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Fairness in Emissions Accounting: a Moral Responsibility Approach

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Abstract
Mitigating climate change requires staying within safe greenhouse gases (GHG) emissions levels. International climate treaties, such as the 1997 Kyoto Protocol and the 2014 Paris Agreement, are intended to distribute emissions entitlements and mitigation burdens among different countries. But before we can decide how much countries are left to emit or which countries should reduce GHG emissions and by how much, we need to know who emitted how much. The most prominent carbon emissions accounting mechanisms are production-based (PBEA), and consumption-based emissions accounting (CBEA). PBEA assigns emissions based on the *production* of goods and services while CBEA assigns emissions based on the *consumption* of those goods and services. One way of deciding between emissions accounting mechanisms is based on fairness considerations. We call this 'fair emissions accounting'. In this paper we present a common approach to fair emissions accounting (Common Approach) and argue that it is misguided. Instead, we offer our Moral Responsibility Approach as an alternative. We argue that the primary consideration for choosing an emissions accounting mechanism from a fairness perspective ought to be who ought to take moral responsibility for emissions. We provide some criteria for moral responsibility in the context of climate change and present a moderate defense of CBEA as the mechanism that, on balance, best meets these criteria.

Keywords Emissions accounting · Consumption-based accounting · Production-based accounting · Climate ethics · Moral responsibility

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1 Introduction

Mitigating climate change requires staying within safe greenhouse gases (GHG) emissions levels. International climate treaties, such as the 1997 Kyoto Protocol and the 2014 Paris Agreement, are intended to distribute emissions entitlements and mitigation burdens among different countries. A central starting point for such efforts is the recognition of a finite global carbon budget—the maximum amount of CO_2 humanity can still emit while keeping global warming below critical thresholds, such as 1.5–2 °C (Moss and Kath 2018; IPCC 2022). Once this remaining budget is determined, the question becomes how to divide it among countries. How much each country needs to do about its levels of emissions depends on two independent elements: the chosen distribution principle and the emissions accounting mechanism. The distribution principle tells us on what basis emissions-reduction duties are assigned to countries. The United Nations Framework Convention on Climate Change (UNFCCC) uses "common but differentiated responsibilities" as a distribution principle (UNFCCC 1992). Before we can decide how much countries are left to emit or which countries should reduce GHG emissions and by how much, we need to know who emitted how much. In other words, we need to decide which emissions accounting mechanism to use.

Various considerations can guide the choice of an emissions accounting mechanism, such as environmental effectiveness, avoidance of carbon leakage, cost-effectiveness and feasibility (Steininger et al. 2014, pp. 79–80). Here, we focus on considerations related to fairness. What we shall call 'fair emissions accounting' concerns to whom emissions should be allocated from a justice perspective. Such questions have gained currency recently in the climate justice literature (Ferng 2003; Roser and Tomlinson 2014; Steininger et al. 2014; 2016; Mittiga 2019; Duus-Otterström and Hjorthen 2019; Garcia-Portela 2022; Torpman 2022). In this paper, we focus on this fairness rationale and ask which emissions accounting mechanism we should prefer if we are concerned about *fairness in the allocation of such emissions.* We defend that fairness in this context demands moral responsibility.

The most prominent emissions accounting mechanisms are production-based (PBEA), and consumption-based emissions accounting (CBEA). PBEA assigns emissions based on the *production* of goods and services. CBEA assigns emissions based on the *consumption* of those goods and services. The distribution principle and the emissions accounting mechanism are independent. If we hold the distribution principle as fixed, we will get different distributions if we change the accounting mechanism. And vice versa: if we hold the accounting mechanism fixed, we will get different distributions when we change the distribution principle. This paper is about the emissions accounting mechanisms.

The choice between these emissions accounting mechanisms can make a big difference in a globalized world, where GHG-intensive production processes often do not take place in the countries where consumers live. In the case of China, which produces and exports many carbon-intensive products for consumption in the Global North, the choice of emissions accounting mechanism makes the biggest difference to the distribution results. Using PBEA, China's per capita emissions amount to 8t CO_2eq, whereas they amount to 7.2t CO_2eq using CBEA (Friedlingstein et al. 2023).

Among philosophers, the most common approach to fair emissions accounting has been to look for a fit between emissions accounting mechanisms and the so-called climate burden-sharing principles (we call this the Common Approach). According to this approach, the question of 'on whose books GHG emissions should go' should be answered by looking

into what the different principles of climate burden-sharing would recommend. We would then have reasons to favor the emissions accounting mechanism recommended by our preferred or most justified climate burden-sharing principle. In this paper, we argue that this approach is misguided. We argue that the point of a fair emissions accounting mechanism is to track who the *morally responsible* polluters are (Moral Responsibility Approach). Based on this approach, we provide some criteria to decide on that question and present a moderate case in favor of CBEA.

