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Telecom Industry and its Carbon foot print

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Abstract

Greenhouse gases are emitted through several sources viz. transport, land clearance, and the production and consumption of food, fuels, manufactured goods, materials, wood, roads, buildings, and services. In simple term, it is often expressed in terms of the amount of carbon dioxide, or its equivalent of other GHGs, emitted in the environment. Most of the carbon footprint emissions for the average U.S. household come from "indirect" sources, i.e. fuel burned to produce goods far away from the final consumer. These are distinguished from emissions which come from burning fuel directly in one's car or stove, commonly referred to as "direct" sources of the consumer's carbon footprint. The word carbon footprint originates from ecological footprint, discussion, which was developed by Rees and Wackernagel in the 1990s which estimates the number of "earths" that would theoretically be required if everyone on the planet consumed resources at the same level as the person calculating their ecological footprint. However, carbon footprints are much more specific than ecological footprints as it measures direct emissions of gasses that cause climate change into the atmosphere.

Keywords: Carbon footprints; emission; greenhouse.

1. Introduction

A carbon footprint is generally defined as "the total sets of greenhouse gas (GHG) emissions caused by an organization, event, product or person."

However, calculating the total carbon footprint is near impossible due to the large amount of data required and the fact that carbon dioxide can be produced by natural occurrences too. It is for this reason that Wright, Kemp, and Williams, writing in the journal Carbon Management, have suggested a more practicable definition:

"A measure of the total amount of carbon dioxide (CO2) and methane (CH4) emissions of a defined population, system or activity, considering all relevant sources, sinks and storage within the spatial and temporal boundary of the population, system or activity of interest. Calculated as carbon dioxide equivalent (CO2e) using the relevant 100-year global warming

potential (GWP100)."1 The name of the carbon footprint find it origin from ecological footprint, discussion, which was developed by Rees and Wackernagel in the 1990s which estimates the number of "earths" that would theoretically be required if everyone on the planet consumed resources at the same level as the person calculating their ecological footprint. However, carbon footprints are much more specific than ecological footprints since they measure direct emissions of gasses that cause climate change into the atmosphere.

2. Literature review

Human beings exert tremendous pressure on our earth, from which there has been a severe damage caused to the natural environmental system, and global environmental change due to excessive carbon emissions is one of the most important changes. The impact of global environmental change has been a topic of interest for many researchers in different fields. Among the various effects, the impact of climate change on human health is of greatest concern and has attracted close attention (McMichael et al., 2006; Haines et al., 2006). The major risks posed by climatic change to human health may have both direct and indirect causes and the major possible health risks could be:

1. Effects of heat waves and other extreme events (cyclones, floods, storms, wildfires);
2. Changes in patterns of infectious disease;
3. Effects on food yields;
4. Effects on freshwater supplies;
5. Impaired functioning of ecosystems (for example, wetlands as water filters);
6. Displacement of vulnerable populations (for example, low lying island and coastal populations);
7. Loss of livelihoods (McMichael et al., 2008).

LCA study essentially consists of four interconnected steps/phases (ISO 14040, 2006):

- Goal and scope definition
- Inventory analysis
- Impact Assessment
- Interpretation

Further details about life cycle assessment (LCA) can be found in (Muthu et al., 2009; SETAC, 1993; Fava et al., 1991; ISO 14040, 2006; ISO 14044, 2006). Shopping bags, as an example of unnecessarywaste, require LCA to assess the environmental impact in terms of their carbon footprint. A large number of studies have been conducted to investigate the LCA of various shopping bags (Muthu et al., 2009, 2010b; Brower et al., 1999; Chaffee and Yaros, 2007; Ecobilan, 2008; Nolan ITU et al., 2002; Excel Plas et al., 2004; James and Grant, 2005; FRIDGE; Los Angeles County Department of Public Works, 2007; Paper vs. Plastic Bags, 1990; Ellis et al., 2005; www.sustainability-ed.org). Most of the studies focused on plastic and paper bags. However, very little work has been done on nonwoven and woven bags compared to plastic and paper bags. And also there have been no published articles till date focusing primarily on the carbon footprint created by shopping bags. Research into the influence of the consumer‘s attitude and governmental policies on this is entirely lacking. Consumer behaviour and governmental policies play an important role in the disposal stage of shopping bags. Notwithstanding the capability of certain types of bags to be recycled and reused, it is in the hands of customers to reuse a bag until it can be discarded or recycled, i.e. to reuse the shopping bags many times till they can be disposed of and to keep them in recycling bins provided by the government, rather

