). At the same time, politics and justice suggest reorienting the low-carbon transition upstream, that is, to also—or indeed primarily—address producers of fossil fuels through supply-side measures instead of focusing on consumers through demand-side provisions (Lazarus and van Asselt 2018). It is, in fact, the oil complex that is the real nest of power, politics, and political economy and where a *just transition*—including impacts of fossil fuel production on humans and labor as well as on intergenerational and intragenerational justice issues—should be concentrated (Healy and Barry 2017).

Oil and gas companies are at the helm of the political power engine within the oil complex, wielding considerable influence on policy, as shown previously. So, what is required is a blueprint of political conditions to escape the different carbon lock-ins created and protected through such power and policy influence. For instance, the IEA in its 2020 *World Energy Outlook 2020* (IEA 2020e) points out that if energy infrastructures in operation and under construction were used in line with past practice until the end of their lifetimes, they would generate a

level of emissions that would produce a long-term temperature increase of 1.65°C.

Ongoing investment in fossil fuel infrastructure and the inertia of institutions and of individual and social behavior bind society to carbon-intensive energy systems and patterns by creating assets, structures, and models that ensure future fossil fuel extraction and the inevitable associated emissions. This makes it harder for low-carbon energy alternatives and challengers to compete, creating a significant barrier to meeting climate protection goals. Addressing carbon lock-ins requires breaking the hold of the oil complex over political systems, institutions, and energy cultures. Additionally, when governments and other relevant agents address decarbonization through actions that create economic winners and prevent/weaken backlash from economic losers, it is more likely to destabilize the oil complex (Meckling 2019).

Measures that aim to tackle inequality and protect the weakest subjects are sorely needed (Bernstein and Hoffmann 2019; Aklin and Mildenberger 2020). They include, for instance, support to displaced workers, unemployment protection, placement support, and relocation grants; support to frontline communities whose main source of financial is fossil fuels; and protection to the weakest investors, such as pension funds. On the other hand, resistance to decarbonization strengthens lock-ins. Carbon lobbies and other entrenched powerful groups in the company's administrative or operational headquarters might actively hamper or slow down processes of decarbonization. The lower the internal resistance, the more likely the process of decarbonization will see the way ahead paved smoothly.

The relevant literature evinces three types of carbon lock-ins: technological/infrastructural, institutional, and behavioral (Seto et al. 2016). The technological/infrastructural lock-in is basically determined by the constraints imposed by prior decisions relating to carbon-based technologies, infrastructures, practices, and their support to future carbon-intensive paths, making it more challenging or even impossible to subsequently pursue more suitable paths toward low-carbon socioeconomic systems (Erickson et al. 2015a, 2015b).

Institutional lock-in refers to the circumstance that institutional choices made at any given point in time shape institutions' subsequent choices. Such lock-ins reflect the political conflict between agents who benefit from the existing set of economic, social, and cultural arrangements that favor carbon-intensive socioeconomic systems and those who would instead benefit from decarbonized ones (Seto et al. 2016). In fact, given the power of the oil industry and the close relationships between governments and the companies within the dominant oil complex, institutions tend to choose and act in ways favorable to the oil industry, thus deepening and strengthening the vicious circle of the institutional lock-in.

Behavioral lock-in depends on patterns of human behavior and is divided into the lock-in of carbon-intensive behavior through individual decision making based on individual cognitive processes (not relevant for the purposes of the current analysis) and the lock-in dependent on social structures and practices determined by routines and norms embedded in the wider sociotechnical environment.

Big Oil is so shielded and protected by these lock-ins that its decarbonization must first and foremost confront the political dynamics that have produced and continue to reinvigorate them. And there lies the rub: to dismantle carbon lock-ins, what is required are disruptive, game-changing social, economic, and political innovations with bottom-up, participative approaches and top-down, centralized technocratic measures: two irreconcilable approaches, it would seem. However, addressing Big Oil's lock-ins through agents of destabilization may kill two birds with one stone, as this approach would fulfill the demands for participation hailing from society, with the effectiveness of coordinated widespread actions put into practice by other operational agents of destabilization working at different levels with diverse approaches.

Indeed, technological/infrastructural, institutional, and behavioral carbon lock-ins are mutually interdependent: they occur through the combined interactions between technological/infrastructural systems, governing institutions, and conduct and activities associated with energy-related goods and services (Unruh 2000). For analytical purposes in

relation to the operationalization of Big Oil's duty of decarbonization, however, it is worth maintaining these three types of lock-in as subdivisions. The following section clarifies the instruments that agents of destabilization can use to more effectively dismantle the lock-ins outlined above. It is thus possible to lay the groundwork for all options of routes leading to the low-carbon requirements demanded of Big Oil by the duty of decarbonization.

