A Moral Analysis of Carbon Majors' Role in Climate Change

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ABSTRACT

Two-thirds of global industrial greenhouse gas emissions over the past two centuries can be traced to the activities of a handful of companies ('carbon majors'). Based on their direct contribution to climate change in terms of carbon emissions and on a number of morally relevant facts, this article proposes a normative framework to establish the responsibilities that carbon majors have in relation to climate change. Then, the analysis articulates these responsibilities in the form of two duties: a duty of decarbonisation and a duty of reparation.

The duty of decarbonisation entails a large-scale transformation that carbon majors ought to undergo in order to reduce and eventually eliminate carbon emissions from their entire business model. The duty of reparation implies rectification through disgorgement of funds for the wrongful actions of carbon majors, which resulted in negative climate impacts, starting from the most socially vulnerable groups affected by climate change. Finally, the article indicates possible practical implications of these duties.

KEYWORDS

Climate change; carbon majors; responsibility; duty of decarbonisation; duty of reparation

INTRODUCTION

Currently there is an active debate about possible agents of climate policy beyond the still predominant state-centric perspective. Some environmentalist rhetoric focuses, for instance, on the role of individuals, both in terms of reducing personal emissions and for advocating larger-scale change.[1] Although this perspective seems to have gained some attention in the recent years, normative questions remain about how much responsibility individuals do have for the harm caused by their (in the bigger picture, infinitesimal) greenhouse gas (GHG) emissions, as well as positive questions regarding individual responsibility given political, economic, and institutional constraints on action (Markowitz *et al.* 2015). Therefore, it seems necessary to better explore forms of collective responsibility, with particular attention to novel and/or neglected collective agents.[2] Among these, large carbon producers contributing to the atmospheric concentrations of the major GHG, such as carbon dioxide (CO_2) and methane (CH_4), are possibly the most significant group of agents, with a unique and distinctive role in the context of climate change

Carbon majors, as the emerging literature generally defines the big carbon business, are the world's largest private and public investor-owned, state-owned, and government-run oil, gas, coal, and cement producers. Recent studies (Heede 2014, Frumhoff *et al.* 2015, Heede and Oreskes 2016, Ekwurzel *et al.* 2017, CDP, 2017) have focused specifically on carbon majors' direct contribution to climate change in terms of emissions. The most striking finding of Heede and colleagues (Heede 2014, CDP 2017) is that 62 per cent of global industrial carbon and

[1] Similarly, the fossil fuels industry often emphasises the role of individual consumers. It is believed that, by implicitly attributing to individual consumers' lack of green virtues the failure to address climate change, this industry's aim is to obfuscate its role and the socio-political and regulatory structures that shape consumers' choices (Lanferna 2018).

[2] It is important to clarify at the outset that this article, consistent with the dominant perspective of climate ethics (e.g. Caney 2005, 2006; Miller 2008; Jamieson 2010, 2015; Shue 2015), discusses responsibility only in ethical terms and not, despite their importance, in legal terms.

methane emissions from 1751 to 2015 can be traced to the activities of 100 currently active carbon majors (41 public investor-owned companies; 16 private investor-owned; 36 state-owned; and 7 government-run) and 8 non-extant ones. The latest Carbon Majors Database (CDP 2017) indicates that carbon majors' emissions accounted for 91 per cent of global industrial emissions and over 70 per cent of all anthropogenic GHG emissions in 2015.[3] Recently, Ekwurzel *et al.* (2017) have extended Heede's (2014) original analysis by linking carbon majors' fossil fuel related activities to atmospheric GHG concentrations, as well as to the associated climate impacts. Strikingly, this study found that the emissions generated by 90 major carbon producers over the historical period 1880-2010 contributed to approximately 57 per cent of the observed rise in atmospheric CO_2 concentrations, to 42-50 per cent of the rise in the global mean surface temperature, and to 26-32 per cent of the global sea level rise. Carbon majors' direct contribution to climate change in terms of emissions has therefore considerably harmed the planet and humanity (Ekwurzel *et al.* 2017), which establishes their causal responsibility. Although by no means the sole prerequisite, causal responsibility is a necessity for the more stringent notion of moral responsibility, which also requires the appraisal of agents' intentions, voluntariness, control, and knowledge. Unfortunately, large carbon producers' responsibilities for climate change are largely unexplored in the scientific literature. The only work to date straightforwardly addressing the topic is Henry Shue's exploration of carbon majors' responsibilities for transitioning to cleaner energy (Shue 2017).[4]

[3] The top emitters and the vast majority of carbon producers are fossil fuel corporations (oil, gas, and coal), whereas cement companies are a small minority among carbon majors. The original 2014 database, for instance, included only seven cement companies, whose emissions amounted to 1.45% of carbon majors' cumulative total emissions (Heede 2013, Table 4, p. 17).