than dispose to landfill, which is detrimental to the environment as far as eco-impact is concerned. It is the responsibility of government to provide more recycling options and viable policies to set things in place in terms of recycling.

Frequent promotion of recycling options by government and the behaviour of the consumer to reuse the shopping bags till they can be discarded is crucial in reducing the carbon footprint.

A literature search in June 2007 for the term "carbon footprint" (i.e. where these two words stand next to each other in this order) in all scientific journals and all search fields covered by Scopus2 and ScienceDirect3 for the years 1960 to 2007 yielded 42 hits; 3 from the year 2005, 8 from 2006 and 31 from 2007. Most articles deal with the question of how much carbon dioxide emissions can be attributed to a certain product, company or organisation, although none of them provides an unambiguous definition of the term carbon footprint. In most cases 'carbon footprint' is used as a generic synonym for emissions of carbon dioxide or greenhouse gases expressed in CO2 equivalents. The concept of a carbon footprint captures the interest of businesses, consumers, and policy makers alike (Lash, J.; Wellington, F). Investors watch the carbon footprint of their portfolios as an indicator of investment risks. Purchasing managers are curious about the carbon footprint of their supply chains, and consumers are increasingly offered carbon-labeled products. Carbon footprints have become popular in spite of the term being a misnomer; it refers to the mass of cumulatedCO2 emissions, for example, through a supply chain or through the life-cycle of a product, not some sort of measure of area (Hammond, G). It is most appropriately calculated using life-cycle assessment or input-output analysis (Matthews, H. S.; Hendrickson, C. T.; Weber, C. L, Weidema, B. P.; Thrane, M.; Christensen, P.; Schmidt, J.; Lokke, S). Given the interest in the carbon footprint (CF) of products, services, companies, and investment portfolios, there have been surprisingly no consistent comparative studies to understand our collective carbon footprint on a national or global level. What consumption categories cause the CF? How does the contribution of different activities vary across regions and stages of development? Studies on the importance of consumption categories and product groups have been instrumental in focusing Integrated Product Policy on housing, transportation, and food. One study (Tukker, A.; Jansen, Huppes, G.; De Koning, A.; Suh, S.; Heijungs, R.; Van Oers, L.; Nielsen, P.; Guinee,

The Intergovernmental Panel on Climate Change (IPCC) presents an extensive analysis of the sources of greenhouse gas emissions (Metz, B.; Davidson, O. R.; Bosch, P. R.; Dave, R.; Meyer, L. A). There is no consideration, however, of the ultimate purpose of production activities that cause greenhouse gas emissions. Only the transportation chapter addresses emissions connected to the production of transportation fuels, focusing on well-to-wheel analysis. It ignores, however, the production of the vehicles. As we show in the Supporting Information, the production of motor vehicles alone emitted 800 million metric tons of CO2 equivalent (MtCO2e) in 2001, comparable to aviation. To get a proper picture of the carbon footprint of transportation, one must include the production of the vehicles. Life-cycle assessments show that about half of the GHG emissions of car manufacturing are related to materials (Schweimer, G. W.; Levin, M), and because car manufacturing has complex international supply chains, a detailed analysis of the emissions from the production of imported products is essential. Hence, a global trade-linked methodology is necessary to correctly attribute the IPCC emission sources to consumption activities.

Haven (2007) mentions the carbon footprint analysis of an office chair as a "life-cycle assessment which took into account materials, manufacture, transport, use and disposal at every stage of development."4 This hints at a more comprehensive approach, rarely described in other articles.

