

Task Force 02

**SUSTAINABLE CLIMATE ACTION AND INCLUSIVE JUST ENERGY TRANSITIONS**

## Looking Beyond National Borders: Integrating Consumption-Based Accounting Approach into Climate Mitigation Policy

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## Abstract

Emissions accounting under the current international climate change regime relies on the production-based (PBA) approach. Therefore, figuring out how much each country contributes to global emissions, setting and tracking national mitigation targets and designing climate policies are currently discussed from the production-based perspective. Yet, the consumption-based accounting (CBA) is not less important. The difference between two approaches comes from emissions embedded in international trade. As they account for the increasing portion of global emissions and this gap between production- and consumption-based emissions (PBE and CBE) in many countries is expanding, solely using the PBA might be misleading and prevent us from capturing the whole picture. For instance, a narrow production perspective puts the major responsibility for emissions reduction on emerging economies though advanced economies tend to import carbon-intensive goods from there. It also provokes carbon leakage due to the asymmetry in climate policies. Furthermore, it reduces the scope of emissions under regulation and narrows the range of decarbonization tools available for governments.

In this policy brief, we discuss why the use of CBA along with PBA is essential for achieving global mitigation targets. We also present some policy recommendations with an emphasis on the critical role of the G20 countries, which represent more than 80% of global emissions and world trade. In this regard, we show that G20 collaboration for regular calculation and official disclosure of CBE and their gradual integration into emissions-reduction target setting would provide a better understanding of where carbon emissions come from, strengthen coordination between exporters and importers of carbon-intensive goods, and incentivize countries to use the wider range of environmental policy tools aimed at fostering just and inclusive green transition.

**Keywords:** Emissions accounting, consumption-based emissions, carbon leakage, emissions embodied in trade, mitigation policy

## Diagnosis of the Issue

Depending on how we consider emissions embedded in trade, we obtain two different concepts of emissions accounting, i.e. production-based accounting (PBA) and consumption-based accounting (CBA)<sup>1</sup>. These concepts are highly crucial because the approach for emissions accounting determines many critical discussions regarding climate change. PBA is directly related to the location of production of goods and services, and thus it simply considers emissions produced within a specific territory.

However, the PBA ignores the consumption-related component and doesn't consider emissions embedded in trade. In contrast, the CBA considers the potential disparities in geographic locations between the production and consumption of a good and offers an emissions measurement taking into account international trade flows in which a country engages as an importer. Therefore, under the CBA framework, regardless of the country in which a good is produced, emissions associated with this good are added to the inventory of the country where it is consumed. As a result, while the CBA includes emissions in imports but excludes exports, the opposite is correct for the PBA.

Although, as per the formulation, production-based and consumption-based emissions (PBE and CBE) should be equal to each other globally, they significantly differ between countries, indicating that the choice of the approach affects the distribution of emissions and the way how we understand countries' responsibility for them. This is what makes

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<sup>1</sup> Territorial-based and PB refer to two different definitions of emissions accounting, but they are commonly used synonymously in the literature (Grubb et al. 2022).

this topic highly important and relevant for the G20 members (Grubb et al. 2022; Steininger et al. 2014, Makarov and Alataş 2023).

The G20 members account for almost 85% of the world's output and three-quarters of the global population. As consistent with these figures, the G20 countries are also responsible for about 84% of global PBE and 82% of global CBE. These aggregated numbers offer insightful outcomes, but they may also hide the huge asymmetries that occur within G20.