The paper is structured as follows. In section one, we present and critically discuss the Common Approach to fairness in GHG emissions accounting and show why this is misguided. In section two, we introduce our alternative approach to emissions accounting based on moral responsibility considerations (Moral Responsibility Approach). In section three, we analyze which emissions accounting mechanism aligns best to this alternative approach. We conclude with a moderate defense of CBEA over PBEA given that, on balance, it is more likely to track moral responsibility for GHG emissions. Finally, we address two possible objections to our approach and advance some responses.

In order to proceed we need to clarify three issues. First, the emissions of a country might come from different sources, such as nationally controlled activities, emissions of individual people, or emissions of companies operating in the country's territory. However, the allocation of emissions at the country level enables the distribution of mitigation duties in the international arena. For these reasons, the allocation of emissions to individuals and companies will become relevant for our discussion. Second, we limit our discussion to the two main emissions accounting mechanisms discussed in the literature, that is, PBEA and CBEA.[1] Thus, we leave open how our analysis and conclusions would apply to other emissions accounting mechanisms. Therefore, arguments in favor of one or the other approach should be understood comparatively. Third, for simplicity's sake, we assume a unitary climate policy base. That is, we assume that there would be no differences between the emissions accounting mechanism applied in each country and thus the same emissions accounting mechanism would be applied globally. This assumption allows us to bracket complications from potential carbon-leakage effects.[2]

2 The Common Approach: Mapping Burden-Sharing Principles

The Common Approach for choosing among emissions accounting mechanisms based on fairness considerations has been to look for the fit between those mechanisms and the climate burden-sharing principles (Steininger et al. 2016; Mittiga 2019; Duus-Otterström and

[1] For instance, the IPCC reports mostly use PBEA and more recently also CBEA (IPCC 2022, Chap. 2.1-2.2). In Section 1.3, we discuss the pragmatic reasons that speak in favor of considering these approaches in particular. The literature on emissions accounting also discusses income-based accounting (Liang et al. 2017), extraction-based accounting (Davis et al. 2011), value-added-based accounting (Liu and Fan 2017) and various mixed approaches (e.g., Dietzenbacher et al. 2020; Tukker et al. 2020, Ortiz et al. 2020).

[2] Carbon leakage occurs when different countries use different accounting mechanisms, i.e. if there is no unitary policy base. For instance, imagine country A uses PBEA and country B and uses CBEA. Country A now wants to reduce emissions and introduces a carbon tax. This makes production in country A more expensive because producers need to pay the tax. The production of goods might then move to country B, because producers in country B pay no tax there and consumers in country A pay no tax, because only production is taxed in country A. In the end, the carbon tax of country A does not achieve its intended goal of reducing emissions, it just leads to emissions "leaking" to another country. (cf. Weber and Peters 2009)

Hjorthen 2019). The most common burden-sharing principles are the Polluter Pays Principle (PPP), the Beneficiary Pays Principle (BPP) and the Ability to Pay Principle (APP). The question of 'on whose books emissions should go' should be answered by looking into what the different principles of climate burden-sharing would recommend. We would then have reasons to favor the emissions accounting mechanism that is recommended by our preferred or most justified climate burden-sharing principle.

Importantly, this Common Approach does not require that those to whose books emissions are to be allocated contributed to climate change. Consider the APP, which holds that climate change-related burdens should be distributed based on the ability of the parties to bear those burdens (Miller 2009; Moellendorf 2014). Who caused the GHG emissions that lead to climate change and how we interpret causal responsibility for these emissions is not relevant when applying this principle. Rather, we need to figure out what the ability to pay consists in, for example by looking at countries' GDP, and then distribute climate change-related burdens proportionally among different parties (Page 2008, pp. 561–62).

If one favored the APP among the climate burden-sharing principles, one would recommend the emissions accounting mechanism that assigns relatively more climate policy-related duties to countries with a higher ability to pay and relatively fewer duties to countries with a lower ability to pay (Shue 1999, p. 537; Caney 2010, p. 213; Mittiga 2019, p. 187). Following this rationale, in the world as it is, the APP would recommend CBEA, since many goods are produced in poorer countries and then consumed in richer countries. By adopting CBEA, rich countries get more emissions on their books and thus need to pay more. Even though this is a contingent matter, it seems to be a relatively stable feature of the global economy that, as countries get richer, they move away from GHG emissions-intensive production and manufacturing industries and closer to less emissions-intensive service-heavy economies. Hence, their consumption-based emissions rise and their production-based emissions fall (Davis and Caldeira 2010; Ritchie 2019).