[4] At least in the literature on climate ethics, within which the argument of this article has been developed. Obviously, the issue of corporate entities' responsibilities for climate change can be framed through different scientific perspectives and has been discussed across various fields of applied ethics. For instance, business ethics scholars argue that corporations are morally responsible for their contribution to climate change and the resulting harm, and that they must substantially reduce their carbon emissions (Arnold and Bustos 2005); additionally this scholarship claims that the corporate political activity of fossil fuel

This article intends to fill this gap in the literature by providing a moral analysis of the role of carbon majors in climate change. It aims to establish carbon majors' responsibilities for climate change and to derive the consequent duties. In particular, after specification of carbon majors' unique agency, the article argues that a number of morally relevant facts testify that their activities have violated the negative responsibility of 'doing no harm'. Therefore, carbon majors have a positive moral responsibility in the context of climate change to 'clean up the mess' they have caused. Subsequently, the article frames carbon majors' positive moral responsibility in the form of two duties: a duty of decarbonisation and a duty of reparation. These duties compel carbon majors to thoroughly rethink their actions and strategies to rectify the harm done. The duty of decarbonisation implies carbon majors transitioning towards the elimination of carbon emissions from both the operational and production side of business. The duty of reparation implies the disgorgement of financial support for coping with the non-adapted negative impacts of climate change. Finally, the article briefly indicates some possible practical implications of the duties of decarbonisation and reparation.

THE ELEPHANT IN THE ROOM: UNIQUE AGENCY OF CARBON MAJORS

By indiscriminately providing fossil fuels to the global economy, carbon majors are the heartbeat of current carbon-intensive socio-economic systems. Their prominent contribution to climate change and the important implications for climate policy and sustainability evince the crucial role of the big carbon business in the present climate crisis. Yet carbon majors remain truly neglected agents in the current global climate discourse, an 'elephant in the room' of the global climate debate and negotiations.

companies to defeat legislative efforts to combat climate change cannot be ethically justified (Arnold 2016). Legal scholarship, instead, contributes to the discussion on the fossil fuel industry's ethical responsibilities for climate change by claiming that, based on the wrongful benefit principle, it should not benefit from its harmful activities (Cornell and Light 2017).

Through their informed and self-advantageous choice to continue the exploration, production, refining, and distribution of fossil fuels after the associated risks became public, carbon majors have essentially imposed on the global socio-economic system a carbon-intensive model of development. Rather than engaging in a large-scale search for alternatives and phasing out fossil fuels, as warranted by the urgency of the climate emergency and by their technical expertise and wealth (Frumhoff *et al.* 2015, CIEL 2017), carbon majors continued with their fossil fuel dependent business models and behaviour. In this light, it is morally unacceptable to equate carbon majors' responsibilities to those of other stakeholders or to those of the private sector in general. As the other corporate agents, carbon majors are only subject to the binding emission limits imposed on them by the national and subnational political authorities. At best, similarly to other corporations outside of the carbon business, carbon majors assume voluntary obligations to disclose their levels of carbon emissions and to integrate abatement strategies into their business models. Given the nature and characteristics of their core business, though, this is not enough.

Global climate governance should reflect the unique agency of carbon majors, as they have played a distinctive and very significant role in the climate problem and should contribute to addressing it accordingly. At this stage of scientific knowledge and consensus about climate change (Cook *et al.* 2016), fossil fuel may be considered a harmful product, the use of which is and will be affecting health, lives, and the wellbeing of the present and future generations of humans and non-humans. Similar historical cases – when harmfulness of a product was confirmed by solid scientific evidence – have occurred in the past, causing entire industries to be restructured. Like companies previously working with tobacco, asbestos, or lead-based paint, carbon majors should assume some form of responsibility for their involvement in operating a harmful product and for the harm produced.

The studies by Heede and colleagues draw attention to the specific contribution, in terms of emissions, of carbon majors to climate change and offer an excellent basis to build a normative

case for their responsibilities and duties in addressing the problem. Based on their unique agency in global climate governance, including carbon majors in the international climate debate would extend the scope from its 'ossified' and still prevalently state-centred UNFCCC perspective (Depledge 2006). It would also be consistent with the current increasing interplay between state and non-state agents in climate governance, which disregards and challenges old geopolitical groupings and institutional structures (Bäckstrand *et al.* 2017). For example, not all carbon majors operate in wealthy states, which indicates the complex structure of the current global economic system. According to Heede (2014, p. 231), 'substantial emissions have come from fossil fuels sourced from non-Annex-I countries, such as China, India, Saudi Arabia, South Africa, Iran, Brazil, and Mexico'. Recognizing carbon majors as important players in global climate change and holding them responsible for their fossil fuel related activity would therefore, among other things, help bridge a simplistic divide between 'the rich' and 'the poor' worlds. This could lead to a fairer distribution of the burden of fighting climate change among state and non-state agents around the world.