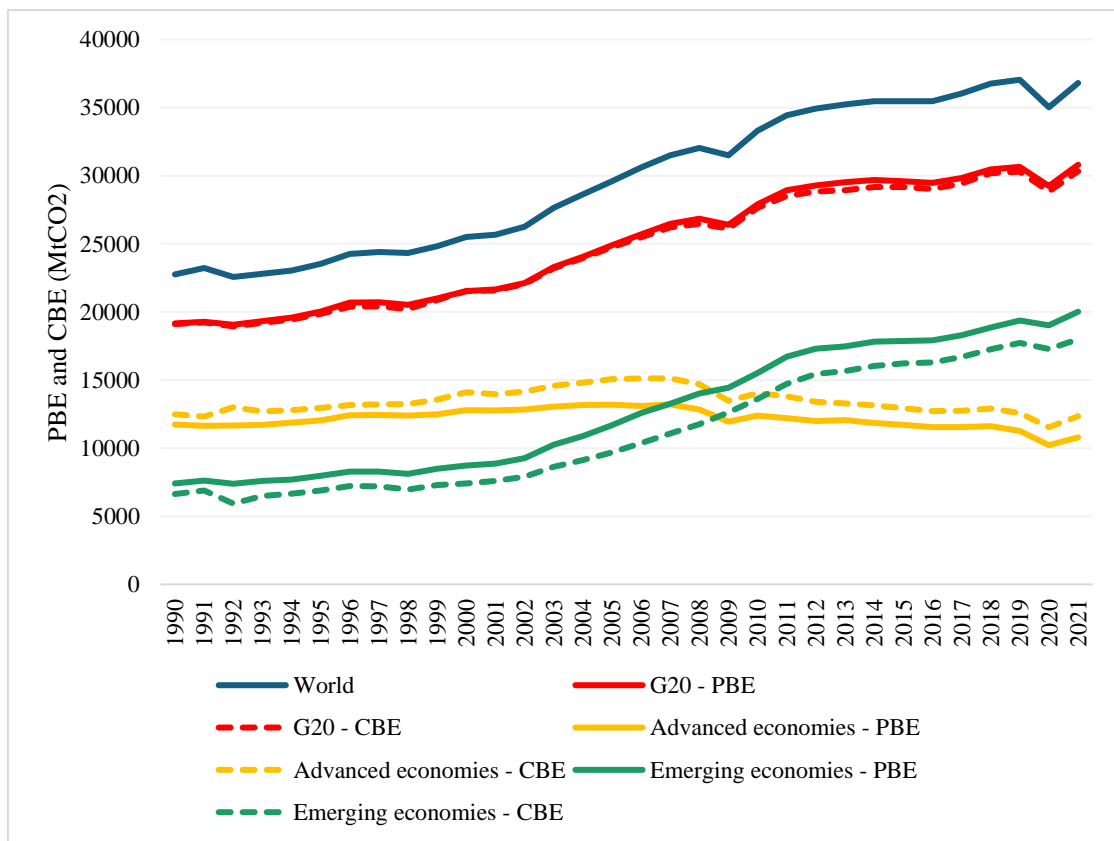


FIGURE 1. The development of PBE and CBE in G20 (1990-2021)

Advanced economies: Australia, Canada, EU (incl. Germany, France and Italy), Japan, South Korea, UK, US. Emerging economies: African Union (incl. South Africa),

Argentina, Brazil, China, India, Indonesia, Mexico, Russia, Saudi Arabia, Türkiye (Friedlingstein et al. 2023)

Figure 1 presents the development of PBE (solid lines) and CBE (dashed lines) for the G20 (red) compared to the world (blue). It also presents the same data separately for advanced (yellow) and emerging economies (green) within G20. Some crucial remarks may be drawn from Figure 1.

Firstly, PBE and CBE of the G20 members have increased by nearly 50% from 1990 to 2021, indicating that these countries are likely to maintain their large share in global emissions in the following decades as well.

Second, emerging economies' trajectory is parallel to that of the G20. This group of countries is the primary cause of the rising emissions in the G20 and the world overall. Therefore, the success of global mitigation efforts to a huge extent would be determined by the ability of world community to start reducing emissions there.

Third, the PBE-CBE pattern varies across G20 members. While the group of advanced economies consists mostly of net importers of emissions, the emerging economies within G20 are the net exporters. Figure 2 displays the net emissions embodied in trade (NEET) in each G20 member and its ratio to PBE. As can be seen, China, the African Union, Russia, India, and South Africa are among the leaders in terms of net exports of emissions, while the EU, US, UK, and Japan are the leaders in terms of emissions imports. Total net imports of advanced economies (1550 MtCO<sub>2</sub> in 2021) are compensated by total net exports of emerging ones (2020 MtCO<sub>2</sub> in 2021).

