Towards a broader climate ethics: Confronting the oil industry with morally relevant facts

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Abstract

To establish and justify the oil industry's responsibilities for climate change in a non-arbitrary way, it is necessary to formulate a solid morally relevant factual basis. Analysing the morally relevant facts helps clarify the conduct of oil and gas companies, understand the moral context within which they operate, evince their intentions and, overall, it provides a normative foundation for the actions such responsibilities would compel them to undertake, as well as for their possible liability.

After outlining the dimensions of the responsibility oil and gas companies should assume with regards to climate change and their relationship with morally relevant facts, this article will analyse them in detail. Oil and gas companies have known for decades that their activities caused climate change (Fact A – Awareness); they did not take steps to modify their fossil-fuel centred behaviour (Fact B – Behaviour), even though less carbon-intensive alternatives were possible (Fact C – Capacity). Additionally, oil and gas companies funded and orchestrated climate change denial campaigns, through which they successfully opposed political action against climate change (Fact D – Denial), while at the same time amassing and distributing fabulous wealth (Fact E – Enrichment) to the privileged few.

Keywords

Climate change; oil and gas companies; climate governance; moral responsibility; morally relevant facts; liability

1. Introduction

Since the dawn of climate policy, states have been the main – sometimes the only – agents involved in addressing climate change, whereas non-state agents have been mostly considered of lesser importance.[1] In the last decade, however, the lines between agents have been blurred. A new framework of hybrid multilateralism, characterised by an

[1] The term "agents" is used as a placeholder to refer to whoever may have or may be attributed any role and form of responsibility for climate change. It includes states, international organisations, businesses and other private sector actors, local authorities and communities, civil society actors (such as consumers unions, NGOs, scientific communities, media), and individuals [3].

"intensified interplay between state and non-state actors in the new landscape of international climate cooperation" [1: 562] has emerged.

There is now widespread agreement within the climate change community that all agents should share common but differentiated responsibilities, as long demanded by article 3.1 of the United Nations Framework Convention on Climate Change (UNFCCC 1992) of its Parties. This means that all agents must play their part in global efforts to combat climate change. Such efforts should reflect a number of relevant concerns related to agents' past association with the problem, as well as future prospects, and indeed to their nature and socio-economic contexts.

Relative to its power, prominence, involvement, wealth, and possibilities, and despite its prominent role in a system of "elite power" aimed at promoting fossil fuels [2], the oil industry[2] appears to be the truly overlooked agent in the current global climate discourse, the "elephant in the room" of climate debate and negotiations [5]. The academic and policy worlds have paid surprisingly little attention to its role in, and responsibilities for, climate change. Society as a whole also seems to be largely unaware of this issue, or perhaps unwilling to confront it [6].

The objective of this article is to investigate the morally relevant facts that provide a normative basis to establish oil and gas companies' moral responsibility for the current climate crisis. Such responsibility can be articulated in the form of two duties: a duty of reparation and a duty of decarbonisation. The duty of reparation implies the relinquishment of funds for the fossil fuel-related actions of oil and gas companies which resulted in harmful climate impacts. The duty of decarbonisation entails a large-scale transformation of oil and gas companies in order to reduce and eventually eliminate carbon emissions from their entire business model. At the same time, the normative framework of responsibility investigated – based on morally relevant facts – can form the necessary moral background for the legal challenges to the oil industry's role in climate change that, for instance, cities, states, and communities around the world are starting to advance [7].

The research question that prompted this article both advances theory and addresses important social, economic, and legal issues related to alternative, more inclusive, ways to address the climate crisis: it can, therefore, be of interest to academia, practitioners and relevant stakeholders [8]. At the same time, a limitation of the research design employed, deriving from the exclusive reliance of the arguments developed to attribute responsibilities to oil and gas companies on highly context-specific morally relevant facts, is its non-applicability to other agents or settings. In other words, the research design adopted prevents the extension of the findings of this study to other agents of climate ethics and/or to socio-economics dynamics outside the realm of the oil industry.

The article first outlines the dimensions of oil and gas companies' responsibilities, and in this light provides a general overview of morally relevant-facts. It then goes on to analyse in

[2] The article refers to the "oil (or sometimes the "oil and gas") industry". This is meant to refer to "the major oil and gas companies", or, more precisely, despite the terminological controversies within the oil world, those large multinational companies that engage in the exploration, production, refinement, and distribution of hydrocarbons, i.e. "conventional oil" "unconventional oil", and "unconventional liquids". The coal industry, despite its current relevance, is not considered since it is already undergoing an irreversible decline as a result of intrinsic cost issues compared to natural gas and renewables [4]. Therefore, the exclusive focus of this article on the oil and gas industry is consistent with its aim to provide the factual basis for specifying, grounding, and justifying the responsibilities – which can possibly provide a basis for establishing legal liability too – of an industry whose very nature poses such a threat to the climate system, and whose modus operandi does not seem set to change in the near future.

detail the morally relevant facts: “Fact A – Awareness”; “Fact B – Behaviour”; “Fact C – Capacity”; “Fact D – Denial”; and “Fact E – Enrichment”.

2. Oil and gas companies’ responsibilities and morally relevant facts

Before analysing the morally relevant facts that specify, ground, and justify oil and gas companies’ responsibilities for climate change, it is useful to outline the dimensions of responsibility relevant to this context, and to briefly shed light on these companies’ causal responsibility originating from the direct contribution they have made in terms of carbon emissions.

Responsibility is a difficult and confusing concept [9], one which actually raises a number of further controversial concerns in relation to climate change [10-12]. Attention should be called to few conceptual distinctions related to its scope and objectives [11-14]; however, they should not be overstated, since they are often blurred when applied to specific issues.

First, the distinction between “causal” and “moral” responsibility should be emphasized. The former can be understood as a “causal contribution”, while the more stringent notion of moral responsibility is based on the appraisal of agents’ intentions, and assesses their voluntariness, control, and knowledge. Responsibility can be “negative” and require agents to refrain from action; or “positive” and compel agents to act in specific ways. Additionally, responsibility can be “special” and pertain only to some agents (e.g. the affected ones); or “general” and be owed to all humanity and possibly to the Earth. Another distinction is between “backward-looking” responsibility, which demands that agents act based on past occurrences, and “forward-looking” responsibility, implying that agents act because they are in the position or have the capacity to do something to improve the situation.