It is worth recalling that the low-carbon transition is already happening now, and in contrast to the duty of reparation, Big Oil could voluntarily take larger strides toward greener business models that would be consistent with the objective of the duty of decarbonization; in other words, Big Oil's industrial goals could themselves generate ruptures in its carbon lock-ins. The impact of this prospect should not be overemphasized, and should, in any case, be considered incognizant, endogenous shifts of the oil complex that can reinforce the cognizant, exogenous destabilizations analyzed in the ensuing section.

OPERATIONALIZING BIG OIL'S DUTY OF DECARBONIZATION: AGENTS OF DESTABILIZATION AND INSTRUMENTS FOR ESCAPING CARBON LOCK-INS

To address the duty of decarbonization, one starting point is unavoidable: understanding how to plan a suitable foray into Big Oil's fossil fuel fortress. More specifically, to implement the duty of decarbonization, its operationalization must first be framed. This can be achieved by investigating the potential of agents of destabilization as well as the instruments they can deploy to overcome the carbon lock-ins. Once an escape route, so to speak, out of lock-ins is defined, the model of the duty of decarbonization for the twenty top oil and gas companies—taking into account their different levels of requirements as well as the determinants indicated in chapter 7—can be implemented. Accordingly, this section attempts to invoke Big Oil's duty of decarbonization by investigating agents of destabilization and instruments that can effectively erode carbon lock-ins; the ensuing section looks at how it can be implemented.

Keeping in mind the analytical distinction between primary agents of destabilization, who prepare the terrain by creating new social/moral norms and undermining resistance, and operational agents, who aim at changing oil and gas companies' behavior through different instruments, it is the latter group that can prove to be of most value with regard to technological/infrastructural and institutional lock-ins. In these contexts, the effectiveness of operational agents' actions is, of course, complemented and amplified by primary agents' diffusion of knowledge and raising awareness about the inadmissibility of fossil fuels as well as ways to phase them out.

On the contrary, the behavioral lock-in—individual and social—is the domain of primary agents of destabilization: those with an influential and catalyzing effect on behaviors and mindsets, the so-called norm entrepreneurs, such as religious leaders, writers, screen actors and broadcasters, influencers, gifted communicators, scientists, and norm champions including environmental advocacy groups, reliable investigative media sources, and social movements. The instruments and strategies to be employed are explained in chapter 8, so it would be gratuitous to detail them again here: the norm-spreading processes and the undermining of resistance for a general destabilization of Big Oil are the same as those required for dismantling the behavioral lock-in.

Suffice it to say that actions to dismantle Big Oil's behavioral lock-in should preferably aim to erode the naturalization of the use of fossil fuels described in chapter 5, which has endured despite the unanimous scientific acknowledgment of their harmfulness. They should also attempt to undermine the prevailing reactionary rhetorical arguments used in defense of fossil fuels, usually based on the dire economic effects of their dismissal, and the disruptive potential of supply-side climate policy and of divestment as well as the importance of low-carbon consumerism and lifestyles. These norm-spreading actions prove to be useful for the other lock-ins too: on such fecund terrain, operational agents can more easily and effectively introduce actions targeting the technological/infrastructural and institutional lock-ins that protect Big Oil.

Breaking free from the carbon trap requires more than just switching to low-carbon technologies or building the necessary infrastructure; nevertheless, the technological and infrastructural lock-in is still the fundamental first step. Given the urgency of the climate crisis, this lock-in should be addressed through an approach of *discontinuity*, which seeks a rapid transition to a different technological/infrastructural system characterized by radical changes (Unruh 2002). In terms of technology, the potential and know-how already exist, as the recent reports of the IEA indisputably show (IEA 2020b, 2020c, 2020e, 2021c).

Much effort is required, though, as a climate-safe system calls for $110 trillion worth of investments in the energy sector by 2050; currently $95 trillion has been earmarked, but mostly for fossil fuel investments. This mammoth sum should be redirected to clean technologies. In this regard, therefore, the operational agents of destabilization seem to be mostly economic agents and, in particular, the financial sector: commercial banks, development banks, insurers, pension funds, and sovereign wealth funds. They should become further inclined to progressively abandon the funding of fossil fuel projects in favor of low/zero-carbon activities, as shown in chapter 8. This trend could significantly benefit from supply-side climate policies banning certain types of fossil fuel production (e.g., fracking) or the phasing out of fossil fuels altogether, as some political local authorities including the US states of Hawaii and California (Roth 2019) and countries as Costa Rica and Denmark, which are building a coalition—the Beyond Oil and Gas Alliance—to bring an end to oil and gas production (Leylim 2021), have already done or planned to do.