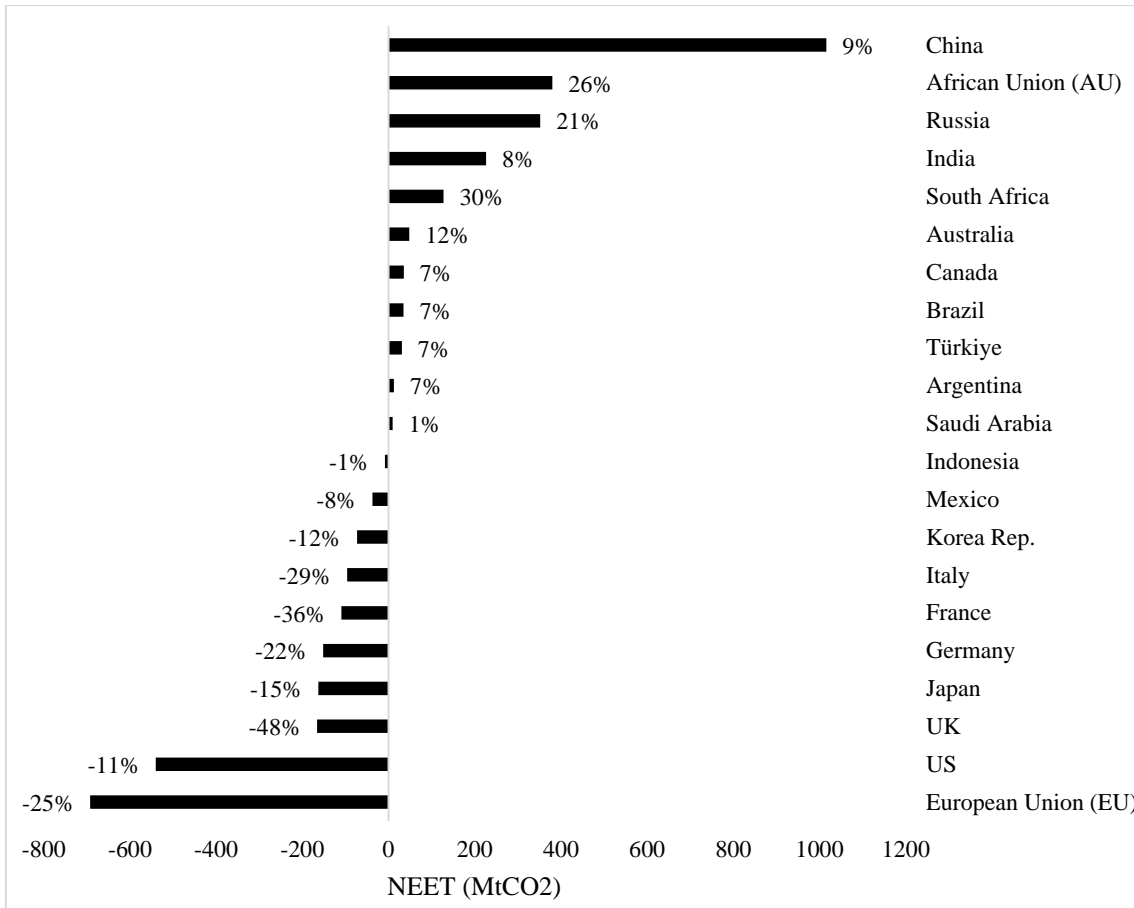


FIGURE 2. NEET (MtCO<sub>2</sub>) and the NEET/PBE ratio (%) in the G20 members (2021) (Friedlingstein et al. 2023)

This asymmetry is not at all occasional. Firstly, it is a result of international division of labor: globalization of the last three decades was based on the principle of specialization. Such factors as the natural resource abundance, relatively cheap labor and scarcity of high technologies made emerging economies specialized in extracting industries and conventional manufacturing. Relatively high carbon-intensity of these sectors hasn't been considered until recently.

Secondly, emerging economies have higher carbon-intensity of production within sectors than advanced ones – primarily due to the obsolete technologies and lack of capital available for investment in low-carbon development.