Bearing this in mind, one of the clearest and strongest imperatives of all systems of morality is the “no harm” principle [14]. It states that agents have a negative responsibility, that they *not* act in certain ways in order to prevent and/or avoid harm to others. The moral imperative to do no harm had shaped and guided societies for generations. The empirical evidence provided by a number of studies on major carbon producers’ activities [15-17] confirms unequivocally that the oil and gas industry, through its climate changing carbon emissions – the main by-product of fossil fuel combustion – has directly and profoundly harmed the planet and humanity [18].[3] This evidence already establishes oil and gas companies’ “causal responsibility”. In this regard, the most remarkable finding of the studies reported above is that 62% of global industrial emissions of carbon dioxide (CO_2) and methane (CH_4) from 1751 to 2015 can be traced to the activities of 100 currently operating majors carbon producers and 8 non-extant ones.[4] This data also demonstrates that these 100 carbon majors have produced 71% of global industrial emissions since 1988, when the global community was already well aware of the potential dangers of climate change.[5] Moreover,

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[3] According to Heede’s figures, the top emitters and the great majority of carbon producers are public and private investor-owned, state-owned, and government-run fossil fuel corporations (oil and gas, and coal companies), whereas cement producers are a small minority among carbon majors. The original 2014 database, for instance, included only 7 cement producers whose emissions amounted to 1.45% of carbon majors cumulative total [19: Table 4, at page 17].

[4] The emissions traced to major carbon producers are calculated based on the carbon content of fuels marketed (subtracting non-energy uses), CO_2 from cement production process, CO_2 from flaring, venting, own fuel use, and fugitive or vented methane.

[5] It is widely agreed that the uncontroversial acknowledgement of the effects of human activities on the climate coincides with the first International Panel on Climate Change (IPCC) report in 1990. In truth, as described in the

Ekwurzel's et al. [17] study extends Heede's [15] original finding by linking major carbon producers' fossil fuel-related activities to atmospheric CO_2 and CH_4 concentrations, as well as to relevant climate impacts, namely the global mean surface temperature (GMST) and the global sea level (GSL), the latter being one of the major consequences of climate change [20]. Strikingly, this study found that the historical (1880-2010) and recent (1980-2010) emissions of ninety major carbon producers resulted in "… ~57% of the observed rise in atmospheric CO_2, ~42-50% of the rise in GMST and ~26-32% of GSL rise over the historical period of 1880-2010 and ~43% (atmospheric CO_2), ~29-35% (GMST), and ~11-14% (GSL) since 1980 [17: 579].

With specific regard to oil and gas companies, their contribution to global industrial carbon emissions is, in many respects, impressive. The top 10 companies in terms of cumulative emissions of Heede's [15] study all belong to the oil and gas industry. The major 60 oil and gas companies contributed to more than 40% of global cumulative industrial emissions in the period 1988-2015; the top 10 accounted for almost 22%, as evinced by Table 1 below [21]. The oil and gas industry holds fossil fuel reserves that, if burned, would bring the planet well above the 2 °C warming target: to ensure that this threshold is not reached – assuming that carbon capture and storage technologies are not available to be used at scale – more than one third of current oil reserves and half of gas reserves should, in fact, be kept in the ground [22].

Table 1 – Oil and gas companies' scope 1+3 greenhouse gas emissions 1988-2015, $GtCO_2e$ and percentage of global industrial emissions 1988-2015

Oil and gas company	**Emissions**	**Percentage**	**Typology***
Saudi Aramco (Saudi Arabia)	40.6	4.5%	NOC
Gazprom (Russia)	35.2	3.9%	NOC
National Iranian Oil (Iran)	20.5	2.3%	NOC
ExxonMobil (United States)	17.8	2.0%	IOC
Pemex (Mexico)	16.8	1.9%	NOC
Royal Dutch Shell (United Kingdom/Netherlands)	15.0	1.7%	IOC
China National Petroleum (China)	14.0	1.6%	NOC
BP (United Kingdom)	13.8	1.5%	IOC
Chevron (United States)	11.8	1.3%	IOC
PDVSA (Venezuela)	11.0	1.2%	NOC
TOTAL 10	**196.6**	**21.9%**	

* IOCs: privately-owned 'International Oil Companies' NOCs: state-owned 'National Oil Companies'.

Source: Elaboration from The Carbon Majors Database – 2017 Dataset Release.[6] According to the Greenhouse Gas Protocol of the World Resources Institute (WRI), scope 1 emissions refer to direct

article, there is no doubt that the major oil and gas companies knew the science of climate change and the potential impacts of their products from at least the late 1950s onwards.

[6] Available at: https://www.cdp.net/en//articles/media/new-report-shows-just-100-companies-are-source-of-over-70-of-emissions.

oil and gas combustions; scope 3 emissions originate from the downstream combustion (for energy and non-energy purposes) of oil and gas that they have distributed within the global economic system. Indeed, the largest share (roughly 90%) of oil companies' emissions consists of scope 3 emissions.

Based on this evidence, oil and gas companies have, as previously asserted, a clear "causal responsibility" for climate change. Although by no means the sole prerequisite, causal responsibility is necessary for the more stringent notion of "moral responsibility", which also requires the appraisal of agents' intentions, voluntariness, control, and knowledge. Based on such causal responsibility, society must determine the most appropriate forms of moral responsibilities [23] for oil and gas companies.

To boost its solidity and cogency, morally relevant facts related to oil and gas companies' activity must be the framework for defining moral responsibility. In the end, as historian of science Oreskes [24] argues, climate change discussions ought to be based on facts.

Morally relevant facts should be understood as the bedrock for assessing moral rightness (or indeed wrongness): if a fact can justifiably be employed to support a particular moral judgement, it is morally relevant [25]. Without entering the complex and still unresolved philosophical debate on ideal and non-ideal theory [e.g. 26,27], the theoretical argument made by the article includes one broad approach that characterises non-ideal theory, i.e. fact-sensitivity [28: 51]. Morally relevant facts provide normative guidance to an approach to justice which takes into account the contextual circumstances of particular justice-related cases [29]. With regard to the issues at stake, by clarifying the conduct of oil and gas companies, understanding the moral context within which they operate, and evincing their intentions, these facts stipulate the normative foundation for viewing their responsibility as a moral one, thereby assigning the oil and gas industry "positive, special, backward-looking" moral responsibility for climate change.[7] Such fact-based, composite responsibility, additionally, provides a sound foundation for requiring oil and gas companies to engage with the forward-looking duties of financially rectifying the harm done and decarbonising their business [5].