Research institutions are another important operational agent of destabilization in relation to the technological lock-in. They can develop new products, services, and business models and create the markets for such technologies as well as diffuse them. On a different level, research institutions should also try to operate as primary agents of destabilization to steer and shape societal discourse, problem framing, and collective expectations on new low/zero-carbon technologies. It is worth

recalling that the success of operational agents of destabilization in this context relies greatly on the vital and effective work—as clarified in chapter 8—carried out by all primary agents of destabilization in promoting the relevance of fossil fuel divestment as well as for prompting and organizing social/justice movements forcefully demanding it.

Financial agents of destabilization also play a prominent role in the infrastructural aspect of this kind of lock-in. This is a thorny issue, though: for instance, the petroleum products and natural gas pipelines industry will see $88.4 billion and $78.8 billion in investments pumped into their industries, respectively, in the United States alone (GlobalData 2018). Given this ominous trend, a ban on the development of new fossil fuel infrastructures—a main supply-side measure—imposed by political authorities would greatly benefit the transition.

Escaping the suffocating embrace of fossil fuels and carbon entanglement in the broadest sense requires concentrating on the institutional lock-in, especially on the power relations between political authorities and the oil industry. Institutions here are understood as being distributional instruments oriented and constrained by considerations of power. It is easy, then, to see why, in the optic of this book, the institutional lock-in is the most entrenched and difficult of carbon lock-ins involving Big Oil. The institutional lock-in is the fruit of the conscious efforts deployed by the hegemonic oil complex to create and maintain its power and influence, as clarified in chapter 7. The companies that make up the complex have intentionally built a resilient regime, which protects and perpetuates the carbon-intensive status quo through intentionally coordinated efforts to structure policies, rules, norms, instruments, and constraints; thus, their goals and interests are safeguarded. In this context, however, it is important to recall the all-important role of primary agents of destabilization to help overcome institutional lock-in with initiatives able to "galvanize stakeholder attention" (Seto et al. 2016, 435), such as those carried out by the mentioned charismatic norm entrepreneurs (e.g., Pope Francis and Greta Thunberg) and champions (e.g., divestment and climate justice movements).

In its essence, institutional lock-in largely reflects the struggle between a Big Oil that overwhelmingly benefits from the carbon-intensive status quo versus agents benefiting from a decarbonized socioeconomic system. Escaping such lock-in requires making agents who benefit from decarbonization economic winners, safeguarding their benefits against a backlash from Big Oil, which could, if not actually become an economic loser, to some extent slide down the winner/loser scale.

To this end, the main operational agents of destabilization are political authorities at various levels, through a portfolio of different targeted demands and mostly restrictive supply-side instruments and policies, including carbon pricing, subsidy reduction, production quotas, supply ban/moratorium, support for clean energy research and development, supply taxes, subsidies, tax rebates, loan guarantees, and deployment mandates for renewables.

To nurture those who could benefit from a decarbonized world and to safeguard them from the backlash of the incumbent oil industry, political authorities face two main challenges. First, they need to build long-term political support for low-carbon initiatives by enacting policies that expand economic opportunities to other sectors too, thus creating a mutually supportive coalition of businesses, workers, and individuals able to disrupt fossil fuel dependence (Bernstein and Hoffmann 2019). Opportunities of decarbonization should be created in order to mobilize well-organized and powerful interests and to generate more solid feedback dynamics around a low-carbon energy system. Second, political authorities must address the direct and indirect costs that decarbonization creates to the oil industry to avoid or limit retrogressive actions; this should take place at each level of governance and across multiple economic and social sectors. Oil and gas companies would, for instance, bear the brunt of profit losses, as they would lose a share of the market. Therefore, political authorities should focus on both cost containment and ways of counteracting or weakening any opposition the oil industry may make (Meckling 2015; Meckling et al. 2019).

To further reinforce the decarbonization, political authorities should also foster a positive institutional lock-in in a new decarbonizing trajectory

(Seto et al. 2016). One possibility is increasing competition in the energy sector through feed-in tariffs so that the fossil fuel companies more aligned with serious decarbonization objectives can participate in a low-carbon future scenario.

