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Carbon footprint calculation in telecommunications companies – The importance and relevance of scope 3 greenhouse gases emissions

Gregor Radonjič[a,*], Saša Tompa[b]

[a] University of Maribor, Faculty of Economics and Business, Institute of Technology and Entrepreneurial Environment Protection, Razlagova 14, 2000 Maribor, Slovenia
[b] Telekom Slovenije, d.d., Controlling, Strategic Controlling Department, Cigaletova 15, Ljubljana, Slovenia

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ABSTRACT

Energy efficiency measures and climate policies are closely related to strategic concerns of companies, and reduction of greenhouse gas (GHG) emissions has become an important indicator of energy efficiency measures. This paper discusses the application aspects of organizational carbon footprint (CF) for telecommunications companies. In order to better understand the structure of overall (direct and indirect) GHG emission, the model for calculating the organizational CF was established for the case of a telecom operator in its initial stages of carbon policy. In order to understand the importance of scope 3 categories in the overall CF, calculated results were compared to CF results reported by three other European telecommunications operators. The results for a particular case based on Slovenian operator revealed that the largest contributor to GHG emissions is the consumption of purchased electricity. The employees' commute to and from work, the use of company-owned vehicles, and heating represent the next major sources of GHG emissions. It was shown that the most contributive upstream scope 3 aspects are similar for various European telecommunication operators and that exclusion of some categories along the supply chain may give a distorted image of organizational CF. However, the comparative analysis revealed that using only the company's own-recorded in-house data can be far from sufficient to make conclusions which GHG emissions scope contributes the highest share to the overall organizational CF of telecommunications companies. In this context, this paper reveals new findings on the relevance of CF determination for telecommunications companies as a guideline for reconsidering their energy efficiency and sustainability plans.

1. Introduction

Energy efficiency has a fundamental role to play in the transition towards a more competitive, secure and sustainable energy system [1]. However, the term does not solely mean focusing on lower energy consumption but it is also closely connected to many environmental pollution problems, particularly those connected to climate change. Climate change is a key issue that is being debated at the global level and has come to the top of political and business agendas including those of the energy sector [2,3]. There is a widespread recognition that global warming is one of the major threats to the environment and economic development of the world [4]. Commitments have been made and actions taken by major industrialized countries to limit the emissions of greenhouse gases (GHGs). Due to the serious and complex nature of climate change problems, all economic sectors need to contribute in reducing their impacts.

Energy efficiency is a broad term in the sense that various solutions to achieve its improvement are available. Consequently, different indicators are used for measuring energy efficiency [5]. Among other factors, reduction of GHG emissions has become an important indicator of energy efficiency measures. Moreover, it has become generally accepted that energy efficiency policy measures and the reduction of GHGs are mutually interrelated [5–7]. Not surprisingly, an increasing number of authors have studied the interrelations between energy efficiency and energy consumption, on the one hand, and GHG emissions on the other hand [8–10]. Due to this, the European Commission launched in 2007 the so-called '2020 Climate and Energy Package' where, for the first time, energy efficiency and climate targets and policies became linked at the EU level [11]. This was followed by the communication calling for a 'Resilient Energy Union with a forward-looking climate change policy' published in February 2015 confirming further attempts to link energy policies and climate change problems [12].

Over the past few decades, organizations have taken more

* Corresponding author.
E-mail address: gregor.radonjic@um.si (G. Radonjič).

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responsibility for the environment and have demonstrated that environmental initiatives and improvements can bring economic benefits. In such a context, energy efficiency engagements are seen as a top priority in reducing GHG emissions in many companies [13]. Consequently, many sectors are considering their energy policies as of further strategic importance in reducing their environmental impacts. This fact is further reflected in the implementation of energy management and environmental management tools in practice. Within reporting and communicating of sustainability approaches of companies, an increasing attention is given to climate data including GHG emissions and reduction measures. In addition, sustainability-related data are growing in importance for investment decisions, as reported by several authors [14–18]. Moreover, the number of investors requesting climate data from their business partners is expected to increase [15,19]. Consequently, companies are regularly publishing corporate responsibility reports, environmental reports and sustainable development reports, besides their annual and financial reports. The proposal of the European Commission on non-financial reporting is that large public-interest organizations with more than 500 employees should disclose in their management report relevant and useful information on their policies, main risks and outcomes relating to the current and foreseeable GHG emissions [20]. Besides potential higher financial risks, it was confirmed that companies implement environmental policies due to the physical and reputational risks, too [14,21]. In this context, one such sector is the information-communication technologies (ICT) sector.