The morally relevant facts significant for the oil industry generally relate to harm: an agent may be considered responsible if they i) are aware and/or are able to foresee that their action(s) bring about harm; ii) have the capacity, possibility, and willingness to avoid or minimise harm [30]. Consistent with these specifications of harm-related moral responsibility, the morally relevant fact belonging to the first group is "Fact A – Awareness": long before a more general awareness in the 1990s, oil and gas companies knew that their fossil fuel-related activities caused dangerous climate change. Those belonging to the second group are "Fact B – Behaviour": oil and gas companies have not changed their fossil-fuel centred behaviour; "Fact C – Capacity": less carbon-intensive alternatives were possible; and "Fact D – Denial": through denial campaigns they successfully opposed political efforts to decarbonise economic systems and to act upon the climate change already underway.

Despite the apparently insurmountable disputes that afflict the analytical and normative understanding of the doctrine of doing/allowing harm [31,32: 79-121], and of what Philippa

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[7] The Paris Agreement implicitly includes backward-looking responsibility when, at article 8, it refers to 'loss and damage'. Importantly, it was possible to adopt this article only under the condition that the developed countries should not be held financially liable for loss and damage. However, the notion of loss and damage has created some momentum for considering backward-looking responsibility as a moral basis for duties of financial rectification of the harm caused by climate change. I owe this point to an anonymous reviewer, for which I am grateful.

Foot [33] calls “enabling” harm, it seems that the morally relevant facts mentioned above “enabled” harm to humanity and the planet, as opposed to oil and gas companies’ contribution in terms of emissions that “did” harm (and on this basis generated their causal responsibility). In brief, harm-enabling morally relevant facts concern the removal of obstacles that prevent harm or the creation of obstacles to harm prevention [32: 89]. Oil and gas companies, in particular, actively created obstacles to the acknowledgment that their activities were causing climate harm, recognition which is the necessary prerequisite for addressing such activities in view of reducing the associated harm [31,32: 90-93].

It is worth noting that the second group of morally relevant facts resonates with the arguments raised by a recent *Amici Curiae’s* brief filed to the Fourth Circuit of the U.S. Court of Appeals holding BP and other fossil fuel companies liable for climate change [34].

Moreover, there is a stand-alone fact that represents and embodies the *raison d'être* of oil and gas companies’ business mission: the staggering profits deriving from their fossil fuel-related activities. It is labelled “Fact E – Enrichment” and it is significant in moral terms; despite not being intrinsically morally wrong and unrelated to harm, Fact E provides a different and complementary moral basis – prevalently justified through the “beneficiary pays” moral principle of climate ethics, as specified in Section 7 – for strengthening and more effectively shaping oil and gas companies’ moral responsibility for climate change.

Such responsibility, in a different perspective, relates to oil and gas companies’ “legal liability”. Indeed, the two concepts – responsibility and liability – are inevitably intertwined, and the proliferation of responsibility-based climate change lawsuits makes it clear that courts are playing an increasing role in determining how carbon emissions and their impacts should be addressed [35]. For instance, Feinberg [36: 222] in his standard legal model of liability based on contributory fault assumes that causal responsibility requires agents to be responsible for the dire consequences that they cause through their faulty actions, and consequently are liable for providing the appropriate remedy. Additionally, he underlines that moral responsibility is the central element that impels remedial actions. In this view, oil and gas companies’ (positive, special, backward-looking) moral responsibility seems decisive for establishing their legal liability both according to tort law and in terms of strict liability [37], as evinced by the recent explosion in climate liability lawsuits – especially in the U.S.A. – [38], as well as their expected increasing importance in relation to fossil fuel investments [39].[8]

Finally, it should be pointed out that recognition of oil and gas companies’ moral responsibility for climate change based on morally relevant facts does not imply that these companies should become the only, or the primary, agents of climate justice. States, consumers, civil society, businesses, and other stakeholders all have responsibilities to do their fair share in addressing climate change [42]. Crucially, states are the primary agents responsible for providing appropriate legislative and political frameworks for ensuring that oil and gas companies act in accordance with their responsibilities. Similarly, consumers should try to curb, at the very least, their superfluous or luxury emissions. Thus, it is not the intent of this article to obscure the role or importance of these agents. Rather, its goal is to draw attention to a significant yet overlooked group of agents, whose unique and distinctive responsibilities in relation to climate change should be translated into much needed policies to support current climate efforts. Oil and gas companies should play a role in climate governance, one which is adequate and appropriate to their role in climate change, along with states, individuals, and other agents.

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[8] Several diverse voices, including current U.S. Democratic presidential candidates [40,41], are more and more frequently demanding that oil and gas companies be held legally liable for (some of) the impacts of climate change.

3. Fact A – Awareness

Oil and gas companies were aware of the threats of climate change, but they did not share their knowledge with shareholders, stakeholders, or the general public. Some IOCs – e.g. Exxon, Shell – had a high level of internal scientific and technical expertise and were aware of the available scientific knowledge about potential harmful effects for the global climate system – especially in terms of atmospheric temperature increase – of burning fossil fuels [16].

The awareness of the perils of climate change spread widely, as mentioned, after the 1990 First Assessment Report of the IPCC, which announced the global scientific consensus on the negative effects of anthropogenic climate change. Oil and gas companies, however, had already known about climate change for decades, possibly even since the inception of the industry: knowledge of the potentially negative consequences of carbon emissions on the planet dates back to the 19th century and was widespread among different scientific communities, including the one gravitating around the oil world. The growing carbon emissions were initially underestimated, given the belief that the oceans would have safely absorbed them, thus eliminating their danger to the climate system. As far back as 1938, however, at least one scientist [43] measured a noticeable impact of CO_2 emissions on global temperatures (0.005ºC per year for the previous fifty years), evidence eventually confirmed – and thereafter referred to as the "Suess effect" – by the Scripps Institute of Oceanography's chemist Hans Suess [44]. A couple of years later, a landmark work [45] demonstrated unequivocally that the world's oceans would not absorb CO_2 as rapidly as previously imagined, and suggested its level in the atmosphere was likely to increase significantly. Two months later, scientists at Humble Oil (a subsidiary of Standard Oil New Jersey, now ExxonMobil) submitted a work on the same topic, in which they similarly recognised the increase in atmospheric CO_2, and acknowledged the connection between fossil fuel combustion and said increase, as well as the link between atmospheric CO_2 and potential temperature increases [46].

In truth, from the 1940s, the western – especially the U.S. – oil industry began carrying out ground-breaking research on climate change and its impacts. By and large, the goal of this research was not to investigate the physical phenomenon, but rather to better understand the exploration of oil. Such work focused, for instance, on long-term changes in the earth's temperature; on the relationship between global temperatures and sea level rise; on changes in the concentration of CO_2 in the atmosphere; on the nature, causes, and history of hurricanes; and even on techniques, technologies, and consequences of intentional weather modification [16].