However, there is no definition or methodological description. Eckel (2007) points out that the "Assessment of a business' carbon footprint is … not just calculating energy

consumption but also with increasing every scrap of data from every aspect of the business practices." Again, no clear scope of analysis is provided.

While academia has largely neglected the definition issue, consultancies, businesses, NGOs and government have moved forward themselves and provided their own definitions. In the grey literature is a plethora of descriptions, some of which are presented in Table 1.

In the UK, the Carbon Trust5 has aimed at developing a more common understanding what a carbon footprint of a product is and circulated a draft methodology for consultation (Carbon Trust 2007, see definition in Table 1). It is emphasized that only input, output and unit processes which are directly associated with the product should be included, whilst some of the indirect emissions – e.g. from workers commuting to the factory – are not factored in. Life-cycle thinking can be found in many other documents and seem to have developed into one characteristic of carbon footprint estimates. A standardization process has been initiated by the Carbon Trust and Defra aimed at developing a Publicly Available Specification (PAS) for LCA methodology used by the Carbon Trust to measure the embodied greenhouse gases in products (DEFRA 2007). Below, we discuss the pro's and con's of various methodologies.

The Global Footprint Network, an organization that compiles 'National Footprint Accounts' on an annual basis (Wackernagel et al. 2005) sees the carbon footprint as a part of the Ecological Footprint. Carbon footprint is interpreted as a synonym for the 'fossil fuel footprint' or the demand on 'CO2 area' or 'CO2 land'. The latter one is defined as "The demand on incapacity required to sequester (through photosynthesis) the carbon dioxide (CO2) emissions from fossil fuel combustion. … [It] includes the biocapacity, typically that of unharnessed forests, needed to absorb that fraction of fossil CO2 that is not absorbed by the ocean." However, while individual documents have used such a landbased definition, for example the Scottish Climate Change Strategy (see Scottish Executive 2006), it has not changed the common understanding of the carbon footprint as a measure of carbon dioxide emissions or carbon dioxide equivalents in the literature.

"*The carbon footprint is a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product.*"

The definition provides some answers to the questions posed at the beginning. We include only CO2 in the analysis, being well aware that there are other substances with greenhouse warming potential. However, many of those are either not based on carbon or are more difficult to quantify because of data availability. Methane could easily be included, but what information is gained from a partially aggregated indicator, that includes just two of a number of relevant greenhouse gases? A comprehensive greenhouse gas indicator should include all these gases and could for example be termed 'climate footprint'. In the case of 'carbon footprint' we opt for the most practical and clear solution and include only CO2.

3. Carbon footprinting—opportunities and threats

There are surprisingly many people out there that obviously think that carbon footprint is a new thing. They obviously are not aware of the fact that it has been around for decades—just being called differently, i.e. the result of the life cycle impact category indicator global warming potential (GWP). However, carbon footprinting (CFP) is really fashionable these days. Like with all fashion, not all that glitters is gold.

Taking carbon footprinting as the one and only yardstick, one has to face life-threatening trade-offs. If carbon footprint is the way to go, we need to shut down each waste-water treatment plant in the world, because it leads to an increased carbon footprint. You should also tear out the catalytic converter and diesel particulate filters from cars, because they lead to a higher CFP. Nuclear power would be obviously a most preferable energy generation option, because it has a lower carbon footprint than even most renewable energy sources—at least based on information provided by pertinent EPDs (Vattenfall 2005; 2007a, b). Recycling paper should be stopped, because compared to virgin paper with a carbon footprint close to ‗zero', it comes with a higher burden—unless renewable energy is used for the processes necessary (Carbon Trust 2006). But, on the other hand, we have the market demand. Whether it is real or just perceived or just desired seems not so important. There is enough momentum for numerous international, national and sectoral initiatives underway to deal with CFP:

- ISO started developing an international standard ISO 14067 on Carbon Footprint of Products (Part 1: Quantification, Part 2: Communication) and there is already a proposal for a standard on Carbon Footprint of Organisations.

- The World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) develop two standards under their Greenhouse Gas Protocol Product/Supply Chain Initiative: A Product Life Cycle Accounting and Reporting Standard and a Corporate Accounting and Reporting Standard: Guidelines for Value Chain (Scope 3) Accounting and Reporting.