IMPLEMENTING THE DUTY OF DECARBONIZATION: BIG OIL'S CONTRIBUTION TO THE LOW-CARBON TRANSITION

An important study (Rogelj et al. 2015) shows that to keep warming below 2°C by the end of the century, current global emissions need to be halved by the late 2030s and reach zero by around 2065. The 1.5°C objective requires that emissions be reduced by half by the early 2030s and reach zero by 2050. These estimates rely on negative emissions technology that is as yet unproven and unavailable at scale; otherwise, the trajectories of abatements must be substantially anticipated.

At any rate, to achieve such goals, fossil fuel use and, consequently, its extraction and production must decline at more or less the same rate (Muttitt et al. 2016). For instance, according to a study by the Carbon Tracker Initiative (CTI 2019a), which sets fossil full companies' limits consistent with the Paris Agreement goals, seven among the major international oil companies (IOCs)—BP, Chevron, ConocoPhillips, ENI, ExxonMobil, Shell, and TotalEnergies—must cut their emissions by 40 percent and production by 35 percent by 2040 to stay within their company-level carbon budgets based on the IEA's *"beyond 2°C" scenario* for a rapid decarbonization pathway in line with international policy.

The scientific, policy, and business communities have not been slow in drafting countless hypothetical decarbonization scenarios to achieve these objectives. The IEA in its *World Energy Outlook 2019* report (IEA 2019c) uses the *Sustainable Development Scenario* (SDS), which "holds the temperature rise to below 1.8°C with a 66% probability without reliance on global net-negative CO_2 emissions; this is equivalent to limiting the temperature rise to 1.65°C with a 50% probability. Global CO_2 emissions

fall from 33 billion tonnes in 2018 to less than 10 billion tonnes by 2050 and are on track to net-zero emissions by 2070" (IEA 2020d).

The SDS can be taken as an ideal benchmark for Big Oil to meet its duty of decarbonization for at least four reasons. First, it sets out a sufficiently ambitious and yet pragmatic vision of the achievement of critical sustainable development goals, consistent with the realistic reference setting of the book.

Second, the IEA belongs to the global oil establishment; indeed, it is sometimes accused of being too conservative. Therefore, its scenarios are never meant to over-penalize the oil industry. The research, communications, and advocacy organization Oil Change International claimed that "the IEA has again failed where it matters on climate. . . . Without stepping up and making high ambition the centrepiece, the IEA seems to be confirming they are not fit for purpose in a time of climate emergency. . . . The IEA should be guiding the world away from the climate crisis. Unfortunately, the IEA has failed to convey the urgency of the situation" (OCI 2019).

Third, the IEA SDS does not rely on net negative emissions (unlike, for instance, the IPCC 1.5°C scenarios, eighty-eight out of ninety of which assume some level of net negative emissions). The current analysis, in fact, is not focused on a fully fledged investigation of societal decarbonization; therefore, the inclusion of approaches based only on abatement measures makes it possible to apply the indications of this scenario to a specific source of emissions such as oil and gas companies.

Fourth, the alleged lack of stringency of this scenario implies that it does not impose lethal emission cuts to the oil industry and thus guarantees its immediate economic survival while preserving its capacity to meet its duty of reparation. In other words, the use of the IEA SDS can in this context of analysis be considered superior to more stringent scenarios, as it implicitly takes into account the trade-offs between the duties of reparation and decarbonization, and while sufficiently driving the oil industry toward the latter, it does not hinder it from achieving the former, as argued in chapter 6.

Basically, consistent with the SDS, Big Oil is required to reduce its scope 1 and 3 emissions by roughly 70 percent by 2050; the SDS envisages global CO_2 emissions falling from 33 billion tonnes to less than 10 billion tonnes by 2050. In this view, there is a lenient assumption that 30 percent of Big Oil's current emissions are allowed for irreplaceable uses, so to speak, while allowing the industry to secure the necessary financial means to satisfy the duty of reparation. This *mild* assumption, added to the choice of not adopting more ambitious decarbonization scenarios, makes the duty of decarbonization less onerous and more feasible in the long term.

As a further simplification, given the exemplary goal of the current exercise, the timeline for decarbonization is not considered, but only the final goal of a 70 percent abatement by 2050, achievable through linear cuts consistent with the objective defined by the IEA SDS, is considered. Indeed, the ways and means required to meet this objective would be left to the discretion of each individual company. Finally, a discrepancy in the data presented should be pointed out. Data on oil and gas companies' scope 1 and 3 emissions are available only up to 2015, whereas the IEA SDS starts from 2018; however, given the analytical goal of the figures indicated in this chapter, this does not undermine their indicative potential. Table 10.1 provides the 2015 scope 1 and 3 emissions and the 2050 scope 1 and 3 *target* emissions for the top twenty oil and gas companies.