Despite a widespread portrayal of – especially – the large international oil and gas corporations as the 'villains' by many civil society actors, there has so far been no comprehensive normative analysis of carbon majors' role and responsibility in the context of climate change. Normative analyses are very important for addressing the climate crisis, and there are already many fundamental works in this field (e.g., Gardiner *et al.* 2010, Gardiner 2011, Jamieson 2014). Introducing carbon majors as moral agents in the context of climate change opens up a new avenue for normative inquiry in climate ethics, which may have major implications for global climate governance. For example, an alternative mode of assigning responsibilities to the different agents of the global system could alter the approaches to rectification of the harm done and the related distribution of burdens and benefits, influence the patterns of well-being among agents, and change the flows of significant resources – financial and otherwise – across peoples and generations.

Such an analysis could also increase the effectiveness of international climate policy. For instance, traditional instruments targeting the consumption-side of climate policy – e.g., emissions taxes, regulations, and measures for supporting the demand of less carbon-intensive products, like renewables – have so far not been as effective in combating climate change as expected (Lazarus and van Asselt 2018, Green and Dennis 2018). Supply-side instruments targeting the production of fossil fuels are required to complement measures targeting emissions deriving from the consumption of fossil fuels. Such instruments aim at constraining and/or influencing the production of fossil fuels whose downstream consumption causes carbon emissions. They are believed to have distinctive political and economic advantages over demand-side instruments (Sinn 2008, Green 2018, Green and Dennis 2018, Lazarus and van Asselt 2018).

Given their centrality in the production of fossil fuels, carbon majors should indeed play a major part in supply-side climate policy. The phasing out of fossil fuels should be enabled by anti-fossil fuel norms based on the widespread acknowledgment that the use of such harmful products is no longer admissible (Green 2018). This social condemnation of fossil fuels is, in turn, greatly favoured if carbon majors are acknowledged as primary moral agents in climate change with specific responsibilities and duties.

At the same time recognition of the prominent role of carbon majors in causing and perpetuating climate change does not mean that they 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 resolving climate change. Crucially, states are the primary agents responsible for providing appropriate legislative and political frameworks for ensuring that carbon majors act based on their responsibilities and duties. Thus, it is not the intent of this article to obscure the role or importance of these agents. Rather, the goal is to draw attention to a significant and utterly neglected group of agents, whose unique and distinctive responsibilities and duties in relation to climate change should be translated into

much needed policies to support current climate efforts. Carbon majors should play their part in global climate governance, which is adequate and appropriate to their role in climate change, along with states, individuals, and other agents.

THE MORALLY-RELEVANT FACTS AND MORAL RESPONSIBILITY

One of the clearest and strongest imperatives of all forms of morality is the 'no harm' principle (Shue 2015). It states that agents have a negative responsibility: this requires *not* acting in certain ways in order to prevent and/or avoid harm to others. The moral imperative to do no harm is central to the notions of justice, and it has shaped and guided societies for generations. Considering empirical evidence of the harm that comes from carbon majors' activity (Heede 2014, Frumhoff *et al.* 2015, Heede and Oreskes 2016, CIEL 2017, Ekwurzel *et al.* 2017), these entities are clearly in violation of the no-harm negative responsibility. In this light, it is a societal judgement to individuate the most appropriate forms of positive responsibility as shaped by morally relevant facts associated with the violation of the no-harm principle.[5] Responsibility is 'one of the most slippery and confusing terms in the lexicon of moral and political philosophy' (Miller 2007, p. 82). It raises a number of serious concerns in relation to climate change that should be addressed pluralistically (Caney 2010, Jamieson, 2010, 2015). The concept of responsibility requires a meticulous contextual investigation in order to ground and develop duties applicable and appropriate to carbon majors. It is also worth noting that most authors use 'responsibility' and 'duty' interchangeably (e.g. Shue 2017). This article, however, distinguishes between the two concepts and adopts a view of responsibility as the *condition* of being responsible according to some principles of justice. A duty, on the other

[5] As Shue (2017, p. 593) puts it, '[i]f one does contribute to harm, in violation of the negative responsibility, it becomes one's positive responsibility to correct it – and perhaps compensate for it as well.'.

hand, is a standard of behaviour inspired by principle/s of justice and involves a *moral commitment* to do something or, indeed, to refrain from doing something.

A few conceptual distinctions related to the scope and objectives of the notions of responsibility (Miller 2008, Jamieson 2010, 2015, Shue 2015) are in order; they should not, however, be overstated since they are often blurred when applied to specific issues. Responsibility can be 'negative' and require agents to refrain from action (as in the responsibility that requires no harm to be done); or 'positive', requesting agents to act in specific ways (such as actions of decarbonisation and reparation). Another significant distinction employed in the article is the one between 'causal' and 'moral' responsibility. Causal responsibility can be understood as 'causal contribution', while a more stringent notion of moral responsibility is based on the appraisal of agents' intentions and assesses their voluntariness, control, and knowledge.