According to the BPP, climate change-related burdens should be assigned to those who benefit from emissions-generating activities (Gosseries 2004; Page 2012; Heyward 2021). Benefitting can take many forms. Much of the infrastructure that is used today was produced and purchased by past generations. Similarly, wealth inherited from past generations is a way in which countries can benefit from polluting activities. Furthermore, countries benefit from non-physical capital, such as intellectual property and institutions that were created by past generations and produced GHG emissions (Gosseries 2004, p. 3 ff.). Since the current generation neither produced nor demanded the creation of the benefits they now enjoy, they are not causally responsible for the connected emissions (Gosseries 2004, p. 3). However, like the APP, the BPP does not require causal responsibility to assign climate policy-related duties. Instead, the BPP directs us to assign GHG emissions to those who benefit from emissions-generating activities.

Generally speaking, many of the benefits of GHG emissions-generating activities go to developed countries that consume products that were made in developed countries in the past but nowadays are often made in developing countries.[3] Additionally, people in developing countries have a much smaller capital stock to benefit from. The BPP thus holds that

[3] We are aware that the distinction between developed and developing countries is problematic. We mean to distinguish here between those countries which industrialized early and are now in a position to lower their emissions via technology and focus on less-carbon intensive means of production, and those countries that can only plausibly increase their citizens' well-being via emissions-intensive production.

developed countries should be assigned more climate change-related burdens (Baatz 2013, pp. 15, 20–21). This meshes neatly with CBEA which also assigns relatively more emissions to developed countries where products are consumed (Duus-Otterström and Hjorthen 2019, p. 867).

However, we believe that this Common Approach is misguided for selecting between emissions accounting mechanisms, precisely because of the independence displayed regarding contributions to climate change. The choice presupposes that contributions to climate change are relevant for assigning climate change-related duties in the first place. To see this, let us reconsider our initial question: Which emissions accounting mechanism should be adopted from the perspective of justice? As we have shown, the Common Approach takes this question to mean something like: Which emissions accounting mechanism leads to a distribution of climate change-related duties that best achieves the distribution that (the independent) burden-sharing principle X requires? (Where X can be, for example, the APP, the BPP or something else). However, the question of what is a fair mechanism to allocate GHG *emissions* only makes sense if we believe that climate policy-related duties ought to be distributed based on contributions to the problem of climate change.[4]

This point can be illustrated with an example: Imagine a group of friends going out to a restaurant. Everyone orders food and drinks to their heart's content, and when the bill arrives, they must decide how to split it. There are several ways to do so. They might divide the cost according to who earns the most (Ability to Pay Principle, APP), or according to who enjoyed the meal the most (Beneficiary Pays Principle, BPP). In either case, there is no need to argue about who ordered which dish. Only if they believe that fairness requires each person to pay in proportion to what they actually consumed (Polluter Pays Principle, PPP) do they need to examine the individual items on the bill.

The same logic applies to climate change. The question of what counts as a *fair mechanism for allocating greenhouse gas emissions* only arises if we assume that duties should track contributions to the problem, rather than ability or benefit. What is needed is a substantive connection between emissions and duties. Because only then is it relevant to know who emitted how much. More succinctly: Why should we care about allocating emissions if we distribute duties based on considerations that have nothing to do with who caused the situation in the first place?

If contribution does not matter but some other normative criterion does, then we should focus on the distribution of those climate change-related duties according to the preferred burden-sharing principle. For example, if we believe that climate change-related burdens should be distributed according to countries' ability to pay, then we should distribute climate duties accordingly – and who has how much *emissions* on their books becomes irrelevant. For international climate policy negotiations, this would mean departing from the discourse focused on emissions reduction targets at a country level, and putting the focus on who pays for overall emissions reductions, wherever they take place. This implies a change in the order of argumentation. Instead of defending CBEA because it would make those with the ability to pay do so through reducing relatively more emissions, one would make them

[4] The importance of this assumption is also noted by Duus-Otterström and Hjorthen who state that "[t]he choice of accounting method for greenhouse gas (GHG) emissions is of central importance to climate policy" (Duus-Otterström and Hjorthen 2019, p. 866) We accept this as an empirical assumption in the sense that the way in which climate policy-related duties are debated and often assigned is via the emissions that one has on one's books.

