

# Carbon accounting for sustainability and management. Status quo and challenges

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## ABSTRACT

This paper provides an overview of carbon accounting as a rapidly developing area of sustainability management and this special issue. The global nature of greenhouse gas emissions as well as increasing climate change impacts is a context that demands new, more holistic approaches to preventing and reducing the negative impacts of climate change. This requires improved ways to anticipate and to fulfil new information requirements and to provide guidance on how to use the evolving accounting approaches for transparency, accountability and decision-making in governments, companies, academia and in non-profit organizations. Different types of carbon accounts – scientific, political, economic and corporate, are evolving. They are related but are not properly interlinked in policy or strategic. On the corporate level, carbon accounting can support carbon management with two basic approaches, *carbon accounts for un-sustainability* and *carbon accounting for sustainability improvements*. Both approaches play an increasing role for corporate functions such as production, distribution, procurement, supply chain management, innovation, communication, and marketing. Carbon management accounting can support all organizational levels in decision-making, regardless of whether a department is particularly challenged to comply with regulations, to better organize energy and material flows for substantial reduction effects, or is motivated to increase eco-efficiency, product innovation or legitimacy. This paper distinguishes different company-internal areas of application and methods of carbon accounting. To support corporate decision-makers environmental management accounting framework provides a structured overview of methods distinguishing physical and monetary approaches to carbon accounting. With the expanding scope of carbon accounting practices to include supply chains and product life-cycles, researchers are challenged to develop new methods, such as input–output assisted hybrid accounting.

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## 1. Introduction

### 1.1. Introduction to this special issue and to this paper

This special issue provides new insights on climate accounting and discusses carbon management accounting issues and methods in theory and practice. Günther and Stechemesser present the first systematic literature review on carbon accounting on different levels. If researchers wish to contribute to combatting climate change they have to go beyond publications, which only inform. This is why Burritt and Tingey-Holyoak highlight the importance of establishing effective linkages between academia and industrial practice to more effectively address climate change issues dynamically. In line with this, Ascui and Lovell analyse how

professional accounting bodies strengthen their carbon accounting competences. Sullivan and Gouldson examine whether voluntary carbon reporting meets investors' needs, a requirement, which has to be met if accounting and reporting are to effectively influence investor decisions. Pellegrino and Lodhia investigated the expected effects of carbon reporting in the mining industry and whether corporate disclosure can or does create legitimacy.

In order to create real improvements in carbon reductions, carbon accounting must support managers to take the 'right' decisions. Lee explores this perspective for supply chain management in the automobile industry. Areas of decision-support with carbon accounting are addressed by Scipioni et al. who propose a methodology for more effective monitoring the carbon footprint of products. In support of that approach, Tsai et al., report on how 'activity-based costing' can help companies to integrate carbon cost information into their accounting and management.

This paper provides an overview of the area of carbon accounting and an introduction to this special issue by discussing how different levels of carbon accounting relate to each other

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(Section 2), what functions corporate carbon accounting can fulfil and what methods exist (Section 3), and by concluding with an overview of future directions of carbon accounting to support corporate sustainability management.

## 1.2. Contextualizing sustainable development, climate change and carbon accounting

This section positions carbon accounting in the context of climate change and sustainable development. Climate change is considered to be one of the six major sustainability problems (among deforestation, loss of biodiversity, population growth, poverty, scarcity of drinking water, climate change), and possibly it is the fundamental one (e.g. IPCC, 2007; Stern, 2007). Both, the main causes and the impacts of climate change are directly linked to economic and social activities. For example uses of fossil fuels for generating electrical power (41%), transport (23%) and industrial uses (20%) are among the main causes for carbon dioxide emissions in the world (IEA, 2011). Examples of large impacts include the ecological effects of melting glaciers in mountains, Arctic and Antarctic regions or the social and economic consequences of rising sea levels in densely populated areas such as in Bangladesh, the Netherlands and large parts of the Asia Pacific region. Scientific climate change evidence includes data on the increasing frequency and severity of weather events, including droughts, fires, typhoons and hurricanes. Combatting climate change is an urgent topic of sustainable development (Banuri, 2009).