By the end of the 1950s, the western oil industry (certainly the North-American one, but very likely European IOCs too, given the highly oligopolistic structure of the industry at the time) was both involved in research on the accumulation of CO_2 in the atmosphere and on the contribution of the combustion of fossil fuels to such phenomenon through the American Petroleum Institute's (API) – the U.S. trade association for the oil and gas industry – Smoke and Fumes Committee; this Committee's main objective was to combine industry-funded research – usually undertaken to prove a pre-determined result, according to 'first-hand accounts' [16: 21] – and public relations advocacy in order to increase public scepticism about air pollution science, with the ultimate purpose of swaying legislation and regulation on critical pollution issues, including those related to CO_2 and temperature increase. For instance, a 1958 API funded project was aimed at measuring the Suess effect, i.e. the proportion of atmospheric carbon of fossil origin [47].

At the same time, the renowned physicist Edward Teller, in a 1959 speech for the 100th birthday of the oil industry in America, organised by the API in New York, warned oil

company executives, government officials, and scientists with startling prescience about the correlation between carbon dioxide and global warming [48].

At any rate, by 1968, the Stanford Research Institute presented the API with a report titled *Sources Abundance, and Fate of Gaseous Atmospheric Pollutants* [49] that summarised the causes, nature, and consequences of global warming and climate change. The report:

> "[w]arned the oil industry explicitly and in strong terms that the science underlying climate change was sound, that fossil fuel combustion provided the best explanation for climate change, that the impacts of climate change could be potentially significant on a global scale, and that the industry's highest research priority should be identifying means and technologies for reducing emissions." [16: 21].

The report did not advance definitive claims on climate change; it did, however, conclude that "[s]ignificant temperature changes are almost certain to occur by the year 2000 and these could bring about climatic changes." [49: 109]. In short, damning evidence that by 1968 the API and the American oil industry knew about the relation between fossil fuel combustion, rising atmospheric CO_2 concentrations, and the consequent temperature rise; as well as being aware of the need to research technologies to address and control CO_2 emissions from fossil fuel combustion. In 1969, the API asked the Stanford Research Institute to better substantiate its original findings. The submitted *Supplementary Report* [50] reiterated, in its section on CO_2, the conclusions of the 1968 work [49]. It stressed that atmospheric concentrations of CO_2 were increasing; that 90% of this increase could be attributed to fossil fuel combustion; and that continued use of fossil fuels would inevitably result in greater CO_2 concentrations in the atmosphere.

In 1972, the U.S. National Petroleum Council (NPC) – an advisory committee under the U.S. Department of Energy that advises the federal government on questions related to the oil industry – submitted a report [51] to the U.S. Department of the Interior that basically acknowledged the findings of the Robinson and Robbins reports [49,50], albeit presenting the fossil fuel combustion-CO_2 concentrations-temperature increase relationships in more ambiguous terms.

In the 1970s, research teams from major oil companies informed the management of the consequences of fossil fuel combustion. For instance, on various occasions in internal memorandums, Exxon's scientists alerted the company's management about the correlation between fossil fuel combustion and climate change, as well as the imperative to take serious action against it [52,53]. In 1977, Exxon's James Black informed the company's top executives about the urgency of the climate risk generated by burning fossil fuels: "Present thinking holds that man has a time window of five to ten years before the need for hard decisions regarding changes in energy strategies might become critical" [54]. By the early 1980s, Exxon internally acknowledged in full the dangerousness of climate change and fossil fuel combustion's role in generating it – especially in terms of temperature rise – through an increase of CO_2 concentrations in the atmosphere. In 1982, Roger Cohen, Director of Exxon's Theoretical and Mathematical Sciences Laboratory was crystal-clear in a communication to Exxon's Office of Science and Technology: "a clear scientific consensus has emerged regarding the expected climatic effects of increased atmospheric CO_2," and concluded by claiming that "[in] summary, the results of our research are in accord with the scientific consensus on the effect of increased atmospheric CO_2 on climate" [55]. At the end of the same year – 1982 – an internal climate change primer was even circulated by Exxon's Environmental Affairs Program to familiarise the company's managers with climate change [56].

It is difficult to imagine, though, that such knowledge remained within the confines of the U.S.A., and, in fact, on the other side of the Atlantic, Shell's knowledge has been documented. In the 1980s, the company acknowledged the seriousness of climate change,

and stated that its products were responsible for it. Specifically, in a number of internal documents drafted from 1981 – hence well-before the 1990 global scientific consensus on the negative effects of anthropogenic climate change – Shell recognised that unabated carbon emissions could lead to a series of effects: an increase of between 1.5 degrees to 3.5 degrees of warming; to major social and economic changes; to severe environmental damage, including the disappearance of entire ecosystems. Additionally, Shell acknowledged that carbon emissions largely originated from the combustion of fossil fuels and from deforestation, and that all its products – oil, gas, and coal – significantly contributed to the problem [57,58]. By the same token, in a 1988 confidential document titled *The Greenhouse Effect*, Shell admitted that climate change – acknowledging the contribution of its products – could lead to large-scale forced migration, especially due to crop failure and extreme weather increases in more sensitive regions. In 1991, Shell even produced a film for public release titled *Climate of Concern*, the essential message of which was that the climate was changing faster than at any time since the last ice age, and that this would have worrying impacts on the planet and on people. With impressive clairvoyance, the film, for instance, asked: "In a crowded world subject to such adverse shifts of climate, who would take care of such greenhouse refugees?" [59]. Yet the Anglo-Dutch giant continued to develop future scenarios largely reliant on oil [60] and publicly justified the use of fossil fuels as the only realistic way to achieve sustainable development and fight poverty [61].

The oil world, despite the enormity of its main actors, is a small one where critical information circulates fast: since Exxon and Shell knew, it is likely that directly or indirectly most of the industry – including NOCs – knew too. In fact, between 1979 and 1983, the API established a task force to monitor and share research on climate change among its members. Notably, members included representatives from almost every western IOC: Exxon, Mobil, Amoco, Phillips, Texaco, Shell, Sunoco, Standard Oil of Ohio and of California, and Gulf Oil, the predecessor to Chevron [62].

In short, it seems safe to claim that major oil and gas companies have known for several decades – since their own scientists and peers told them – that their fossil fuel-related activities caused dangerous climate change.

4. Fact B – Behaviour

It is extremely difficult to analyse oil and gas companies' behaviour in relation to climate change. Generally, they have shown a duplicitous attitude towards it: as pointed out in the previous section, they carried out serious science on climate change and knew that it was real. At the same time, they controverted their own scientific evidence by denying it and not taking action against it [63].