pay for emissions reductions wherever they are needed. Where that would happen could be decided according to cost-effectiveness considerations. For example, if it is most cost-effective to cut emissions in China, e.g., by installing CO_2-scrubbers in coal power plants, then emissions should be cut there, with other countries paying for the burdens of those installations and in accordance with the APP.[5]

In other words, if one believes that principles such as the APP or the BPP ought to be the guiding burden-sharing principles in the context of climate change, then one should deny the importance of a justice perspective on emissions accounting mechanisms. Nevertheless, if one believes in the possibility of fairness in emissions accounting mechanisms, one ought to believe that contributions to climate change in the form of emissions are relevant for distributing climate change-related duties. Such an idea is prominently reflected in the PPP, according to which the burdens of addressing climate change should be distributed according to emissions records. Thus, when one engages in the discussion about fairness in emissions accounting mechanisms, one must already accept the PPP as a guiding principle for burden-sharing and assess under what conditions it is fair to allocate emissions to a particular entity. Any further investigation about the fit of emissions accounting mechanisms with contribution-independent burden-sharing principles undermines the motivation of the original question.

3 Returning to the Original Concern: Who is (morally) Responsible for GHG Emissions?

Some scholars have addressed the choice of emissions accounting mechanisms by referring to what we believe is the original concern: Who is responsible for which emissions? However, some have understood responsibility only in a causal sense. Liu has emphasized the relevance of causation for choosing between emissions accounting mechanisms, arguing that "[p]roducers are principally, logically, and obviously responsible for emissions from production', and that 'it is still producers that need to reduce emissions" (Liu 2015, p. 5).

As many scholars have argued, this account is overly simplistic. Emissions are the product of the causal input of many parties. In the simplest case, a producer makes a product that is then sold to a consumer. Without the producer the emissions would not have been released, as producers cause the emissions, for example, by burning fossil fuels in a production process. However, the product would not have been made if it was not for the demand from consumers who buy or use it (Roser and Tomlinson 2014, pp. 237–38; Steininger et al. 2016, p. 35; Duus-Otterström 2022a, p. 342). Thus, both producers and consumers are causally responsible for the emissions associated with the product. Mere causal considerations leave us with indeterminacy for choosing between PBEA and CBEA.[6]

[5] We do not mean to say that proponents of the Common Approach insist that emissions reduction obligations have to happen in the country that the relevant duties have been assigned to. Emissions reductions can be traded, of course. However, we argue that the Common Approach seems to include an unjustified extra step by realizing the preferred distribution of duties via the choice of an emissions accounting mechanism. We discuss how proponents of the Common Approach may answer this point in Section 5.

[6] Some authors have discussed mixed emissions accounting mechanisms that split responsibility for emissions between parties. This would require determining who contributes how much to particular emissions and attributing emissions proportionally. As Steininger et al. (2014) note, however, determining who contributes how much is practically and conceptually difficult.

We believe that the indeterminacy problem of this causal approach can be avoided by focusing on moral responsibility. We argue that emissions accounting mechanisms should identify the appropriate morally responsible party (producers or consumers) in order to be fair. The goal of the r of this section is not to conclusively answer what is a fair emissions accounting mechanism, but rather to sketch the kind of conditions that would give us an answer to that question. We do not claim that our approach is the only way to link fairness and emissions accounting. Other accounts—such as agential approaches that emphasize control and capacity to act, or institutional approaches that focus on functional roles—offer alternative routes to connecting agents and emissions.[7] Our aim here is simply to develop one plausible and general framework for understanding fairness in emissions accounting.

The approach we favor is best described as a Moral Responsibility Approach. Moral responsibility for emissions requires causal responsibility for emissions but comes with further conditions. In the vast literature on moral responsibility, two conditions become salient to attribute moral responsibility for emissions: The knowledge condition and the avoidance condition (cf. Bell 2011, p. 393). According to the knowledge condition, moral responsibility requires having the opportunity to know about the possible negative consequences of the actions one is taken to be morally responsible for. According to the avoidance condition, one needs to have the possibility to avoid the actions, usually, by having alternative possibilities. In order to assess whether and to what extent producers or consumers are morally responsible for GHG emissions, we need to explore how these conditions appear in the context of climate change.