To balance the somewhat alleged lack of meaningful ambition of the IEA SDS, oil and gas companies are further required to comply with a *managed decline scenario* whereby "no further extraction infrastructure is developed, existing fields and mines are depleted over time, and declining fossil fuel supplies are replaced with clean alternatives" (Muttitt et al. 2016, 32). This is consistent with the findings of a landmark report of the International Energy Agency (IEA 2021c), which suggests that to achieve the 1.5°C target a rapid decrease of fossil fuel production as a result of no new project is necessary.

This is a further requirement that, by barring new fossil fuel projects and managing the decline of the oil industry over time, would avoid the worst impacts of climate change and increase the chances of Big Oil's

Table 10.1

Top 20 oil and gas companies' scope 1+3 greenhouse gas emissions 2015 and *target emissions* in 2050 (2050: 70% reduction compared to 2015), $MtCO_2e$

Oil and Gas Company	2015	2050
Saudi Aramco	1,951	585
Gazprom (Russia)	1,138	341
National Iranian Oil	1,036	311
Rosneft (Russia)	777	233
CNPC/PetroChina	625	188
Abu Dhabi National Oil–ADNOC	584	175
ExxonMobil (USA)	577	173
Pemex (Mexico)	530	159
Shell (UK/Netherlands)	508	152
Sonatrach (Algeria)	492	148
Kuwait Petroleum	478	143
BP (UK)	448	134
PDVSA (Venezuela)	398	119
Petrobras (Brazil)	382	115
Chevron (USA)	377	113
Petronas (Malaysia)	340	102
Nigerian National Petroleum Corp	329	99
Lukoil (Russia)	328	98
TotalEnergies (France)	311	93
ConocoPhillips (USA)	224	67
Top 20 O&G Companies	**11,833**	**3,550**

Source: Author's elaboration from the Carbon Majors Database—2017 Dataset Release (CDP 2017). According to the Greenhouse Gas Protocol of the World Resources Institute (WRI n.d.), scope 1 emissions refer to direct oil and gas combustions; scope 3 emissions originate from the downstream combustion (for energy and nonenergy purposes) of oil and gas that they have distributed within the global economic system (the largest share, roughly 90%, of oil and gas companies' emissions are scope 3).

compliance with the goals of the Paris Agreement (Scott 2018). Big Oil is therefore expected to abandon all future fossil fuel projects.

Besides stopping any future investment in fossil fuels, ambitious abatement objectives are required that involve cutting scope 1 and 3 emissions associated, respectively, to their processes and products

by 70 percent in 2050. According to Heede (2013, 2014), scope 3 emissions amount roughly to 90 percent of the emissions associated to the industry, with scope 1 emissions accounting for the remaining 10 percent; table 10.2 reports scope 3 target emissions for the top twenty oil and gas companies. For the sake of the analysis conducted here, the reduction in scope 3 emissions should be understood as the very objective of the duty of decarbonization as it testifies to a willingness to abandon fossil fuels, as required by a managed decline scenario. Scope 1 emissions abatement, despite its importance in the overall picture, resonates more with a business-as-usual low-carbon scenario, which does not involve a structural change in the business model of the company. At any rate, the oil industry actually has several effective and efficient options available to address scope 1 emissions, which in part it seems willing to adopt (IEA 2020a).

Therefore, the figures reported in table 10.2 represent the "absolute target values" of the effort required by the duty of decarbonization in terms of abandonment of carbon-intensive *products* by the top twenty oil and gas companies. Absolute target values mean here the emissions associated with the fossil fuels sold to the global economy; from a different perspective, as these emissions correspond to a specific quantity of fossil fuels, the values reported in table 10.2 are proportional to the quantity of fossil fuel products that oil and gas companies must stop producing in order to meet the requirements of the IEA SDS.

As in the case of the indicative disgorgements required by the duty of reparation suggested in the previous chapter, the 2050 scope 3 target emissions provided in table 10.2 should be seen as an ideal to which all companies must aspire, despite not all of them necessarily being required to fully comply with it. In fact, the fulfillment of these reductions is influenced by the social, political, and economic factors of the determinants that influence Big Oil's duties, as outlined in chapter 7: societal context, institutional strength, economic and political situation, and resource availability and nature of the resource. To better understand the top twenty oil and gas companies' level of commitments demanded by the duty of decarbonization, it is vital to attribute greater weight to the

Table 10.2
Top 20 oil and gas companies' scope 3 greenhouse gas *target emissions* in 2050, $MtCO_2e$