- The UNEP/SETAC Life Cycle Initiative launched a project group on carbon footprinting.

- The British Standards Institution published a Publicly Available Specification (PAS) to specify requirements for assessing the life cycle greenhouse gas emissions (GHG) of goods and services. The development of this PAS was co-sponsored by the Carbon Trust and the Department for Environment, Food and Rural Affairs (PAS 2050 2008).

- The Japanese Ministry of Economy, Trade and Industry (METI) launched a carbon footprint trial project and a Technical Specification ―General principles for the assessment and labelling of Carbon Footprint of Products‖ will be issued shortly.

- and many more like, e.g., the Korean Product Based Reduction Scheme, the European Commission Project on ―carbon footprint measurement toolkit‖ for the European Union Ecolabel, the potential carbon products footprint software developed by Bilan Carbone (ADEME, France), the methodology project of the German Ministry of Environment or the carbon footprint methodology of the New Zealand Ministry of Agriculture and Forestry.

All these initiatives try to serve an increasing market demand for ‗climate relevant' information along supply chains and towards consumers. From an application and communication side, there are numerous questions and issues to deal with. However, whether a certain number of CO2 equivalents on the packaging of a food product make sense or not, whether the term ‗footprint' has any meaning or not or why it is a footprint and not a fingerprint—all these questions are outside the scope of this journal. But the potential communication to consumers raises many issues with regard to quantification as well.

4. Scientific relevance and challenges

When we try go a bit deeper into contents, there are several interesting aspects of carbon foot printing— some of them even very scientific in nature. Some core questions and challenges that were raised in the recent meeting of the ISO Working Group dealing with the standardization of the quantification included the following issues:

- Scope of emissions shall all GHGs specified by IPCC 2007 or only the six GHG gases of Kyoto Protocol be considered?

- Life cycle stages while a general understanding is that CFP should relate to the life cycle using process-based data, the inclusion of the use phase might be controversial between business-to-business and business-to-consumer perspectives. If included, how can use phase profiles be defined in a meaningful way?

- System boundaries How to specify cut-off criteria? Materiality threshold or GHG threshold? How to deal with employees transport? Time boundaries can be challenging as well, especially for agricultural products.

- Offsetting- Shall offsetting be included in the calculation or not? Is the use of renewable energy a type of offsetting or not?

- Data Even though there was broad agreement to use process-based data linked to technical processes, not data linked to money flows, there are still fundamental issues: Which data sources? Share of primary activity data and secondary data? Are any operational data quality requirements possible?

- Allocation Is there any progress or further specification possible compared to the existing ISO 14040 procedures? For system expansion, how can the identification of an avoided product system be qualified?

- End-of-life How to define end-of-life scenarios? Recycled content approach on the product level or average recycled content on the material level?

- Carbon storage How to deal with carbon storage, carbon capture, carbon sequestration?

- Land use change Shall emissions arising from direct land use change be included or not? Shall changes in soil carbon (source or sink) be included or not?

Climate change

"Climate change refers to a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."

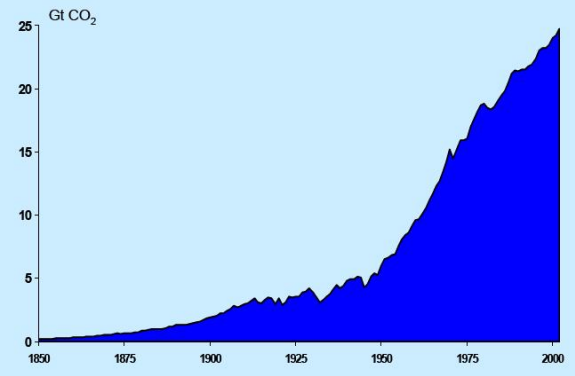

Figure 1 Global CO2 emissions from fossil fuel burning and cement over the long-term40

CO2 is released from the burning of fossil fuels such as gas, oil and carbon. The amount of CO2 released is strictly related to the amount of fossil fuel that has been combusted and cannot be destroyed in any way.6 Figure 1 illustrates the change in the amount of CO2 that has been released into the atmosphere from the pre-industrial age until today. Currently, atmospheric levels of CO2 are rising by over ten percent every 20 years. The result of this is known as the enhanced greenhouse effect which is a warming of the earth's surface and lower atmosphere. CO2 is responsible for over 60 percent of the enhanced greenhouse effect.