As introduced above, to allocate emissions at the country level, we might need to assign emissions to individuals and companies living and operating within that country, as these entities are often relevant producers and consumers. For this reason, when addressing moral responsibility for emissions it becomes relevant to what extent the different entities, ranging from individuals to companies and states, comply with these two conditions for moral responsibility, and what kind of considerations would excuse them from having moral responsibility. The aim of the following discussion is not to give a comprehensive analysis of moral responsibility in the context of climate change, but rather to provide some guidance on the kind of considerations that warrant attribution of moral responsibility for GHG emissions.

In the context of climate change, the knowledge condition is heavily affected by the excusable ignorance objection. It is commonly argued that until the publication of the first IPCC report in 1990, parties could not have known about the negative effects of their emissions, since the scientific consensus around climate change did not exist until then. Hence, according to this objection, parties cannot be held responsible for emissions occurring before 1990 because those were emitted under conditions of 'excusable ignorance' (Meyer 2004; Caney 2005; Bell 2011; Baatz 2013).

Arguably, this cut-off date may not be adequate for all emitters. In the case of large companies, especially in the fossil fuel sector, there is reason to believe that they were aware of the harmful effects of GHG emissions and the necessary cuts to emissions long before 1990. Some carbon majors, such as ExxonMobil, had robust scientific information on the dangers of their emissions in the 1970 s and 1980 s (Supran et al. 2023). These companies, and others, decided to suppress this information and instead invested money in disinformation campaigns to confuse and distract the public (Supran and Oreskes 2017). In this case, attributing

[7] For some discussion, see Duus-Otterström and Hjorthen2019.

moral responsibilities to those companies for their emissions from an earlier point in time than 1990 might be granted. And in turn, the countries these companies belonged to should have these emissions on their books.[8]

A different cut-off date might be applied to individual people. Wündisch (2017) argued that many people were excusably ignorant well after 1990, and some may even be excusably ignorant today, at least for some of their GHG emissions. This is because many people lack access to trustworthy information, and even if they had it, may not able to interpret it correctly. For example, whether car-sharing or taking the train is better to reduce emissions is a difficult question. It not only depends on immediate emissions, but also on whether other people also go by car or train and what they will do in the future (Wündisch 2017, p. 295). Access and understanding differ between people, and thus different people, in different places, may be more or less excusably ignorant. Wündisch argues that even today, well-educated people may be excusably ignorant regarding some part of their emissions (Wündisch 2017, p. 295).

Even though the excusable ignorance of individuals might affect the allocation of emissions to them, none of the above necessarily means that states with ignorant citizens should be allocated fewer emissions. If people were excusably ignorant because their state failed to inform them, then those emissions should still be allocated to their states. For example, a state might remove information about global warming from school curricula, or might cut funding to scientific research on global warming. In that case, emissions would be allocated to those countries based not on people's responsibility for emissions but on their government's responsibility. Likewise, if a country was responsible for the ignorance of the citizens of another state, then those emissions might be allocated to that second state, or at least partially so.

Let us now turn to the avoidance condition. Among other possible circumstances, the avoidance condition is met when individuals or companies engage in luxury GHG emissions, and ought to be dismissed when it comes to subsistence emissions (cf. Shue 1999; Duus-Otterström 2024). Subsistence emissions are those that are necessary to enjoy a minimally decent standard of life (Shue 1993, p. 42). This means that even in cases where someone caused emissions in the knowledge that they would contribute to harmful global warming, we may judge that they should not be held morally responsible (Burkett 2021; for critical discussion, see: Duus-Otterström 2022b). This will be the case for many of the subsistence emissions that occur in developing countries, for example, those resulting from agriculture, basic infrastructure such as roads and hospitals, preparing food with polluting energy sources, and so on. Luxury emissions come from activities that can easily be replaced by other, less emissions-intensive activities that serve the same goals. For instance, many cruise ship tours can easily be replaced with vacations within train-traveling distance. The distinction between subsistence and luxury emissions is, of course, a matter of

[8] We should pre-empt two concerns here. First, multinational companies complicate the attribution of emissions because their operations typically span several jurisdictions. For instance, if we adopted production-based accounting and considered a company headquartered in the United States, producing in Mexico, employing Bolivian workers, and owned by shareholders across the globe, it becomes unclear where its emissions should be attributed, according to PBEA. Questions of this kind raise complex issues about how to align territorial, economic, and moral responsibility. A detailed treatment would go beyond the scope of this paper, but see, for example, the discussion in Duus-Otterström and Hjorthen (2019). Second, we are not committed to an equal distribution of the final burdens among all individuals within that country. Countries could decide to distribute the respective burdens also according to similar criteria, and thus 'make the companies pay for their emissions', without it affecting their individuals. See also Section 5.1.

degree, where some emissions are clearly subsistence emissions and others are less clearly so. While it is plausible that recreation is part of a minimally decent standard of life, it is less clear how many train kilometers to holiday locations per year that might include.[9]

The conclusion of this section is that choosing an emissions accounting mechanism based on fairness considerations requires an account of who is responsible for the emissions. However, moral responsibility cannot be understood merely in causal terms but has to meet both the knowledge condition and the avoidance condition. The knowledge condition is not met when emitters are excusably ignorant, and the avoidance condition is not met for subsistence emissions.