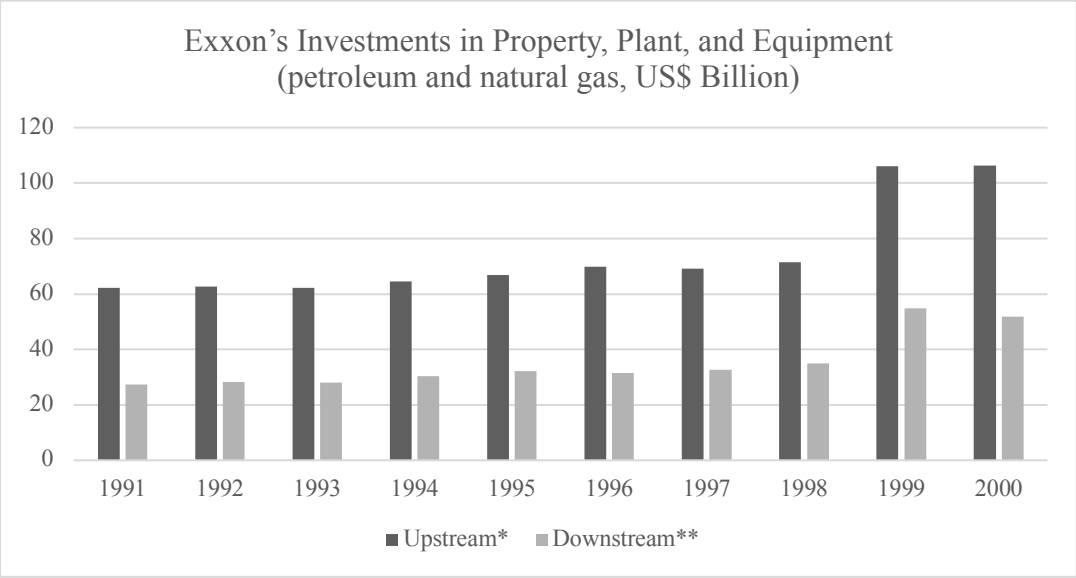
When, in the early 1990s, the social and political pressure to act against climate change started to gain momentum, oil and gas companies, by and large, did not change their carbon-centred business models. In public, IOCs mostly dismissed the scientific evidence on the relations between fossil fuels and climate change as a leftist attack on the oil world. NOCs, the oil champions of some oil-rich or oil-poor countries, ignored the issue [21]. The general rhetoric of oil and gas companies was that cutting emissions would directly threaten their survival, as well as imperil the many industries dependent on hydrocarbons, eventually disrupting the quality of human life [64,65].

Progressively things appeared to change, despite the still controversial attitude of major oil and gas companies towards serious engagement in the climate crisis [66]; in a somewhat rough schematisation, at the beginning of the 2000s, American IOCs adopted a reactive strategy based on the rebuttal of responsibility for climate change, whereas European ones embraced a more proactive strategy that accepted some forms of responsibility [67].

Currently, all the largest IOCs have recognised climate change and started to aim at a low carbon future; in the meantime, NOCs too seem to have acknowledged the climate crisis.

But, as a matter of fact, the issue remains: for decades after their internal knowledge, and at least for one decade after public scientific consensus on climate change, oil and gas companies did not switch to less carbon intensive business models. Rather, oil and gas companies continued to explore, produce, refine, and distribute fossil fuels throughout the global economy, just as they did in the old carbon-unconscious world [68]. Exxon, for instance, in the decade immediately following the knowledge accrued and the agreed scientific consensus on climate change of the 1990s, did not reduce its investments in oil and gas; on the contrary, it increased them, as evinced by the following infographic.

Figure 1 – Exxon's Investments in Property, Plant, and Equipment (petroleum and natural gas, US$ billion)



*Upstream investments: oil and gas exploration and production

**Downstream investments: oil and gas refining and marketing

Source: Exxon 10K Annual Reports to the U.S. Securities and Exchange Commission (various years). Available at: http://ir.exxonmobil.com/phoenix.zhtml?c=115024&p=irol-sec

Taking into consideration more recent years, when the oil industry did publicly acknowledge climate change and announced its intention to transition to more sustainable business models, it is revealing to scrutinise Anglo-Dutch Shell and British BP's budgets. Shell's capital expenditures (capex, i.e. the money it spends to buy, maintain, or improve its fixed assets for exploring producing, refining, and distributing oil and gas) remained almost constant in the four years between 2015 and 2018, with a maximum in 2015 of US$ 26.1 billion and a minimum in 2017 of US$ 20.9 billion. In the same period BP's – allegedly the most climate virtuous oil major – capex varied from a minimum of US$ 17.5 billion in 2016 to a maximum of US$ 25.1 billion in 2018.[9]

[9] Data taken from the companies' Annual Reports and Forms 20-F to the U.S. Securities and Exchange Commission 2015, 2016, 2017, and 2018 (Available at: https://www.shell.com/investors/financial-reporting/annual-publications.html#iframe=L3JlcG9ydC1ob21lLzIwMTgv (Shell); and

The tableau of the immediate future – in a world where the current lion's share of energy investments is still in oil and gas [69], just as it was 30 years ago – looks pretty much the same: IOCs are still deeply engaged with fossil fuels. ExxonMobil recently said that the world needs more energy, and that, accordingly, it planned to invest more than US$ 200 billion in major oil and gas projects around the world over seven years [70]. As a matter of fact, in March 2019, ExxonMobil announced capital outlays of US$ 32 billion through to the end of 2020, a 24% increase from 2018, and raised its 2025 profit-growth target by five percentage points to 140% compared with 2017 levels [71]. Objectives to be achieved through an almost exclusively fossil fuel-centred strategy which greatly speculates on shale: for example, the output of the cornucopian Permian basin should skyrocket to 1 million barrels per day by 2024, according to the company [72].

In Europe, the British oil and gas industry argues for continuing the production of fossil fuels at maximum level [73]; the Shell CEO recently claimed that '[de]spite what a lot of activists say, it is entirely legitimate to invest in oil and gas because the world demands it … We have no choice but to invest in long-life [fossil-based] projects' [74]; in 2017, French Total signed a multibillion-dollar agreement to develop part of the Persian Gulf South Pars, the world's largest gas field, shared between Iran and Qatar [75]; south of the Alps, Italian "hybrid" IOC ENI likewise plans billions of dollars worth of investments in Algerian gas over the next three years [76].