Thirdly, the gap between PBE and CBE increases due to uneven climate policies. Active carbon regulation, such as carbon pricing, and the wider use of supply-side rather than demand-side climate policy tools lead to carbon leakage and substitution of domestic production of carbon-intensive goods by their imports from abroad – primarily from emerging economies, with no real success in emissions reduction globally.

Focusing merely on PBE ignores all these crucial factors. In advanced G20 economies, it leads to misleading expectations that the efforts to reduce emissions within their national borders are the major priority and may be later replicated in the emerging world. Regarding emerging economies, it masks the fact that their large and increasing emissions are not only their fault and responsibility but also that of the whole world.

## Recommendations

### **1. G20 collaboration for regular calculation and official disclosure of CBE**

The PBA has always been the mainstream approach for measuring and tracking emissions. However, the use of PBA ignores trade-related emissions, which are currently estimated to account for around 25% of global emissions and makes it hard to ascertain whether these emissions are due to domestic or foreign demand (WTO, 2021).

To address the drawbacks of PBE and deepen our comprehension of emissions, the significance of CBE is gradually becoming more widely acknowledged, particularly in academic literature (Makarov and Alataş, 2024). However, in the actual implementation of carbon regulation, the CBA is largely ignored. Even if some national initiatives already exist, how these attempts should be scaled up and integrated into the mainstream climate policy still requires serious consideration, given institutional inertia (Davis and Caldeira 2010; Steininger et al. 2018; Makarov and Alataş 2023). In this regard, the G20 collaboration for the regular calculation and official disclosure of CBE (not instead, but together with PBE) is crucial.

### **2. The gradual integration of CBE along with PBE as a target setting for emissions reduction**

Responsibility sharing, which basically refers to how countries should share the cost of reducing emissions, is typically done through pledges under international agreements, such as the Nationally Determined Contributions (NDCs) under the Paris Agreement. Since the early 1990s when climate mitigation policies began to be effectively implemented internationally, countries' pledges for emissions reduction have been solely



based on PBA. The use of CBA as a target setting in the countries' pledges is largely ignored. It is critically important because while producers bear the major responsibility for emissions under the PB responsibility sharing scheme, the CBA framework puts the major responsibility on the point in the supply chain where goods or services are finally consumed. Therefore, when taken together with the data shown in Figures 1 and 2 above, it is clear how adopting the PB responsibility (the "polluter pays" principle) or the CB one (the "consumer pays" principle) could significantly impact the emission reduction responsibilities of countries (Peters 2008; Afionis et al. 2017; Grasso 2017).

As also illustrated in Figure 2, developed countries, like Germany, Japan, the UK, the USA, and the EU as a whole, are net importers of CO<sub>2</sub> emissions, whereas emerging countries, like those in the BRICS, are net exporters of CO<sub>2</sub> emissions. Therefore, the seemingly successful performance of developed countries in reducing PBE may not be an accurate reflection of their actual mitigation efforts, but their ability to successfully outsource their emissions to other emerging economies. This is known as carbon leakage, which refers to a situation when reducing emissions in one jurisdiction results in a rise in emissions in another jurisdiction, without an actual reduction in emissions on a global scale. Considering the speed at which trade between countries is expanding, relying solely on the PBA-oriented climate policy is, therefore, unfair and ineffective as it puts a disproportionate burden on emerging economies, where most of the carbon-intensive industries have been allocated, and leads to a carbon leakage problem, which significantly reduces the overall effectiveness of global emission reduction efforts. In this regard, the G20, which includes both developed countries that import emissions and emerging countries that export them, may be an important platform for the gradual integration of CBE along with PBE into a process of target setting for emissions reduction.

### **3. The use of CBA for broadening the scope of regulated emissions and understanding sectoral peculiarities**

In the GHG inventories on the corporate level, one normally takes into account the companies' direct and certain indirect emissions associated with the purchased electricity – the practice which follows from PBA. Therefore, there is no standard application for accounting for a certain amount of Scope 2 and Scope 3 emissions. However, they are not less important because these emissions account for a sizable part of all supply chain emissions in some industries (Barrett et al. 2013; Hertwich and Wood 2018). More importantly, the gap between PBE and CBE varies depending on the sector covered, i.e. while it is often large for tradeable sectors, it is less for some non-tradeable sectors (Grubb et al., 2022). Compared to the PBA, the CBA framework takes a more comprehensive view of emissions. This presents a significant chance for the national carbon regulation to cover more emissions and consider sectoral differences. In this regard, the introduction of CBE to the agenda of the G20 will also expand the scope of regulated emissions and help us better understand sectoral peculiarities for deep reduction.