4 PBEA or CBEA? A Moderate Defense of CBEA

In the previous section, we discussed the conditions under which agents can be considered morally responsible for emissions. In this section, we discuss how these considerations apply to the selection of emissions accounting mechanisms. We thus address whether consumers or polluters are more likely to meet those conditions of moral responsibility for emissions. In a second step, we present a moderate defense of assigning moral responsibility to consumers and thus in favor of CBEA from a fairness point of view. Finally, we discuss the limitations of this argument.

As stated in Section 3, knowledge about climate change differs. Some companies knew, to a sufficient degree, about the risks of emitting in the 1970s. Some individuals might still be ignorant today about the effects of some of their emissions. But which emissions accounting mechanism best allocates emissions so that they are on the books of those who fulfil the knowledge condition to a greater degree? Awareness of climate change, the harms it poses, and its causes tends to be higher in wealthier countries (Leiserowitz et al. 2023). This may be due to better access to education, especially higher education (Lee et al. 2015). Furthermore, rich countries generally tend to have more economic resources to invest in climate research, monitoring, and policy development. This includes hiring experts, conducting extensive studies, and implementing advanced technologies to measure and mitigate GHG emissions. Similarly, there tends to be more public discourse about climate change, and thus, citizens and companies can be expected to know (more) about climate change than their counterparts in poorer countries (Leiserowitz et al. 2023).[10]

Which accounting mechanism best reflects these wealth-based differences in knowledge about the effects of GHG emissions? In general, CBEA assigns relatively more emissions to rich countries since they import more emissions-intensive products from other countries than they export (Chancel 2022; Meng et al. 2023). If we wanted to target those who are in a better position to know about the effects of climate change, then CBEA would be the better choice.

[9] In addition to our normative account, insights from the economics literature on *luxury goods*—defined as goods with high income elasticity—may also inform how we think about luxury emissions, especially when it comes to questions of policy implementation (e.g. Oswald et al. 2020).

[10] However, news media in wealthier countries is more likely to portray climate change and its overwhelmingly anthropocentric causes as an unsettled issue. Thus, while people in wealthier countries are more likely to have heard about climate change, they are also more likely to doubt that humans caused it (Vu et al. 2019).

Let us turn to the avoidability condition. In Section 3, we distinguished between subsistence and luxury emissions. Subsistence emissions are those that come with leading a minimally decent life. Luxury emissions are everything above and beyond that. Luxury emissions rise with wealth (Wallace and Welton 2023), since once subsistence needs are met, people can engage in emissions-generating activities that are not necessary, but optional. Examples are sports cars, holiday trips, and fine dining. Emissions from these goods and activities can be avoided, by definition, while still leading a minimally decent life. Thus, it is less burdensome for wealthier people to reduce emissions because they can cut luxury emissions without dramatic consequences for their lives. Furthermore, wealthier people are even able to lower their subsistence emissions because they can afford low-emissions technologies that are out of reach for poor people. For instance, instead of heating their houses with emissions-intensive coal stoves, rich people can switch to heat pumps powered by renewable energy.

Since CBEA assigns more emissions to rich people and thus to rich countries, it assigns more emissions to those who have a higher degree of moral responsibility because it is easier for them to avoid these emissions. Thus, both the knowledge and the avoidability condition point towards CBEA over PBEA.

We consider the discussion so far to be a moderate argument in favor of CBEA. It is moderate since it comes with important assumptions we now discuss. The first assumption is that climate policy-related duties must be allocated via emissions-reduction duties. This assumption seems reasonable because, in the world as it is, countries' climate policy-related duties are the result of international climate agreements, such as the Paris Agreement, that focus primarily on emissions reductions.[11] Thus, we assume that if we want to do something about climate change, we might need to do it via the established international mechanisms which deal in emissions reductions targets. The second assumption is that we are also limited to simple, technically and administratively feasible emissions accounting mechanisms, namely PBEA and CBEA. Given that limitation, the relevant question then is which of these mechanisms is better. Finally, our defense of CBEA is moderate because we admit that, if we could, the ideal way of allocating emissions to an entity would be looking into whether they are morally responsible for each and every emission they cause. We would need to do so by assessing whether those entities comply with the conditions for moral responsibility (knowledge and avoidability) in every instance. However, again, in the world as it is, we need to make a pragmatic decision about the emissions accounting mechanism that would enable us to allocate emissions to morally responsible parties on balance. Our case in favor of CBEA is thus conditional. It is the best among the available options to distribute emissions-reduction duties, but it is far from perfect.