Oil and Gas Company	2050
Saudi Aramco	527
Gazprom (Russia)	307
National Iranian Oil	280
Rosneft (Russia)	210
CNPC/PetroChina	169
Abu Dhabi National Oil–ADNOC	158
ExxonMobil (USA)	156
Pemex (Mexico)	143
Shell (UK/Netherlands)	137
Sonatrach (Algeria)	133
Kuwait Petroleum	129
BP (UK)	121
PDVSA (Venezuela)	107
Petrobras (Brazil)	103
Chevron (USA)	102
Petronas (Malaysia)	92
Nigerian National Petroleum Corp	89
Lukoil (Russia)	89
TotalEnergies (France)	84
ConocoPhillips (USA)	60
Top 20 O&G Companies	**3,195**

Source: Author's elaboration from the Carbon Majors Database—2017 Dataset Release (CDP 2017).

objective parameter of *contribution* employed to group the various companies in chapter 7. Such determinants and the relevance of the contribution parameter testify to the capacities of the sociopolitical and economic context the oil company finds itself in as well as of the company itself in creating or already being in possession of the conditions of breaking free of carbon lock-ins and thereby transitioning to low-carbon business models.

IOCs

Despite grouping oil and gas companies for the operationalization and implementation of the duty of reparation, as shown in chapter 7, the duty of decarbonization needs to take account of the distinction between IOCs and NOCs for one very straightforward reason: while NOCs' revenues contribute to social and public goods as well as to the provision of private goods in their home countries, IOCs—besides having quite similar situations with regard to the determinants mentioned above—respond only to their shareholders in economic terms. In other words, as they do not have mandatory social functions and do not face the associated economic constraints, IOCs should fully meet the benchmark of decarbonization associated to their scope 3 target emissions set out in table 10.2. The levels of abatement required would allow them the possibility to simultaneously fulfill their duty of reparation, as stressed above. For the sake of clarity, IOCs' requirements in terms of actual emissions levels by 2050 as demanded by their duty of decarbonization are grouped together in table 10.3, excluding NOCs. It should be noted that while ConocoPhillips and TotalEnergies belong to the MR grouping, as table 7.2 shows, their private ownership and consequent lack of social functions—i.e., the fact that they are IOCs—mean that these companies nonetheless are among those with the most stringent duty of decarbonization.

NOCs

In the case of NOCs, the implementation of the duty of decarbonization needs a more exhaustive analysis that can be usefully carried out within the HR/MR/LR groupings of chapter 7. It was stressed there that given their social functions, NOCs' duty of decarbonization should be more prudent than IOCs' and that emphasis should be on the contribution parameter goal.

Based on these assumptions, it is possible to argue that with specific regard to NOCs, ADNOC, CNPC/PetroChina, Gazprom, Kuwait Petroleum, and Saudi Aramco belong to the HR group; Lukoil, Pemex, Petrobras, Petronas, and Rosneft to the MR group; and National Iranian Oil, Nigerian National Petroleum, PDVSA, and Sonatrach to the LR group (see

Table 10.3
IOCs' scope 3 greenhouse gas emissions levels in 2015 and 2050 (30% of 2015) and emissions to be abated in the period 2015–2050, $MtCO_2e$

IOCs	2015	2050	Abatements
ExxonMobil (USA)	519	156	−364
Shell (UK/Netherlands)	457	137	−320
BP (UK)	403	121	−282
Chevron (USA)	339	102	−238
TotalEnergies (France)	280	84	−196
ConocoPhillips (USA)	202	60	−141
Total	**2,201**	**660**	**−1,540**

Source: Author's elaboration from the Carbon Majors Database—2017 Dataset Release (CDP 2017).

Table 10.4
NOCs grouping in relation to the duty of decarbonization

High Requirement (HR)	Medium Requirement (MR)	Low Requirement (LR)
ADNOC, CNPC/ PetroChina, Kuwait Petroleum, Gazprom, Saudi Aramco	Lukoil, Pemex, Petrobras, Petronas, Rosneft	National Iranian Oil, Nigerian National Petroleum, PDVSA, Sonatrach

Source: Author's elaboration from the Carbon Majors Database—2017 Dataset Release (CDP 2017).

table 10.4). It should be noted that in this case the general grouping indication of chapter 7 is not respected because among determinants, besides attributing greater weight to the contribution parameter goal, it is believed that the economic one is of cardinal importance.[1] Additionally, no attempt to quantify the *generousness* in terms of a *discount* on the 70 percent decrease in 2050 emissions of IOCs is carried out, as it would inevitably be fraught with overly subjective considerations: abatement commitments are rather described in qualitative terms. Suffice it to say that in general, the HR, MR, and LR groups are granted progressive reductions on the ideal 70 percent objective or lengthier time horizons than 2050 (no longer than 2070, though, the IEA SDS net-zero emissions target year).