Carbon majors' positive responsibilities – originating from their negative responsibility – ought to be established in a non-arbitrary way to justify and outline their consequent duties. To this end, it is necessary to point out the morally relevant facts related to carbon majors' activity. Presenting such facts helps clarify the conduct of carbon majors and understand the moral context they operate in. The morally relevant facts also evince the intentions of carbon majors, therefore providing a normative foundation for considering carbon majors' positive responsibility as a *moral* one. It is worth reiterating that carbon majors' direct contribution in terms of emissions emphasised in the Introduction already establishes their causal responsibility. The morally relevant facts reported below instead assign carbon majors with the more stringent notion of moral responsibility, which provides the basis for developing their consequent duties.

F1-Knowledge: Some carbon majors had a high level of internal scientific and technical expertise and were aware of the scientific knowledge about potential harmful effects for the

global climate of burning fossil fuels (Frumhoff *et al.* 2015); they, however, decided not to disclose this knowledge to shareholders, stakeholders, or the general public (CIEL 2017).

F2-Timing: Over half of the current CO_2 emissions in the atmosphere (50.4 per cent) were released between 1988 and 2017 (CDP 2017): by the early 1990s almost all carbon majors were fully aware of the dangerousness of GHG generated by the combustion of fossil fuels (CIEL 2017, Grasso 2019);

F3-Capacity: Carbon majors had the capacity to reduce the harmful effects of their activities and to adjust their business models to become less carbon-intensive; some private investor-owned oil and gas corporations have had this opportunity for more than forty years (Frumhoff *et al.* 2015, CIEL 2017);

F4-Denial: In some countries, leading investor-owned oil corporations shaped and funded climate denial with the objective of slowing, opposing, and/or preventing actions towards GHG emissions reduction (Frumhoff, *et el.* 2015, Heede and Oreskes 2016);

F5-Enrichment: Carbon majors through their activities related to fossil fuels have made substantial profits that have greatly increased the wealth of their shareholders (Frumhoff *et al.* 2015).

According to Miller (2004, p. 46), moral responsibility means that 'the agent intended the consequences that flowed from his action, whether he acted negligently, whether he acted in breach of obligations that he should have met, and so forth'. Carbon majors have known about the harmful consequences of their business model (*F1-Knowledge*) at least since the first IPCC report (IPCC 1990) was presented to world leaders at the Rio Conference in 1992 (and some knew two decades before that (CIEL 2017, Grasso 2019)).[6] Despite this knowledge, the

[6] Heede (2014) also stresses this when he claims that a principle of 'objective responsibility' demands that a polluter cannot escape responsibility by claiming ignorance of environmental damages.

majority of their emissions have been released since 1988 (*F2-Timing*), while they were able to limit (at least to some extent) those harmful actions (*F3-Capacity*). At the same time, some carbon majors funded and orchestrated denial and opposition campaigns to intentionally block initiatives against climate change (*F4-Denial*). Moreover, all carbon majors have become rich through their fossil fuel related activities (*F5-Enrichment*). The last fact is not related to harm per se, but it is morally relevant as it strengthens the notion of the moral responsibility of carbon majors. It provides a complementary moral basis, an alternative to harm-doing – the benefit that carbon majors have gained through fossil fuels – that strengthens and more effectively shapes carbon majors' positive moral responsibility and, especially, the consequent duty of reparation, as shown below.

In sum, these facts justify assigning carbon majors with positive moral responsibility for climate change.

CORRECTIVE JUSTICE AND DUTIES

Moral responsibility of carbon majors is a normative construct focused, as said, on their conduct and intentions in the context of the violation of the no harm principle. Moral responsibility provides the moral basis for duties compelling carbon majors to act in certain ways. These duties should be understood as informal 'sanctions' imposed by the nature of carbon majors' moral responsibility (Jamieson 2015).

To justify and outline the duties generated by moral responsibility it is useful to refer to corrective justice. Aristotle referred to it as 'rectificatory justice', in the fifth book of his *Nicomachean Ethics.*[7] In his view, corrective justice concerns the preservation of an impartial social order through the rectification of the injustice inflicted by one party on another. In the same book, Aristotle also specifies the notion of 'distributive justice', which deals with the distribution of what is divisible (e.g. wealth, rights, honours, benefits, burdens). This latter

[7] Available from: http://classics.mit.edu/Aristotle/nicomachaen.5.v.html.

notion of justice would not offer a helpful perspective in the case of carbon majors' responsibility, since distributive justice is grounded in forward-looking responsibility, disregards past injustice, and, therefore, fails to acknowledge carbon majors' wrongful activity (Vanderheiden 2011, Steininger *et al.* 2016). On the contrary, corrective justice, originating from wrongful harm doing, helps focus on the past and present harm produced by carbon majors and elaborate on the resulting actions required to rectify the injustice produced by such harm (Meyer and Roser 2010).

To articulate the corrective justice perspective in relation to carbon majors' duties of decarbonisation and reparation, it is necessary to identify:

i) The duty bearer (i.e. the agent who should bear the financial and other burdens of rectificatory actions);
ii) The moral basis of the injustice (i.e. the moral principles that justify and define rectificatory actions);
iii) The structure of the duties imposed on carbon majors and the forms that rectificatory actions should take (i.e. the concrete means through which rectification of harm done should be attained); and
iv) The duty-recipients (i.e. the subjects entitled to rectification and the modality of the allocation of the rectificatory actions among them envisaged by the duties individuated).