5 Objections and Responses

In this section, we would like to address two possible objections to our approach and provide answers to them.

[11] The overwhelming majority of climate finance is directed to mitigation projects (1,150 billion USD) for 2021/2022. Financing for adaptation projects amounts to 63 billion USD during the same time (Buchner et al. 2023). Loss and damage financing is still in its infancy. Early pledges announced at COP28 amounted to merely 0,7 billion USD (Mechler et al. 2024).

5.1 Is CBEA fine-grained enough to track morally responsible emitters?

When considering the knowledge condition and the avoidability condition, we took countries to be the relevant agents i.e., we assumed that people in richer countries have more knowledge about climate change and can more easily avoid emissions than those in poorer countries. However, one might argue that there are rich people in poor countries, who may have good information about climate change and may be able to easily avoid emissions. There are also poor people in rich countries, with little knowledge and few options to avoid emissions. This raises the worry that an emissions accounting mechanism that operates at country level, such as CBEA, overlooks these facts and considers countries as homogenous wholes. If that would be the case, such mechanism would not be properly tracking moral responsibility at the level of individuals. One might argue that this mechanism would be unfair towards poor people in rich countries and would leave rich people in poor countries off the hook.

We agree that, ideally, emissions would be assigned directly to those who are morally responsible for them, i.e., those who fulfill both the knowledge condition and the avoidability condition. This is practically unfeasible since there are no practical means to track moral responsibility in such a detailed way and there are no institutions in place that could perform this task, let alone ensure that morally responsible emitters bear the burdens associated with their emissions.

However, our defense of CBEA also implies that it is the best mechanism to apply at the country level to distribute the burdens associated with emissions in the same way. When states are allocated a given number of emissions and thus a number of burdens associated with them, they are not bound to distribute them equally among their citizens, which would raise the above problem that poor people in rich countries would bear relatively high burdens and rich people in poor countries would bear relatively low burdens. Instead, countries could distribute these burdens internally in ways that burden rich people more, e.g., via taxing emissions. Furthermore, the knowledge condition and the avoidability condition that we used on the level of states could also be used by states to distribute burdens internally. This would avoid deviating from the rationale that guided the selection of the emissions accounting mechanism.

Admittedly, the effectiveness of such redistribution depends on national political and institutional contexts—but this is true of any allocation mechanism, including those operating internationally. If CBEA is workable at the global level, there is no reason to think it could not also be implemented at the state level.

5.2 Is the Moral Responsibility Approach Substantially Different from the Common Approach?

Our moderate argument in favor of CBEA concludes that CBEA does better than PBEA in attributing emissions to those who are morally responsible for them. We also granted that, if practically feasible, emissions should be directly allocated to those who are responsible for them. This line of argumentation may seem similar to what we argued proponents of the Common Approach defend. On the Common Approach, a particular emissions accounting mechanism, usually CBEA, is defended by showing that it *best* aligns with the authors' preferred principle of distributive justice (Steininger et al. 2016; Mittiga 2019; Duus-Otter-

ström and Hjorthen 2019). Similarly, we defend one emissions accounting mechanism, namely CBEA, because it is *best* at attributing emissions to those who are morally responsible for them. The approaches also appear similar because they rely partly on the same moral consideration to decide which emissions accounting mechanism is best. For example, many defenders of the Common Approach argue that emissions should be allocated so that richer people bear more burdens.

Even if both approaches reach similar conclusions, they do so for radically different reasons. The crucial difference between our Moral Responsibility Approach and the Common Approach is that we rely on the substantive connection between emissions and duties because the question of on whose books emissions should be already assumes that those who caused the problem should fix it. As we argued above, we believe that our approach respects the initial origins of the concern about how to allocate emissions to polluters. While our approach allocates burdens to those who are morally responsible for their emissions, the Common Approach attributes responsibility based on other considerations that are not related to the problem at stake.