Notwithstanding these assessments, scientific researchers have concluded that the global 'carbon bottom line' is still increasing and putting eco-systems, the global society and the existing economies at a historically, incomparably high risk. In contradiction to the necessity for carbon emission reductions, the overall greenhouse gas releases have increased world-wide for the last decade, largely due to the rapid growth of large emerging economies such as China and India, while other large economies such the United States have

not been sufficiently willing to reduce their already exceedingly high emission levels. In spite of the relative ineffectiveness of international efforts, some national strategies are making progress (on national developments see e.g. Karlsson et al., 2011; Hovi et al., 2010). Few countries with very high greenhouse gas emission levels such as Germany and the Netherlands are leading the reduction efforts (see IEA, 2011), whereas, vulnerable nations such as the nations in the 'Coalition of Pacific Island States' are urging the international community to become actively involved in climate change prevention and adaptation efforts. Others, like Australia or China, are observing and following other's lead in efforts to reduce per capita carbon emissions.

For the last two decades Europe has been successful in partially decoupling greenhouse gas (GHG) emissions from GDP growth (Fig. 1). Starting from a high GDP level, a substantial real GDP growth of 30% for the EU15 countries (in average 1.7% per annum) was achieved between 1995 and 2010 while the GHG emissions decreased by more than 10 per cent during this time.

At first the data presented in Fig. 1 suggest that climate policy is doing well in Europe, and is setting an example for other parts of the world. Other regions and large economies kept increasing their carbon dioxide (CO<sub>2</sub>) emissions; China releasing a major part of the global of greenhouse gas emissions for the last two decades (Fig. 2).

The European achievement in curbing carbon emissions in spite of economic growth, however, is only partly a 'real' improvement in efficiency and emission reductions. Much of the apparent reductions of carbon emissions are due to the fact that they were 'exported' with major shifts of industrial production to Asia. Weber et al. (2008) documented that in 2005 approximately 30% of Chinese emissions were related to the production of exports and that this share increased rapidly in the early 2000's. Furthermore, substantial differences in emissions exist among different industrial sectors. Although the manufacturing sector in Europe has reduced its climate impact over the last twenty years, the transport sector has caused a rapid growth of emissions for the same period

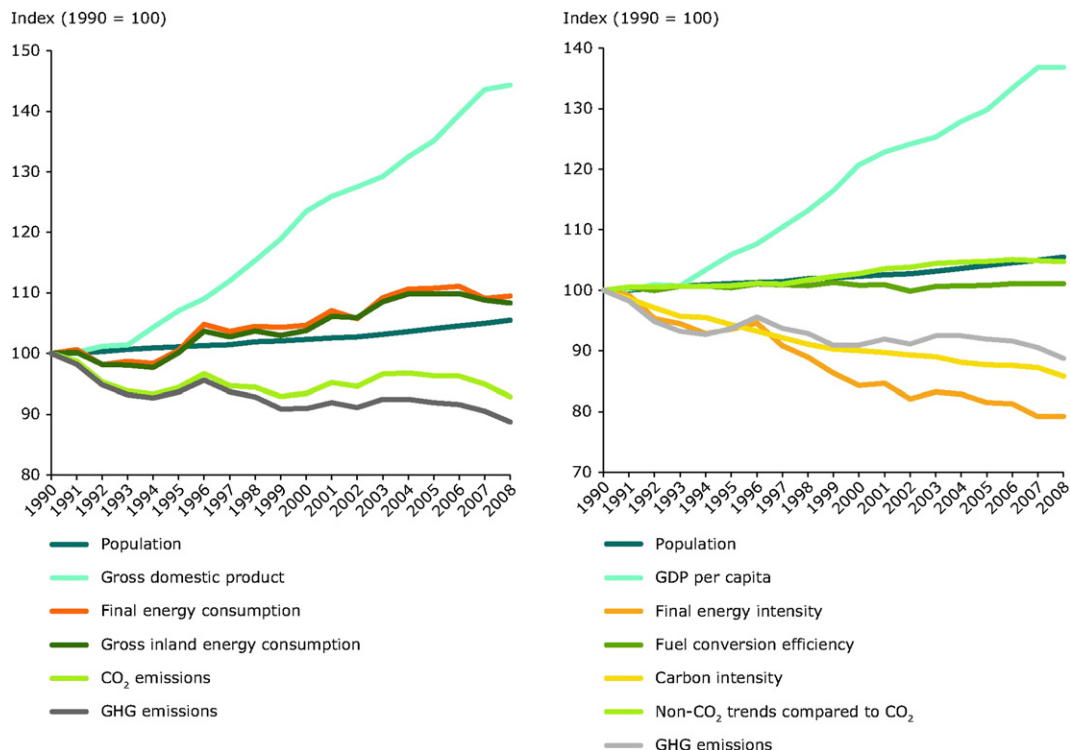


Fig. 1. GHG emissions and GDP growth appear to be decoupled within the European Union (source: EEA, 2010, p. 20).

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