In relation to HR NOCs, with regard to the determinants of chapter 7, Russia and Saudi Arabia share a similar societal context adverse to decarbonization; China, Kuwait, and particularly Abu Dhabi seem increasingly interested in finding alternatives to fossil fuels. In economic terms, the Persian Gulf states are solid, whereas the others have more limited wealth; politically, all countries with NOCs in the top twenty can be considered authoritarian (Economist Intelligence Unit 2021) with a sufficient level of institutional stability; China and the Gulf states have the potential to deploy renewables at scale, despite currently having a high dependence on fossil fuels.

This necessarily cursory overview suggests that ADNOC and Kuwait Petroleum should bring their decarbonization as close as possible to the levels indicated in table 10.2. CNPC/PetroChina, Gazprom, and Saudi Aramco should instead have a reduced obligation, in terms of time and scale, to decarbonize their products. From a different perspective, the emergence of a favorable political and social context to promote and implement legal initiatives for decarbonizations can be foreseen in Abu Dhabi and Kuwait. This is another factor that explains the bar being higher in terms of abatements for ADNOC and Kuwait Petroleum.

As for MR NOCs, the determinants considered show a certain degree of internal consistency across all countries. For instance, their GDP per capita varies from $10,192 for Malaysia to $9,972 for Russia, $8,069 for Mexico, $6,450 for Brazil (all data refers to the International Monetary Fund 2020 GDP per capita values at current prices [IMF 2021], as specified for the HR NOCs above). All in all, it seems that their efforts to decarbonize should be slightly inferior to those of the third subgroup of HR NOCs above, that is, Gazprom and Saudi Aramco.

Similarly, LR NOC countries should be considered as a rather homogenous group with regard to the determinants shaping the duty of decarbonization. Therefore, National Iranian Oil, Nigerian National Petroleum, PDVSA, and Sonatrach should be granted the largest *discount* compared to their 2050 target values and the longest possible period for carrying out the envisioned abatements.

A PATHWAY TO BIG GREEN

Fossil fuel advocates loudly proclaim how the low-carbon transition entails massive costs, especially in terms of job losses, increased/regressive energy prices, dangers to economic growth, and loss of revenues; on the other hand, campaigners for a low-carbon future underline the costs associated with the incumbent fossil fuel regime: the impending climate crisis, pollution, exploitation, corruption, conflicts, and violence. A balanced vision would be to admit that a low-carbon transition generates benefits and costs, broadly understood, borne by different agents: it creates *winners* and *losers* and therefore involves significant moral issues (Newell and Mulvaney 2013, 133).

The duty of decarbonization—Big Oil's main contribution to the low-carbon transition—similarly involves moral issues. In this perspective, the aim of this final section is first to underline the general moral principles that should underpin oil and gas companies' duty of decarbonization. Justice, by providing unifying moral principles, plays a major role in facilitating collective action in issues of this kind. The more the duty of decarbonization is informed by moral principles, the more a managed decline of the oil industry's involvement in fossil fuels can, in principle, be achieved. Furthermore, based on such principles, this section suggests a possible pathway for Big Oil to transition into Big Green.

The idea of a *just transition* was first developed by trade union and environmental/climate justice movements and was mainly focused on the job losses that would be caused by a reduction of fossil fuel production. The objective was to provide displaced workers and frontline communities with appropriate job opportunities and other context-specific forms of assistance as well as to create the conditions for their participation in the entire transition process (UNFCCC 2016).

Big Oil's duty of decarbonization requirements, however, entails a broader understanding of just transition, which indeed includes considerations about job losses, given their complexity, sensitivity, and implications. In such terms, a just transition is a fair and equitable process of

moving toward a low-carbon society. The different scholarships (e.g., climate, energy, transition research, environmental studies, social sciences) working on the low-carbon transition have diverse notions of justice and therefore different understandings of what exactly a just transition should involve. For instance, Heffron and McCauley (2018) argue that it should involve a comprehensive approach to three dimensions of justice: distributional, procedural, and restorative (this book refers to the latter approach as *corrective*, as clarified in part II). While corrective justice issues provide the general moral background for developing both Big Oil's duties, distributive and procedural justice are important to justly achieve the duty of decarbonization within a context of managed decline.