5.3 What About Emissions that Cannot be Attributed Via our Moral Responsibility Approach?

Our Moral Responsibility Approach relies on the knowledge condition and the avoidability condition. However, with those criteria, we cannot identify morally responsible agents for all emissions. As we mentioned above, pre-1990 emissions are mostly subject to the excusable ignorance objection. Most individuals and only some companies knew about the consequences of their emissions. Even after 1990, many remained ignorant. Similarly, many could not have avoided their emissions even after 1990 because they constitute subsistence emissions or because of path-dependencies and carbon lock-in effects (Garcia-Portela 2025), for which no agent can be held morally responsible. Some philosophers have expressed their worries about emissions accounting mechanisms that cannot cover all emissions. Steininger et al. (2016) argue that "[g]iven the limited applicability of compensatory justice, the focus should be directed towards achieving a more equitable distribution of undeserved benefits and harms rather than focusing on compensating wronged persons" (Steininger et al. 2016, p. 36). In a similar vein, (Torpman 2022) suggests that an approach is preferable if it enables us to attribute more emissions (Torpman 2022, p. 359). The worry seems to be that some victims of climate change will not receive assistance if some emissions cannot be attributed to anyone.

It may not be immediately obvious why our approach would not be able to account for these emissions. After all, we are defending CBEA, and CBEA by itself does not require that emitters fulfill the knowledge condition and the avoidability condition. Instead, we argue that CBEA is more likely to attribute emissions to those who fulfill the two conditions than the alternative, PBEA. It may not always properly assign emissions to those who are morally responsible for them, but it will mostly get it right.

However, the moral responsibility approach reaches its limits when it comes to very early emissions. Certainly, not even well-informed individuals could have known about the effects of climate change in the 1950s. For these emissions, we can safely say that the moral responsibility approach would neither recommend CBEA nor PBEA – no one is morally responsible for these emissions. A proponent of the Common Approach does not

necessarily face that problem. For instance, CBEA can be grounded on the APP. Emissions are then attributed to those who have the ability to pay for them. Excusable ignorance does not matter in this approach, and thus, all emissions, including very early emissions, can be attributed to someone.

We do not believe it to be problematic that the Moral Responsibility Approach cannot account for very early emissions because we do not think that this means that some climate policy-related duties will not be covered. For example, if victims of climate change still require assistance after morally responsible emitters have contributed their share, then other principles shall be used to address the remaining harms. The distribution of these duties could be guided, for example, by the APP. In other words, a problem should be fixed by the perpetrator – and if no (morally responsible) perpetrator can be identified, then we need to turn to principles of distributive justice.

6 Conclusion

The choice of an emissions accounting mechanism has far-reaching consequences for the distribution of climate policy-related burdens. Here, we concentrated on a comparative analysis of PBEA and CBEA. Some countries would face much stricter emissions reductions duties with one mechanism than with the other. Apart from economic considerations such as how emissions reductions are achieved in a cost-efficient way, and how carbon leakage can be prevented, philosophers have presented normative considerations that are relevant to that choice. We have thus called the topic of our investigation 'fair emissions accounting'.

We have introduced the distinction between the Common Approach and the Moral Responsibility Approach. We critiqued the Common Approach which aligns emissions accounting mechanisms with climate burden-sharing principles such as the Polluter Pays Principle (PPP), the Beneficiary Pays Principle (BPP), and the Ability to Pay Principle (APP). We contend that this approach is misguided because it overlooks the essential connection between emissions and the moral responsibility of those who contribute to climate change. The Moral Responsibility Approach that we defend starts from the assumption that emissions should be on the books of those who are morally responsible for them. This requires, at minimum, causal responsibility for emissions as well as knowledge about the consequences of emitting and the avoidability of emissions.

While neither PBEA nor CBEA can fully capture moral responsibility, our analysis suggests that CBEA is more aligned with the Moral Responsibility Approach. This is because knowledge of both the consequences and avoidability of emissions are correlated with wealth and wealth is correlated with consumption. This mechanism is particularly relevant in a globalized world where emissions-intensive production processes often occur in different countries from where the goods are consumed.

Finally, we addressed three objections. First, we have addressed the worry that CBEA is not fine-grained enough to attribute emissions to those who are actually morally responsible. We pointed out that our goal is to attribute emissions to countries and that there is a separate question of how the relevant burdens are distributed within countries. Second, we have shown that our Moral Responsibility Approach crucially differs from the Common Approach because of the substantive connection between emissions and duties that our approach requires. Third, we have argued that whenever the Moral Responsibility Approach

cannot convincingly support the CBEA, remaining climate policy-related duties can be addressed with other mechanisms to respond to the demands of climate justice.

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