In sum, the five largest IOCs (ExxonMobil, Royal Dutch Shell, Chevron, BP, and Total) are forecast to invest around US$ 3.5 billion (only 3% of their 2019 capex) in low carbon technologies, whilst US$ roughly 110.5 billion will be put into more oil and gas [77] (InfluenceMap 2019). In general, it seems that major IOCs plan massive short-term oil and gas expansion [78].

Similarly, NOCs are continuing to expand their role in fossil fuels. Saudi Aramco plans to invest US$ 300 billion over 10 years in upstream oil and gas [79]. Russian Gazprom's investment program for 2018 amounted to over US$ 20 billion and was largely centred on the development of natural gas projects, as well as on the realisation of gas facilities and infrastructure projects [80], whereas its oil arm Gazprom Neft will spend roughly US$ 7 billion for the development of new oilfields and the modernisation of refineries [81]. Resource-seeking China National Petroleum Corporation invested US$ 1.2 billion to buy 10 per cent of three offshore oilfields in Abu Dhabi [82].

A further unequivocal signal comes indirectly from the oil, petroleum products, and natural gas pipelines industry. In the 2018-2022 period, the U.S.A. and Russia will be the biggest spenders: the first will invest US$ 88.4 billion, the second US$ 78.8 billion [83].

The figures provided are indisputable (morally-relevant) facts: the oil and gas industry did not change – and doesn't appear to be planning to change – its fossil-fuel centred behaviour. In 2018, all of the major oil companies (IOCs and NOCs) invested US$ 50 billion in projects that are largely incompatible with the 1.5 °C goal of the Paris Agreement [84], while the whole industry invested only 1.3% of their total 2018 capex in low carbon [85]. Overall, oil and gas companies are projected to spend US$ 785 billion on new oil and gas fields between 2020 and 2029. All capex in new fields is, similarly, irreconcilable with any climate goal [86]. As the last (September 2019) meeting of the Oil and Gas Climate Initiative testifies, the oil industry refuses to abandon fossil fuels [87].

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https://www.bp.com/en/global/corporate/investors/results-and-reporting/annual-report/annual-reporting-archive.html (BP)).

There is something else indicative in oil and gas companies' behaviour: they have also long been aware that climate impacts could endanger their business. And they have prepared to brace for such a reality, by taking into account potential climate impacts in their long-term business and operation planning. Back in 1989, for instance, Shell changed the design of its offshore oil drilling platforms to account for sea level rise; in 1995, Imperial Oil, a Canadian Exxon subsidiary, started taking into account the impacts of climate change in the Arctic in its planning strategies [16]. Additionally, oil and gas companies are actively preparing for an impending climate crisis through deployment of adaptation strategies for climate risk management: the most important include project design and location planning, emergency/crisis planning, risk management systems, and water management [88].

5. Fact C – Capacity

Less carbon-intensive alternatives were possible. Major IOCs actually had the capacity and the opportunity to reduce the harmful effects of their activities by modifying their business models; some IOCs had this option more than forty years ago [16,68].

However, the oil industry, by and large, did not take any significant measures to reduce the harmfulness of its products; neither did it engage in policy design – rather, as shown in the ensuing section, by denying climate change, it actively hindered such initiatives. The largest IOCs, however, researched technologies to mitigate climate change. In particular, the oil industry has been researching and patenting technology for removing CO_2 from waste streams, for low emission vehicles, fuel cells, and solar panels since the 1950s [16: 19-21,68].

CO_2 removal technologies were of great interest to oil and gas companies: the oil industry was fully aware of their potential for addressing climate change. Both Exxon and Shell had several patents for capturing and storing CO_2. But a very mundane matter slowed and eventually brought to a halt the full development and industrialisation of these technologies: "… removal of only 50% of the CO_2 from stack gases would double the cost of power generation" [89].

IOCs invested heavily in fuel cells too. Exxon and Shell, stimulated by the rising interest in clean and electric vehicle technologies, led this research in the early 1960s [90]. The oil crisis of the early 1970s helped spur research in solar technologies: the 1974 U.S. Solar Energy Research Development and Demonstration Act distributed US$ 6 billion in federal research subsidies in this area. IOCs ended up netting much of those subsidies – either through developing their own technology or by buying smaller solar energy companies [91]. By the end of the 1980s, the oil industry owned or controlled the largest share of solar panels production in the U.S. and maintained its prominence in this technology well into the 2000s [92].

The largest oil and gas companies had the technical capacity and held several early patents on different technologies for diminishing their carbon intensity. Such technologies, if developed and deployed, could have significantly reduced carbon emissions or accelerated the shift to clean energy. Apparently, the very reason this did not happen was commercial: the higher cost, at least initially, of industrial processes involving their carbon-saving technologies would have slashed the oil industry's profits [16: 22].

It is worth reiterating that an alternative vision did actually exist: some oil and gas companies, or maybe some of their more enlightened executives, envisaged it. For example, in a 1997 speech given at Stanford University, BP CEO John Browne acknowledged the scientific consensus on anthropogenic climate change presented by the 1995 second report of the IPCC, as well as BP's consequent responsibility and duty to take action. Browne even remarked upon the potential of solar energy, and affirmed BP's intention to invest and to

reach US$ 1 billion in sales within the following decade [93]. Browne's speech was widely appreciated and raised many hopes. Observers saw it as being as revolutionary as the tobacco industry's acknowledgment of the correlation between smoking and cancer and heart disease [94]. Unfortunately, a molehill was made out of a mountain: his words generated some fanfare in the media – the *Financial Times* [95], the *Los Angeles Times* [94] –, some praise by the environmental world – Sierra Club, the California Environmental Protection Agency –, other oil companies (e.g. Shell, Chevron) pledging to move in the direction outlined by the BP CEO and to put an end to climate-denial [96]. In the end, however, it turned out to be much ado about nothing.

It is clearly impossible to predict what might have been, what could have changed, or how much climate harm could have been averted had the oil industry fully implemented the cleaner technologies it detained. What it is reasonably sure, however, is that several decades ago, major IOCs already had both the capacity and the opportunity to decarbonise their business, to markedly influence the behaviour of the entire industry, and to light the way to a transition to cleaner socio-economic systems [97]. But, despite this opportunity, no significant steps were taken.

6. Fact D – Denial

The oil industry invested heavily in climate change denial [98]. Denial is, in itself, profoundly wrong in moral terms. Much ink has already been spilled on the features and dynamics of oil and gas companies' climate denial.[10] Rather than reiterating its main facets – financing and orchestrating multiple initiatives for sowing doubt and misinformation about the existence and severity of climate change, the role of anthropogenic carbon emissions in it, its science, and the motives of those who study climate change and communicate their findings – it seems more pertinent in this context to focus on one of the main objectives of oil and gas companies' denial campaign: impeding and/or slowing action to address climate change.