The natural greenhouse effect on the other hand is a prerequisite for life on earth. Without it, the temperature would be 35°C colder at the earth's surface. The most common greenhouse gases (GHG) are CO2 and water vapour. They prevent some of the infrared radiation from the earth from leaving the atmosphere, which results in a warmer climate. The phenomenon can best be explained with figure above.

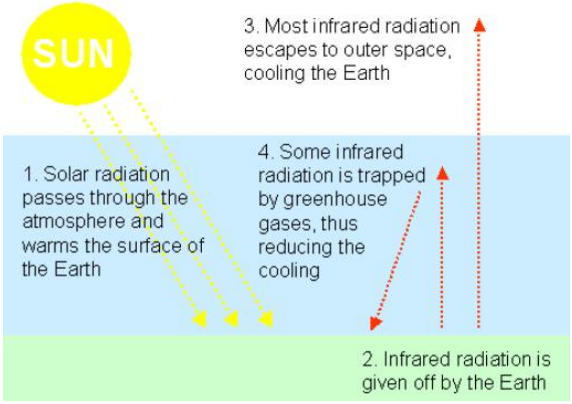

Figure 2 The greenhouse effect

Although the greenhouse effect is a natural phenomenon, it is now due to the increased emissions starting to become a threat to the planet. So far it has resulted in an increase of 0.8°C in the average temperature of the earth since the end of the 19th century. The rise in temperature has more effects than the melting of ices, which cause a rise in sea level. Higher temperatures are also expected to expand the range of some dangerous vector-borne diseases, such as malaria, cause extinction of many endangered species and bring about disruptions in food supply etc.

In addition, a rise in temperature will be accompanied by changes in climate concerning cloud cover, precipitation, wind patterns and the duration of seasons. Several long-term changes in the climate have been observed including extreme weather such as droughts, heavy precipitation, heat waves and the increased intensity of tropical cyclones. The link between the increased amount of GHG in the atmosphere and the climate change as well as the effects of climate change, are illustrated in figure below.

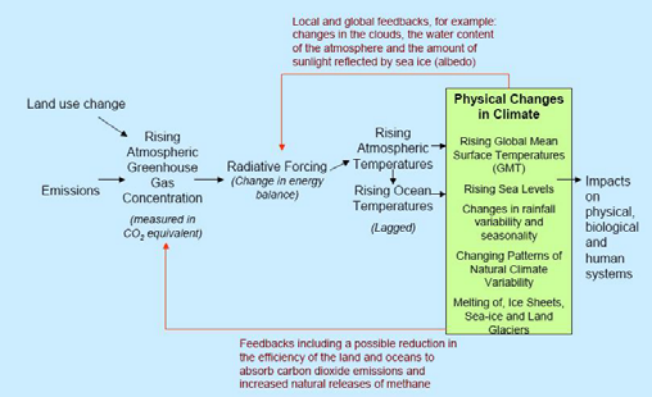

Figure 3 The link between climate change and greenhouse gases

Stakeholders that can make demands on the company's environmental work. The roles of governments as regulator, facilitator and buyer have to provide them resources to help preserve the environment. They can influence the companies' and the consumers' actions in a number of ways and it is desirable too in larger public interest. Monetary in terms of taxes and subsidises, regulatory such as making some standard smandatory or regulating the maximum emission levels and finally communication policies, making the consumers more aware of the consequences of their choices. With the right mix of policies, these can work as incentives for companies to invest in newer Green technology. The emission trading system is one example of a policy that is regulatory as well as monetary. The aim with such system should be on reducing the emissions in the most cost effective way. An actor say companies, industries or even government that needs to pay a significant amount of money in order to reduce the emissions can instead purchase carbon credits from another actor who can reduce the emissions to a lower cost. An actor that does not need all the carbon credits can sell them to another actor. As the number of carbon credits is limited and the total number of carbon credits assigned will decrease, the system will lead to a reduction of the total emissions.