These four points are similar to those put forward by Caney (2006, p. 465) for justifying 'reparations' in climate change. The rest of this section addresses points (i) and (ii), since these are common to both duties of decarbonisation and reparation. The following section addresses points (iii) and (iv) in relation to each of the two duties indicated.

Duty bearer

A thorough answer to point (i) is pleonastic, since this analysis obviously considers carbon majors as duty bearers and, more broadly, as moral agents. Postulating the moral agency of carbon majors implies, however, acknowledging their collective responsibility, a highly controversial notion. For instance, liberal scholars, especially those working on individual responsibility, tend to resist the idea that non-individual agents can be responsible for their actions (Smiley 2017).

There are different theoretical perspectives that justify the collective responsibility of groups (French 1984, pp. 13-15, Pettit 2007). One assumes that only groups with well-ordered decision-making structures can be held collectively responsible, because this allows for the identification of a moral agent (for example, the governing board) that can give rise to group action, and because this kind of group can take rational and self-conscious decisions. Another perspective focuses on the sharing of interests and needs among the group's members, as happens in the case of clubs and political and social movements. A third perspective requires that group members have deep-rooted shared attitudes on potentially harming issues like racism or sexism.

All these seemingly competing approaches to collective responsibility have one feature in common: in French's terms, they all characterize conglomerate collectivities, organizations of individuals whose 'identity is not exhausted by the conjunction of the identities of the persons in the organization' (French 1984, p. 13). Unlike aggregate collectives, conglomerate collectivities have the following features: a) an identity larger than the sum of the identities of their members; b) decision-making structures that enable the inputs of members' judgements to be translated into collective judgements as outputs; c) consistency over time; and d) self-conception as a unit. According to this definition, carbon majors are indeed conglomerate collectivities, which can qualify as moral agents and, therefore, have responsibilities and duties.

In a different vein, this article, by endorsing collective responsibility, implicitly accepts the view that climate change is a matter of aggregative harm. On the one hand, carbon majors' impressive aggregate contribution to climate change in terms of emissions (Heede 2014) highlighted in the Introduction implies, per se, that harm from their fossil fuel-related activities is significant. On the other hand, the empirical facts that (at least some) carbon majors on their own have clearly brought about enough emission (Heede 2014, Grasso 2019) to be harmful in a non-negligible way suggest that (at least some of) these entities have significantly concurred to harming humanity and the planet.

The moral basis of the injustice

Point (ii) concerns the moral principles that justify the rectificatory actions included in the duties imposed on carbon majors by their moral responsibility. Climate ethics literature (e.g. Caney 2005, Shue 2015) 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 emissions. The BPP holds instead that proportionality in such distribution should be calculated based on the benefits that agents have derived from activities generating emissions. Finally, the APP posits that the quota of burdens should be proportional to the agents' relative capacity to bear such burdens.

All of the abovementioned principles aim to establish and justify positive responsibilities for sharing the burden of rectifying the unjust situation created by the actions that produced climate change. Instead of relying on any one principle, this moral analysis endorses the hybrid version developed by Shue (2015). Shue argues that 'those who contributed heavily to creating the problem of excessive emissions thereby both benefitted more than others and became better able to pay than most others' (Shue 2015, p. 16). This triple-hybrid approach appears to be perfectly suitable to carbon majors, and provides a moral justification for their duties of

decarbonisation and rectification, indeed with a different moral relevance of the principles included for the two duties.

THE DUTIES OF CARBON MAJORS

To prevent harming humanity and the planet, moral responsibility requires carbon majors to undertake certain actions to stop causing climate change through reduction and eventual termination of their harmful activities. Moreover, it calls for actions to better cope with the effects of climate change through the rectification of harm already caused and the prevention of future harm. These actions can be articulated respectively in the form of the duties of mitigation and adaption, as usually discussed in the relevant literature (e.g. Caney 2010, Vanderheiden 2011). The duty of mitigation requires agents to curb anthropogenic GHG emissions and/or enhance carbon sinks in order to avert dangerous interference with the climate system. The duty of adaptation requires agents to support efforts aimed at preventing climate change impacts, adapting to them, and compensating the non-adapted ones.

A distinction between duties of mitigation and adaptation is undoubtedly a helpful one in the general context of climate ethics. However, in the specific case of carbon majors, these duties require a more contextualized and nuanced interpretation. The current analysis articulates the duties of decarbonisation and reparation as specific manifestations of the duties of mitigation and adaptation, respectively. These names – decarbonisation and reparation – reflect and emphasize the kind of actions required from carbon majors in climate governance in light of their unique agency and moral responsibility.