Development of ICT has been one of the most transformative technological and societal processes of the last decades. Technology development is fast and ICT is integrated in new products, services and processes continuously. One of the main characteristics is that the ICT sector not only constitute an industry in their own right but also has obvious ties to virtually every other business sector, all of which increasingly rely on ICT for a range of needs [22,23]. In May 2008, the European Commission adopted a communication in which it recognized the potential of ICT to provide cost-effective means of improving energy efficiency across industry and broader civil society [24]. The fact is that the ICT sector will face serious demands on further network energy efficiency because the energy consumption of ICT is still increasing [25]. The ICT companies may see pressure from corporate clients operating in other sectors that are under pressure themselves to reduce their environmental impacts [22]. Consequently, high expectations are being placed on ICT in relation to sustainable development and related environmental impact reductions.

As a consequence of business and societal demands, ICT companies are being forced to develop strategies and establish targets to reduce the energy use associated with their operations, office buildings, data centers and telecommunication networks, including efforts to promote energy efficiency and the use of low-carbon and renewable energy [26,27]. According to a report by GeSI [26], climate change presents the ICT sector with both risks and opportunities, as listed below:

- Impact of more extreme weather events on the reliability of telecommunications networks,
- Increasing cost and scarcity of energy to power ICT equipment,
- Increasing the energy efficiency of telecommunication networks,
- Manufacturing more energy-efficient ICT products,
- Dematerialization of ICT services (replacing products with services),
- Increasing efficiencies regarding data and energy passing over networks through digitalization.

With this in mind, ICT companies have started to more intensively integrate both mutually interrelated aspects – energy efficiency and reduction of GHG emissions – into their business and energy policies. However, the involvement of the ICT sector with the GHG emissions problem is more complex than it might seem. In numerous studies published in the last decade or so, different authors have described ICT as being responsible for both negative environmental impacts, on the one hand, and for environmental benefits, on the other hand. Benefits can be due to the new possibilities offered by technological development in ICT industries (digitalization of information, dematerialization of transport, teleworking, etc.). The actual outcome will depend on the way the sector is managed by policy measures. However, some recent indications confirmed that a great number of ICT decision makers still do not have a system in place to measure environmental impacts [28].

Within the ICT sector, telecommunications networks provide the fundamental support to all modern communications due to the rapid growth in the use of the internet, data processing and transfers, mobile communications, etc. This is leading to significant increases in both energy use and GHG emissions. However, most of the electricity used to power telecommunications networks around the world is still produced by burning fossil fuels and increased energy consumption means increased amounts of GHG emissions. As a part of telecommunications networks, telecom companies have an influence on the environment and a responsibility to manage that influence. Telecom operators may still use fossil fuels for heating, vehicles and to produce part of the electricity they need and they therefore generate significant amounts of direct GHG emissions [29]. According to some authors, telecom companies are already ranked among the top three electricity consumers nationally in most EU countries [30] and ranked second place within the ICT sector regarding direct GHG emissions plus indirect GHG emissions from consumption of purchased electricity, heat and/or steam [13]. The energy demand of the telecommunication networks can create a serious environmental burden, and this trend is expected to continue due to rapid diffusion of mobile applications and the internet of things.

Because it is expected that the importance of GHG emissions will grow in the future [29], many initiatives related to their reduction have already been taken by telecommunications companies in various countries which include some of the biggest national companies such as, British Telecommunications, Deutsche Telekom AG, Telekom Austria AG, Magyar Telekom Nyrt and others. Besides CO_2 emissions, the ICT sector may face increasing regulatory limitations on the releases of other GHGs including SF_6 and PFCs during manufacture, use and end-of-life stages [22]. In the context of these trends, energy efficiency measures are gaining increased importance.

However, to establish relevant climate policy and effective corporate climate change strategy, organizations need robust numerical data to understand their company's GHG impact. This includes a detailed determination of sources and quantities of GHG emissions caused by the organization's direct and indirect activities. Among applicable tools, different 'footprints' have been developed to be used as indicators of environmental impacts of products, services and organizations [31–33]. Among these methodologies, the carbon footprint (CF) has become a very popular approach worldwide. Carbon footprint is a term used to describe the total amount of greenhouse gas emissions (GHG) caused directly and indirectly by an individual, product, event, activity, organization or country [34–39]. It has become one of the most widely used and discussed environmental indicators in the business sector. Applied to an organization, it measures the direct and indirect GHG emissions arising from all activities across an organization [40]. Determination of the GHG emissions improves management's understanding of the company's emissions profile and can facilitate better decision making on climate policy. It allows businesses to focus on achieving the most meaningful reductions, not only from within their operations, but across whole value chain(s). Thus, information obtained by CF determination can additionally serve as a useful parameter within the company's wider energy efficiency measures [41]. However, a limited focus on direct emissions from a company's own operations may miss major GHG risks and opportunities, while leading to a misinterpretation of the company's actual GHG impacts. This was confirmed by different authors showing that scope 3 emissions often represent a company's biggest GHG impact and ignoring them will generally lead to large underestimates of GHG emissions [42,43]. In