Leading IOCs actively opposed and, in many cases, successfully prevented policies on emissions reduction [68,98]. To this end, since the early 1990s, major IOCs deftly orchestrated a campaign of deception and disinformation – still enduring – with the primary objective of manipulating and steering public decisional processes related to the control and limitation of fossil fuels [99]. This campaign was used with great effectiveness to block regulations against fossil fuels and to refute the liability of the oil industry, mirroring what happened a few decades earlier within the tobacco industry [98].

In this regard, the Union of Concerned Scientists' (UCS) "Disinformation Playbook" [11] is a useful point of reference: it lays out the IOCs' strategy for disproving climate science in order to oppose climate initiatives, articulated, it says, in four "plays". First, "The Fake: Conduct counterfeit science and try to pass it off as legitimate research". Exxon, for instance, funded external scientists to publish poor research contradicting its own scientists, who all agreed on the relations between fossil fuel combustion and climate change and on its threat [100]. Second, "The Blitz: Harass scientists who speak out with results or views inconvenient for the oil industry". For instance, conservative, "free-market" think tanks funded by the oil industry are supposed to have been behind 2009's "Climategate" and the 2010 attack on climate scientist Michael Mann [101]. Third, "The Diversion: Manufacture uncertainty about science where little or none exists". Oreskes and Conway [98] dubbed oil and gas – and

[10] Most arguments of climate change denial have been masterfully analysed in the book *Merchants of Doubt* [98].

[11] Available at: https://www.ucsusa.org/our-work/center-science-and-democracy/disinformation-playbook#.WzJwuql9ijQ.

tobacco – companies "merchants of doubt": "Doubt is our product, since it is the best means of competing with the 'body of fact' that exists in the minds of the general public", as a now infamous tobacco industry memo stated.[12] To manufacture doubt, major IOCs funded a host of initiatives to discredit the science and spread misinformation: real science was dismissed as "junk", while misrepresentations were offered in its place. IOCs' pseudo-experts' favoured *modus operandi* was to herald a (non-existing) division in climate science to acquiescent journalists and politicians, happy to pass on the "news" to already confused laypersons [102]. Fourth, "The Screen: Buy credibility through alliances with academia or professional societies"; generally speaking, through its generous donations, the fossil fuel industry seems to have colonised parts of American academic work on climate policy and energy [103]; Exxon, for instance, funded established research institutions – e.g. Columbia University and MIT – to investigate science, policies, and technologies to address climate change [104]; the Texan giant has for years also sponsored the American Geophysical Society annual meeting [105]; the API has partnered with Black and Hispanic business groups to publish op-eds in local newspapers to build support for offshore drilling by emphasising its benefits, especially in terms of job creation [106]. A fifth play could be added: one adopted by oil and gas companies which consists in framing the question of climate change as one of individual, consumption-based, responsibility, thus preventing the general public from understanding that the climate crisis is a structural problem largely driven by the oil industry's denial, misinformation, lobbying, and disablement of climate policy and legislation. In this way, oil and gas companies have been able to obfuscate their responsibility for climate change and to present themselves as suppliers, merely meeting the existing demand, rather than as the major underlying cause of the problem [107].

These plays were successful: while their scientists contributed to advancing climate science, IOCs deceived their stakeholders by spreading disinformation about climate change in their public communications and advertorials [108]. The ultimate objective of these initiatives was to oppose climate action through a final manipulative play, defined in the UCS's Disinformation Playbook as "The Fix: Manipulate government officials or processes to inappropriately influence policy". The Fix worked all too well: IOCs effectively lobbied against climate policy and regulations in the U.S. [109,110]. This, however, had significant international repercussions: consider, for instance, Exxon's successful efforts against the U.S. ratification of the Kyoto Protocol [108]. Or, in 2014, how the Western States Petroleum Association – the top lobbyist for the oil industry in the western United States, which included BP, Shell, ExxonMobil, and Chevron among its members – used fake consumer groups – innocuously named, for example, *California Driver's Alliance* or *Washington Consumers for Sound Fuel Policy* – as part of a campaign to exaggerate public support against California climate regulation [111]. In the U.S.A., major IOCs have a significant influence on the Republican Party: their grip over climate and energy policy – at least until the next political overturning – is almost complete [63].

At the international level, the Global Climate Coalition (GCC), a fossil-fuel backed lobby group active in the mid-90s and early 2000s, tried to manipulate the IPCC, the United Nations' official scientific advisory body on climate science [112], while some IOCs – especially Shell – actively tried to obstruct international climate negotiations thanks to the privileged access gained to the annual UNFCCC meetings through trade associations [113].

Unfortunately, no game changer is on the cards: major IOCs (ExxonMobil, Royal Dutch Shell, Chevron, BP, and Total) have invested over $1 billion of shareholder money in the three years since the Paris Agreement (2016-2018) on misleading climate-related branding and lobbying [77]. In particular, they have spent €251 million lobbying the EU since 2010

[12] Available at: https://www.industrydocumentslibrary.ucsf.edu/tobacco/docs/#id=xqkd0134.

[114]. Hundreds of American and European – largely U.K. based – individuals and institutions involved in climate denial recently sent a letter to leaders of the European Union and the United Nations arguing that there is no climate emergency and therefore no need to set net zero emissions targets [115]. On a different note, just seven years after the disastrous Gulf of Mexico oil spill, BP intensified the pressure on the American powers to be allowed to drill for oil in the Arctic sea and in an Alaskan wildlife refuge [116].
In brief, through their intensive, protracted, and sophisticated denial campaign, major IOCs successfully opposed political efforts to move socio-economic systems away from fossil fuels [117], thereby inducing decision-makers to commit a morally relevant omission [118] that has seriously aggravated the global negative repercussions of the climate crisis.

7. Fact E – Enrichment

Oil and gas companies have made substantial profits that have greatly increased the fortunes of their executives and shareholders – some of them acquiring extraordinary wealth, in fact, as testified by the 'Polluter Elite Database'[13] – through their activities related to fossil fuels [68,119]. This, obviously, is neither morally wrong nor related to harm. However, Fact E – Enrichment is still morally relevant since it strengthens and better typifies oil and gas companies' moral responsibility for climate change.

As anticipated in Section 2, in this context, to see why the wealth the oil industry made from fossil fuels provides a different and complementary moral basis that reinforces and more effectively shapes its (positive, special, backward-looking) moral responsibility for climate change, it is necessary to briefly look at the moral principles that justify oil and gas companies' consequent rectificatory duties of reparation and decarbonisation [5].