Indeed, carbon majors are not at all a homogeneous group. For instance, the most significant carbon majors – fossil fuel companies – can be generally divided into privately-owned International Oil Companies (IOCs) and state-owned National Oil Companies (NOCs), characterized by remarkably different strategies and objectives (Grasso 2019), that necessarily entail different accounts/levels of responsibilities. Accordingly, the scope and depth of their duties of decarbonisation and reparation vary from one carbon major to another. Given the

eminently theoretical focus of the analysis and the usual space constraints, it is impossible to analyse this issue in detail. It is worth, however, clarifying the difference through a couple of significant examples: one distinction can, for instance, be ascribed to carbon majors' diverse historical responsibility that generates different degrees of emissions abatement depending on the specific cumulative emissions, as explained below. Or, with regards to *F4-Denial*, it was only a handful of IOCs – admittedly with the not impartial acquiescence of the rest of the oil and gas companies (including NOCs) – that conceived and deployed the denial and opposition campaigns. This would imply that the IOCs most responsible for denial should bear heavier burdens; the same logic also applies to those IOCs with greater awareness of the perils of fossil fuels (*F1-Knowledge*).

I. The duty of decarbonisation

Structure of the duty and the form of rectificatory actions

To address the harm produced by their fossil-fuel related activities, the duty of decarbonisation requires carbon majors to engage in a process of eliminating carbon emissions from their business (Shue 2017). In line with the general logic of the duty of mitigation, a broad interpretation of decarbonisation implies a commitment by carbon majors to phase out fossil fuels from their business. Decarbonising the business means adopting non-carbon intensive business models to eliminate carbon emissions from the company's operations and products. To truly decarbonise, a carbon major would have to either cease its operations completely or to transition to distributing low/zero carbon intensive products, such as renewable energy for example. Such efforts would be consistent with the mounting pressure for phasing out fossil fuels (Green 2018).

A broad understanding of decarbonisation should not be confused with two narrower interpretations. One would only compel carbon majors to comply with binding emissions limits set by some legitimate political and regulatory bodies (e.g., states, environmental agencies,

local, national, regional, international authorities with enforcement power, etc.). This narrow commitment to decarbonisation depends on the willingness of legitimate authorities to set and enforce binding emissions limits, while a broader notion of decarbonisation entails much thornier governance-related behavioural and institutional issues. Another narrow interpretation solely implies the decarbonisation of carbon majors' operations, like reducing the carbon footprint of their offices around the world. Some companies have already engaged in such actions, which, in essence, have served the purpose of 'greenwashing' their image. Decarbonising operations (and not products) of carbon majors is clearly insufficient, considering that these companies distribute fossil fuels to the global economy.

As carbon emissions are the commonly accepted 'currency' of climate ethics, framing and accounting for the burden of decarbonisation imposed on carbon majors in terms of emissions is the logical course of action. In this light, decarbonisation entails an extensive and systematic reduction in the carbon emissions generated by the products and the overall activity of carbon majors.

Such a burden should be distributed among carbon majors based on the prioritarian principle of historical responsibility for their cumulative emissions, which represent a sound measurement of their harm-generating activity over time (Grasso 2012). The carbon majors which contributed the most to cumulative global emissions should curb their fossil-fuel related activities at a higher rate than the less implicated carbon majors. Any 'carbon allowances' that may be assigned to carbon majors according to this logic should be gradually reduced over time to zero. It is, as said, beyond the scope of this article to elaborate on ways to justly distribute the burden of decarbonisation among carbon majors. However, the gradual and progressive restriction of allowances ought to make it possible to proportionally ramp up the supply of cleaner energy in order to avoid disrupting the global energy demand.

Duty recipients

Given the global nature and spatial unpredictability of harm reduction generated by carbon majors' decarbonisation, humanity in its entirety is the duty recipient.

II. The duty of reparation

Structure of the duty and forms of rectificatory actions

The duty of reparation captures the need to ensure that carbon majors rectify the injustice caused to those who undeservedly suffered the harm they generated (Vanderheiden 2011, Shue 2015). This duty posits that carbon majors should relinquish part of the funds they have accumulated from their harmful activities to help those affected by climate impacts to prevent and/or adapt to them, and to compensate the non-adapted ones.

To frame and better understand the structure of the duty of reparation, as well as the form that it should take (point (iii) of the corrective justice specifications), it is useful to consider carbon majors as moral agents that, through their harmful fossil fuel related activities, have benefitted from the suffering of others. According to Pasternak's (2014) categorization of wrongful beneficiaries, carbon majors would be 'voluntary beneficiaries', as they know of the wrongdoing, could have avoided it without incurring unreasonable costs, but instead have sought and welcome it (Facts *F1-Knolwedge*, *F3-Capacity*, and *F5-Enrichment*). As 'voluntary beneficiaries', carbon majors must rectify the harm done by supporting those affected by the harm they caused. There are different ways to support them: from immaterial approaches, like public acknowledgment and apologies or establishment of the truth, to material rectification of historical wrongdoing. In the context of climate change, much remains to be done in practical terms to reduce its harmful impacts. Rectification, therefore, must be primarily material and ought to aim at minimizing climate change impacts through practical actions.