Specifically, the moral principles put forward in this section are essentially distributional; however, their realization must include considerations of procedural justice, that is, of the fair involvement of all interested parties in the schemes of collaborative social decision making required and produced by the duty of decarbonization. To this end, recognition and participation are key features of procedural justice. Suffice it to say here that procedural justice increases the practicability of the moral case requiring Big Oil to decarbonize its processes and products. At any rate, it is worth recalling that adequately addressing the moral concerns raised by Big Oil's duty of decarbonization is fundamental to fostering its feasibility.

There are two main moral concerns raised: to minimize the disruption of key developmental priorities, with regard to the provision of energy services and the possibility of diversification for the relevant economies, and to distribute its costs fairly. An additional moral concern is, necessarily, the one stemming from the original just transition demands focused on the protection of workers and communities (Kartha et al. 2018).

To address these moral concerns underlying the just achievement of Big Oil's duty of decarbonization, two overarching moral principles are required: proportionality and sufficiency.

Proportionality

In its broadest and least controversial understanding, the principle of proportionality demands a reasonable balance between actions and their consequences. In the current context, the aforementioned principle holds that the duty of decarbonization should impose obligations to oil companies in terms of emissions abatements that, while adequately stringent, do not penalize the entire society. Therefore, such obligations should be more rigorous in the socioeconomic systems that are least dependent on fossil fuels and have the greatest resources to address their wider societal implications as well as those with a greater ability to politically and technologically manage the low-carbon transition.

Sufficiency

The principle of sufficiency, by and large, demands that all agents should have enough to subsist above a certain threshold, below which it is impossible to have reasonable opportunities in life, that is, to have access to the basic environmental, social, and economic conditions required for a dignified life. Given the emphasized importance for social cohesion and protection against job losses associated with the duty of decarbonization, the achievement of such a principle should ensure secure livelihoods and stability for workers and communities within the fossil fuel industry's value chain.

* * *

Based on these two principles and taking into account the specifications about the operationalization and implementation of the duty of decarbonization for the top twenty oil and gas companies, it can be surmised that a morally sound process turning Big Oil into Big Green should be enacted and governed along the lines described below in order to be more feasible and to lessen possible negative socioeconomic implications.

First, the process should aim at preventing socioeconomic systems from being irremediably unsettled. Basically, any related actions, initiatives, and projects must cause the least possible damage to the fewest socioeconomic systems. Consistent with these considerations, one

approach for incorporating and systematizing the clusters of practices and values that should guide Big Oil's decarbonization is fundamental: precaution. Given the extreme uncertainty that characterizes processes of decarbonization, precaution should, however, allow for contextual and emerging circumstances and elements.

Second, a major stumbling block to Big Oil's decarbonization processes and governance is that the companies lack the coordination qualities needed to achieve abatement requirements. To obviate or at least lessen this risk, decarbonization processes and governance should achieve the coordination required in a way that can defensibly be trusted in the long term (Buchanan and Keohane 2006). In short, these processes and governance must acquire and maintain legitimacy. Legitimacy is understood in this context as a normative property that favors the convergence of opinions on the need to endorse actions required by the duty of decarbonization.

Third, given the contentiousness and criticality of decarbonization, its processes and governance risk being appropriated, as chapter 7 outlines, by the oil complex and by elites, techno-scientific managers, bureaucrats, and profit-seeking investors, as the political economy of climate change and current climate politics evidence suggest. These composite challenges may encourage processes and forms of governance forged around the will of Big Oil or the other powerful groups, largely based on instrumental rationalities. To contrast this hazard, decarbonization arrangements should guarantee independence, as this normative property can actually lessen the possibility of vested interests coming into play and can also magnify the ability of processes and governance working in the public interest, even in the event of possible interference.

Fourth and finally, given the fact that the decarbonization of oil and gas companies is a costly matter and that oil-exporting countries would see a significant source of their revenues sacrificed, the related processes need to be financially supported. In this regard, it is worth recalling that chapter 9 suggests that to contrast the overall burden of decarbonization, the Fund for Oil Rectification should have two subsidiary units: the

transition unit, to contribute to fund actions, initiatives, and projects to favor the low-carbon transition, and the workers and communities unit, which should support displaced workers and frontline communities. It also seems prudent to consider wealthier countries' support, channeled for instance through development aid, for the low-carbon transition in less capable/more vulnerable countries, such as certain petrostates (Armstrong 2020).

From Big Oil to Big Green

Holding the Oil Industry to Account for the Climate Crisis

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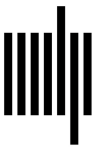

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