### **4. The use of CBA for expanding the scope of climate policy with demand-side instruments**

Concentration merely on PBE leads to a dominance of supply-side climate policies, such as carbon pricing through a carbon tax or a cap-and-trade system, along with incentives and regulations targeting producers. These instruments have critical importance but are not sufficient. In this context, demand-side policies — designed to lower emissions by altering consumption patterns — are equally important. It is especially true for the largest emerging economies where physical and institutional infrastructure

rapidly develops with the threat of locking in related emissions for coming decades and consumption behavior patterns of the emerging middle class are still being formed. Relying on CBA would give an impetus for such demand-side policy instruments which may play a greater role in mitigating climate change.

## Scenario of Outcomes

Given the discussions above, the use of CBA along with PBA would contribute to more comprehensive and just mitigation policies based on fair sharing of climate responsibility between producers and consumers and across different country groups. In this regard, the integration of CBA into policy-making within G20 could be made in three stages:

**1. G20 countries should agree on the calculation and disclosure of CBE on a regular basis and based on a single methodology recognized by all of them**

CBA was previously considered more challenging and controversial than PBA, primarily due to the lack of reliable data. The long history of institutionalized measurement and disclosure of PBA also pushed academics and policymakers to overlook CBA and created a narrative of no choice. However, as trade databases and environment-related input-output techniques have advanced significantly over the last decade, the lack of data is no longer a barrier to the implementation of CBA. It is especially relevant for G20 countries for which data is on average better than for smaller economies. G20 also includes both exporters and importers of emissions embodied in trade, allowing for the creation of an unbiased methodology of CBA calculation that addresses both sides' concerns. Adopting a uniform methodology and starting disclosure of CBE at the level of G20 is, therefore, the best start to promote this accounting approach worldwide.

## **2. Targets for CBE reduction may be set for the future on a non-binding basis - in addition to PBE reduction targets set within NDCs**

National emission targets submitted through the NDCs under the Paris Agreement are currently based on PBA, as discussed above. However, such unilateral policies exacerbate the problem of carbon leakage, which reduces welfare through decreased output or increased production costs in the regions where ambitious climate policies are being implemented. By setting targets for CBE reduction, G20 countries can mitigate the risk of carbon leakage and provide a more attractive alternative to carbon border adjustment, which creates many contradictions between G20 countries that are net importers and net exporters of emissions. Consumption-based target setting will also increase the scope of emission regulation and encourage collaboration between importing and exporting countries to reduce emissions throughout the global supply chain. In practical terms, G20 countries may, on a non-binding basis, include CBE reduction targets into new iteration of NDCs which should be submitted starting from 2025.

## **3. More active dialogue may be held on the policy instruments to reduce CBE**

Compared to CBE, PBE reduction tools have received a broader attention so far. The supply-driven toolkit has demonstrated its effectiveness in mitigating the environmental effects of industrial production; but it fails to incentivize other economic actors, most importantly households, which are the main drivers of the demand for growing industrial output. Therefore, CBA may be able to bridge the gap left by PBA and address individual consumption patterns, lifestyles, housing, infrastructure, etc. Demand-side policy instruments could involve advertising, carbon labeling, and the construction of social norms rooted in the idea of environmental protection. Some G20 nations have already

started implementing efforts linked to these policies; one such example is India's LiFE (Lifestyle for Environment) initiative. However, active discussion of CBA/PBA on the national level of G20 countries will help spread sustainable consumption practices globally. For instance, it would enhance knowledge sharing and capacity building among countries, particularly those with less developed policy frameworks for addressing consumption-related emissions. It would also incentivize dialogue between importers and exporters of carbon-intensive products and facilitate redirecting climate finance flows from the Global North to the Global South for the reduction of GHG emissions, which are now considered as Global North's CBE.

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