There are different forms of material rectification, too. For example, restitution implies returning misappropriated things to the rightful owners or their successors, while compensation

means compensating the rightful owners or their successors for the harm done. Unfortunately, since they both require identification of the recipient of such duty, applying restitution and compensation forms of rectification is highly problematic (Goodin 2013) considering the complex nature of climate change. Given substantial temporal and spatial lags between carbon emissions and their impacts, it is virtually impossible to identify the rightful duty-recipient or a legitimate successor with certainty. Moreover, in case of restitution, the context of climate change makes it close to impossible to identify the 'misappropriated thing' (apart from a rather abstract notion of atmospheric absorptive capacity, which was wrongfully overconsumed by carbon majors' emissions).

Where restitution and compensation fail, disgorgement appears to be more appropriate. Disgorgement requires only the relinquishment of the fruits of historical wrongdoing: in the case of carbon majors, their tainted assets and benefits. Unlike the restitution and the even more demanding compensation forms of rectification, the disgorgement form focuses on the duty-bearer and not on the duty-recipients and their welfare (Goodin 2013). A remarkable example of implementing the moral provisions of disgorgement has already occurred in the case of disgorged art stolen by the Nazis from Jews. After the war, in instances where the victims of the theft were heirless, the art was sold and the proceedings were put into a fund providing support to Holocaust survivors. Disgorgement does not require the identification of a particular duty-recipient, or speculation over how they would have been today had the past wrong not occurred. The potential and the advantage of the disgorgement form of rectification lies in its informational parsimony that makes it much more feasible, especially in the complex context of climate change.

As underlined, not all benefits that are attributable to carbon majors' historical wrongdoing should be viewed as 'tainted'. For example, tainted benefits would not include charity donations or benefits to communities that emerged as a result of oil-related operations. On the other hand, they should include all those benefits not employed in climate-productive ways,

such as speculative financial investments. A satisfactory theoretical proxy and a sound pragmatic measure for carbon majors' tainted benefits could be their profits, although not all of them would count as such. In the case of carbon majors, the notion of wrongdoing reasonably applies to their emissions since 1992 (presentation of the first IPCC Assessment Report at the Rio Conference). After this point in time, ignorance about the consequences of carbon emissions and alleged impotence of carbon majors to reduce them became inexcusable.

Most of the past profits are no longer available, as they have been distributed to shareholders and employees and invested. Yet, given that some shareholders became extraordinarily rich through the dividends paid by carbon majors (Frumhoff *et al.* 2015, Wenar 2016), it would make sense to include part of these disbursed profits in the category of tainted benefits. In particular, the richest individual shareholders should disgorge a part of the dividends received: as such a share would not, in principle, endanger their wealth, it should not be a negligible amount of the original dividends earned. The question of corporate shareholders might be more sensitive. The most vulnerable – such as pension funds, on account of their individual investors – should not disgorge the dividends received by carbon majors. Those corporate shareholders which by and large serve the interest of wealthier constituencies – e.g. investments banks – should instead, similarly to richer individual shareholders, disgorge non-negligible parts of the dividends received. These brief considerations need to be developed further, taking into account more specific cases.

Leaving aside more profound issues related to disgorging past profits, as a general rule, the duty of reparation would require carbon majors to disgorge future profits associated with the tainted benefits. Reaping these profits in a business-as-usual fashion is morally unacceptable for carbon majors and their shareholders, considering the harmful effects of the activities that produce these profits. Obviously, there exists a trade-off between duties, as emphasized in the ensuing section. Decarbonisation is expensive, and it can indeed leave little room for reparation. Ideally, therefore, the disgorgement of future profits would start from a level which

would not financially prevent carbon majors from engaging in the just transition required by the duty of decarbonisation. The quota of disgorged profits would then increase over time, compatibly with the funds required for decarbonising; at any rate, all future profits associated with tainted benefits should eventually be disgorged.

Duty recipients

Finally, to articulate the duty of reparation, it is also necessary to identify who should be entitled to the disgorged funds. In relation to climate change, agents most vulnerable to its harmful impacts should be the rightful duty-recipients. Vulnerability to climate change impacts is not simply about the risks of certain harmful events occurring; it is about the preparedness and capacity of different groups to cope with these effects. In this light, it is useful to clarify the notion of vulnerability, which, applied to social systems, is also termed social vulnerability (Brooks *et al.*, 2005). Social vulnerability could be broadly understood as a state of well-being pertaining directly to individuals and social groups. Its causes are related not only to climate impacts but also to social, institutional, and economic factors, such as poverty, class, race, ethnicity, gender, etc. (Paavola and Adger 2006). Social vulnerability produced by climate impacts endangers a number of critical aspects of well-being, such as life, health, livelihood, etc.