Climate ethics literature [e.g. 14,120] usually refers in this regard to two backward-looking principles (the "polluter pays principle" – PPP, and the "beneficiary pays principle" – BPP) and one forward-looking principle (the "ability to pay principle" – APP). The PPP distributes the financial and other burdens associated with rectificatory actions in proportion to past contributions that agents have made to the overall level of harm. The BPP holds instead that proportionality in such distribution should be calculated based on the benefits that agents have derived from activities generating harm. Finally the APP – less relevant in this analysis given its forward-looking stance – posits that the quota of burdens should be proportional to the agents' relative capacity to bear such burdens.

While the morally relevant facts A, B, C, and D described in the previous sections are all related to harm, and therefore refer mostly to the PPP, Fact E, which is not related to harm, prevalently refers to the BPP. In other words, the inclusion of the "wealth component" intrinsic to Fact E expands and reinforces the justifications for oil and gas companies' moral responsibility, especially in view of a consequent "duty of reparation" [5,121] which should be, in fact, carried out through the disbursement of funds. Given the urgency of adequately involving oil and gas companies in climate policy and governance, the stronger and more inclusive its responsibilities are, the more cogent they are likely to be.

In practical terms, the question of the oil industry's wealth should be quantitatively addressed by pointing out their profitability trends. However, profitability in the oil industry depends on countless contingent economic, social, political, institutional, and environmental factors, as well as on internal deliberate financial and fiscal choices; therefore profits vary

[13] Dario Kenner's Polluter Elite Database is available for download at: https://whygreeneconomy.org/the-polluter-elite-database/. It reports the shares detained by large multinational oil, gas, and coal companies' executives and directors, the values of their shares, as well as their personal emissions related to the ownership of such shares.

greatly over the years, and profitable and non-profitable periods tend to span several years [122].

The first quarter of 2018 was, for instance, the most profitable in years for IOCs, particularly for BP [123]. This is mainly due to a marked increase in oil prices and to the industry's success in cutting costs. Here are some key figures of major IOCs' 2018 first quarter profits [124]:

- BP's profits soared by 71% to US$ 2.4 billion, compared to US$ 1.4 billion a year earlier;
- Chevron's profits increased to US $3.6 billion, an increase of 36% compared to 2017;
- ExxonMobil saw its profits rise by 16% to US$ 4.7 billion compared to 2017;
- Shell's profits surged to $5.32 billion, 42% more than the same trimester in 2017.

The oil industry's wealth can probably be further understood, albeit rather allusively, by examining industry linked individuals who have accumulated extraordinary wealth through fossil fuels: the "oil billionaires", usually with close ties to state-run NOCs.

For instance, Russian president Vladimir Putin has a fortune estimated somewhere between US$ 40 and 200 billion: most of it comes from his stakes in the oil sector [125,126]. He is said to own 37% of Surgutneftegas (a Russian oil and gas company created by merging several previously state-owned companies that owns large oil and gas reserves in western Siberia), and 4.5% of Gazprom. A fortune with similar origins is detained by Azerbaijan's president Aliyev, whose AtaHolding held in 2014, according to the Panama Papers,[14] over US$ 490 million in assets, mostly in the oil and gas sector; or by the former Kazakh president Nazarbayev. Angolan Isabel Dos Santos, daughter of the former president of a destitute country with massive oil wealth, chairwoman for a year of Sonangol, Angola's NOC, is worth US$ 4.3 billion. A conservative estimate of the wealth of Sultan Hassanal Bolkiah of Brunei – the third-largest oil producer in Southeast Asia – is US$ 40 billion, most of which has been accumulated by the exploitation of the country's huge reserves of oil and gas [126].

8. Conclusion: Facts and factoids

To establish the oil industry's moral responsibility for climate change, it is first necessary to point out the morally relevant facts related to its fossil-fuel activities which contributed to this situation. Presenting such facts helps clarify the conduct of oil and gas companies and understand the moral context within which they operate. The morally relevant facts analysed in this article – Fact A – Awareness; Fact B – Behaviour; Fact C – Capacity; Fact D – Denial; and Fact E – Enrichment – also evince the intentions of oil and gas companies, and, overall, provide a normative foundation for their composite moral responsibilities and, conceivably, for their legal liability.

This article makes it clear that the oil and gas industry has known for several decades that its fossil fuel-related activities caused dangerous climate change (Fact A); that oil and gas companies did not change – and, in all likelihood, are not planning on radically changing soon – their fossil-fuel centred behaviour (Fact B), even though less carbon-intensive alternatives were/are possible (Fact C); that through funded and coordinated denial campaigns, they successfully opposed political efforts to move socio-economic systems away from fossil fuels (Fact D), while at the same time amassing and distributing fabulous wealth to the few (Fact E).

[14] Available at: https://www.icij.org/investigations/panama-papers/20160404-azerbaijan-hidden-wealth/.

These are the morally relevant facts that oil and gas companies face in relation to the climate crisis. Such facts justify their (positive, special, backward-looking) moral responsibility for climate change that can provide the basis for establishing their legal liability.

Interestingly, based on various arguments articulated within this article, New York City and other cities and counties across the United States, as well as the state of Rhode Island are currently seeking to hold oil and gas companies liable for the harm produced though their fossil fuel-related activities by shifting part of the cost of protection to the companies [127]; ExxonMobil is the main target of these legal actions [128]. Similarly, in Europe, activists and other subjects are suing major fossil fuels producers (e.g. Shell and the German energy company RWE), while in more far-flung corners of the globe, the Philippines' Commission on Human Rights is conducting a National Inquiry on Climate Change (NICC) to investigate 47 major carbon producers for their alleged contribution to climate change and its impact on the human rights of the Filipino people [129]. At the same time, it is worth noting that the more attribution science – the capacity of attributing specific extreme events to climate change – becomes certain, the more it can be used to inform climate litigation and establish the financial liability of larger emitters like oil and gas companies [130].

However, by way of conclusion, it should be pointed out – paradoxical though it may seem – that these morally relevant facts remain largely obfuscated by the almost endless number of factoids – in the original sense of the Norman Mailer-coined neologism meaning something that sounds credible and is assumed to be true by a significant number of people, and yet is not true [131] – that the oil industry and, more broadly, those who, for many diverse reasons, oppose climate change have disseminated over the last decades. At the same time, it is dispiriting to fully grasp the power of factoids: despite essential public interest in health, safety, the well-being of humans and the planet being at stake, the oil industry could – and does – defend and advance its vested interests by denying science, browbeating scientists, and subjugating politics with their shell game – no pun intended – of deftly mixing in plausible factoids with the indisputable facts.

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