Activities on a micro level are not only made as response to governmental actions. For businesses that early adopt preventative actions it can help generate marketing advantages due to the increasing demand for ―green‖ products in the marketplace.

Telecom Industry

Thus far, the telecommunications industry has deployed mobile networks that have focused mainly on the needs of retail consumers. These networks have advanced considerably from their analogue origins to encompass 3G mobile networks, broadband wireless networks such as WiFi and WiMax, and are now progressing towards LTE 4G networks. While wireless networks have evolved to support the needs of the mobile user, new applications for mobile data are emerging. Recently, the power and energy distribution industry have commenced transformations of their electrical networks to build intelligence within their electricity grids. These new networks augment the electrical power network with telecommunications infrastructure. In effect, the electrical power grid and communications technology are converging to form the intelligent grid traditionally, the telecommunications operators have offered several alternative mobile network solutions for enterprise and retail customers. Although recent 3G and wireless networks have boasted a significant broadband capability, these networks have been largely overlooked by energy companies seeking to wirelessly enable their smart grids. Often, the telecommunications operator is viewed as an option for _difficult to access customers or as a backhaul mechanism for localized mesh radio or power line carrier solutions. Instead, energy distributors have tended to deploy their own wireless infrastructure to support their grid transformations. There are several factors that have contributed to this deployment approach including the need to support several thousand simultaneous devices, higher qualities of service, and priority for mission-critical data traffic.

Indian Telecom Industry Contributes Less Than 2% of the Total Green House Gas Emissions

The recent claims with regard to the information on the diesel consumption, by the Indian Telecom Industry are erroneous and misleading. It is factually incorrect to say that Telecom industry uses the maximum amount of diesel. The Railways, Defence as well as unorganized sectors such as transportation (trucks) use much more diesel. Facts reveal that Telecom industry‘s carbon footprint contribution across the World is less than 2%.

As per the recent report by SMART 2020; enabling the low carbon economy in the information age report by the Climate Group. The facts about the global emissions are ;

- The Global ICT carbon footprint is relatively small at 1.43%
- India is included in Rest of the World (RoW) with other countries i.e, India, Brazil,
- South Africa, Indonesia and Egypt with the share of all being only 27% of 1.43%
- Sector-Wise CO2 (eq) emissions in India – Agriculture, Electricity, Transport and
- Cement account for 83% of CO2 emissions in India.
- Given that telecom is a part of ―Other Industry‖ which contributes just 9% of CO2 emission in India. Share of Telecom sector in the overall CO2 emissions is negligible

- Even if telecom sector was to change overnight, the overall impact on the carbon footprint will not be material.

While we need to acknowledge the Industry consumes a significant amount of diesel and it has been because of the facts that it is the only Industry and vital infrastructure service which is required to be made available 24x7, 365 days to consumers..

In absence of the grid supply especially in the rural areas where there is no grid connectivity at all. To overcome this gap both the consumer and industry have to rely on off-grid power methods. The most popular of these is diesel generators because these are the most widely available generators and also because compared to other available fuels like petrol, kerosene etc. diesel is the least polluting. To minimize the environmental impact, all operators first use battery power and switch to diesel generators once the battery runs out. Approximately 30% of the opex cost for all companies is attributed to the fuel consumption for running the network. Therefore the industry has all the incentive to push for the renewable energy sources which promise economies of scale and are easily available and affordable. Industry has already taken several initiated significant activities aimed at reducing their reliance on the diesel and fossil fuel consumption. Details of which can be found in the COAI presentation enclosed herewith.

It is evident that the CO2 emissions from the Indian telecom sector are abysmally low and are ALREADY ON THE GREEN TRACK and the industry should keep their activities on such track in time to come too.. The Industry is committed towards clean & green practices and looks forward to significant support from the government.

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