The degree of social vulnerability can be used for defining duty recipients' level of entitlement to the disgorged funds: the greater their social vulnerability, the larger the rectification through disgorged funds. Shue's third general principle of equity clearly endorses a stringent normative imperative of putting the most socially vulnerable first (Shue 1999). This principle of guaranteed minimum states that those who have less than enough for a decent human life should be given enough. To this end, being socially vulnerable means being deprived and having far less than enough. More socially vulnerable agents, therefore, should be given the rectification means (the funds, in this case) necessary to attain a level sufficient for them to cope with, and to recover from, climate impacts.

In practical terms, disgorgement envisaged by the duty of reparation could be implemented through fund similar in its objectives to the Earth Atmospheric Trust envisaged by Barnes *et al.* (2008), aimed at the most socially vulnerable people to cope with climate change impacts.

POSSIBLE DEVELOPMENTS

If carbon majors act on their responsibilities and duties, there may be different possibilities for their actions to unfold. The harshest (and least likely) possibility would involve abrupt dissolution of carbon majors as a result of the immediate termination of their fossil fuel related activities. Let us call this option 'Sudden End'. From a moral perspective, this abrupt termination would help prevent harm from any future fossil fuel related activities. However, given the trade-off between the duties of decarbonisation and reparation remarked above, it would at the same time rob victims of climate change from fair rectification for their suffering and for adapting to climate impacts. The 'Sudden End' scenario would also put in jeopardy some of the more vulnerable shareholders of carbon majors, such as pension funds and their individual account holders, mentioned above. Thus, though attractive from the perspective of preventing future harm, this scenario is not functional from the point of view of the duty of reparation. In fact, there appears to be no ideal scenario from a moral perspective – all possible courses of action imply some degree of compromise among different moral concerns.

Another possibility would imply phasing out fossil fuels from carbon majors' operations and products more gradually. Let us call this scenario a 'Just Transition'. Rectifications towards more vulnerable stakeholders make a strong case for 'keeping carbon majors alive' to enable them to do whatever justice requires of them. This scenario would certainly be less disruptive than the 'Sudden End' to the fossil-fuel dependent global socio-economic system, including the interests of some states (especially in the case of state-owned carbon majors) and other businesses which rely on fossil fuels (such as chemical or automotive industries, etc.). This does not change, though, the ultimate goal of the 'Just Transition', which is complete phasing

out of fossil fuels from carbon majors' operations and products, over a period of several decades.

The 'Just Transition' can take various shapes in terms of length and a combination (in different proportions) of decarbonisation, reparation, business-as-usual (BAU), offsetting emissions, etc. The range of possible transition scenarios could vary from slow and ineffective BAU coupled with greenwashing efforts, to BAU coupled with enhanced rectification through disgorgement efforts, or a more rapid phasing out of fossil fuels combined with a switch to other, non-carbon intensive business models. In the end, trade-offs between the duties of decarbonisation and reparation are inevitable. Carbon majors have finite budgets to allocate to the two duties, and will need to prioritize the more appropriate courses of action. Yet, it is difficult to argue in favour of one duty over the other in abstract terms: both decarbonisation and reparation are critical from the justice perspective. Future research could address this conundrum in a contextualized way and offer a more nuanced exploration of the relative weight of each duty.

CONCLUSION

Carbon majors' activities of exploration, extraction, refining, use, and distribution of fossil fuels generate emissions which are harmful to the planet and to humanity. In this light, the article maintains that carbon majors have the moral responsibility to reduce and eventually cease their harmful activities and to rectify the harm done. This moral responsibility originates from carbon majors' no harm negative responsibility: it compels them to *not* act in certain ways in order to prevent and/or avoid harm to others. This analysis articulates carbon majors' moral responsibility in the form of two duties: a duty of decarbonisation and a duty of reparation.

The duty of decarbonisation requires carbon majors to engage in a large-scale transformation to radically alter their business model and to progressively eliminate all the carbon emissions from their operations and products. The duty of reparation requires that carbon majors disgorge their tainted benefits as an appropriate form of rectification for their historical wrongdoings.

By specifying and vindicating the duties of decarbonisation and reparation, this analysis aims to contribute to the creation of the necessary normative basis for justifying the moral inadequacy of the prevalent socio-economic practices of carbon majors in the broader context of moral progress of humanity (Jamieson 2017). Condemning these practices as morally unacceptable could lead to the emergence of a social norm (Finnemore and Sikkink 1998), which would delegitimize the current fossil fuel-centred behaviour of carbon majors (Green 2018), as happened for other once deeply entrenched and influential socio-economic practices, such as slavery (Jamieson 2017).

A normative perspective that justifies and outlines carbon majors' responsibilities and consequent duties could provide a helpful normative framework for a reasoned dialogue with civil society, as well as between political representatives belonging to different political traditions and subject to different political constraints. Despite their alleged abstractedness, the duties of decarbonisation and reparation are moral provisions with immediate and major relevance to current international climate governance. Future work on the role of carbon majors' in climate change governance should explore the practical implications of these duties, with particular attention paid to the cultural, political, and institutional strategies required to address the harsh resistance that their introduction would inevitably face.

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