

## **Value added-based carbon responsibility: added value as allocation criteria for GHG emissions in comparison to existing full and shared responsibility approaches**

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Several approaches to allocate environmental responsibility along international supply chains have been introduced in the input-output literature, in particular related to the issue of greenhouse gas (GHG) emissions. This paper adds a new approach to this debate: value added-based carbon responsibility. This approach allocates total GHG emissions occurring along a global supply chain to industries and countries according to the share of total value added which is created within that specific supply chain. The calculation method is relatively simple and easily replicable: value added-based carbon responsibility is obtained post-multiplying the consumption-based carbon footprint by the value added multipliers matrix, i.e. by the product of the sectoral value added vector and the Leontief inverse. However, value added is as well employed as environmental responsibility allocation criteria in other approaches, such as the shared producer and consumer responsibility, the beneficiary-based shared responsibility, or the income downstream responsibility. While the reasons for using value added are in theory very similar in all cases (e.g. as a proxy of actor's control over the supply chain or share of generated benefits), these approaches differ in important methodological aspects, such as the allocation direction (upstream vs. downstream) or the fraction of environmental responsibility which each actor receives. In this article, we investigate the differences between the value added responsibility and other allocation methods using GHG emissions as common environmental indicator. The empirical assessment is performed employing EXIOBASE 3, a global multi-regional input-output database covering the global economy separated into 44 individual countries and 5 country groups. Our results suggest that the value added-based approach levies significantly higher or lower responsibility for certain countries and industries in comparison to other perspectives. Our approach thus contributes to the debate on how to share the global costs of climate change mitigation and adaptation.