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MSc. Energy and Environmental Management

Defining Carbon Neutrality

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# Executive Summary

The Greenhouse Gas Protocol (GHG Protocol) developed the Corporate Accounting and Reporting Standard, which provides standardised framework aimed at the calculation of emissions from various organisations (private and public), including non-profit ones. It is also possible to determine a carbon footprint at an individual level by using online calculators on certain websites. However, due to a lack of standardisation, different calculators using different methodologies lead to different results in terms of emissions.

The unavoidable emissions can be offset through four major kinds of carbon market: trade in emissions allowances and project-based transactions, which can be either Kyoto-compliant or not. Some studies have provided evidence of the difficulties in following the path of money intended to be used to support voluntary carbon offsetting projects, and there is also the possibility that the offsetting will take place sometime in the future, not immediately.

Due to many uncertainties such as those listed above, the concrete concept of carbon neutrality seems non-existent. This plethora of well-intentioned eco-friendly initiatives to reduce GHG emissions and provide offsets should rather be referred to as “climate-friendly” instead. However, any attempt to reduce emissions and save the world from the catastrophic predicted consequences of climate change is worth considering.

# Introduction

Carbon-neutral, considered 2006’s “Word of the year” by Oxford Dictionaries (2006), is defined by that reference work as an adjective that means “*Making or resulting in no net release of carbon dioxide into the atmosphere, especially as a result of carbon offsetting*.”. However, there has been some debate as to whether the concept of carbon neutrality can be understood as “cancelling out” the harm done to Earth’s atmosphere through offsetting in a sort of “equal but opposite behaviour” (Murray & Dey, 2009) and as a corporate benchmark for companies (Vandenbergh & Steinemann, 2007).

Since the term began to increase in popularity, many companies have publicly declared themselves as carbon-neutral. A UK company (1), for example, invested £200 million over five years (2007–2012) on its sustainability project, which included reducing energy usage, managing waste and offsetting in order to become carbon-neutral in 2012 (Anonymous 1, 2012). Another company (2), also declared itself to be carbon-neutral in 2010 following a plethora of emissions reduction initiatives and compensation of direct and indirect emissions through offsetting projects in Africa (Anonymous 2, 2010).

Although the definition provided above is stated in a renowned dictionary, it seems very restricted in its exclusive reference to carbon dioxide (CO2) and the simplicity of offsetting remaining emissions. Why are other gases that contribute to climate change and whose emissions are limited by the Kyoto Protocol (UN, 1998) not included? Is carbon offsetting the main special way to achieve net zero carbon emissions and neutralise carbon?

This report will review, with light criticism, the real meaning of the term carbon-neutral, pointing out the difficulties in defining boundaries as recommended by an internationally recognised standard, the role of the carbon-offsetting business and the true value of the offsetting projects offered, in order to reach a definition of carbon neutrality.

# Setting the boundaries and accounting greenhouse gas (GHG) emissions

The first step towards carbon neutrality is to define boundaries and to account all the emissions from the activities or products one wishes to make carbon-neutral, i.e., to calculate the carbon footprint, which can be at a personal, business/organisation or product level, and should be expressed in tonnes of CO2 equivalent (CO2-e) (Carbon Trust, 2012).

However, despite the increase in usage of the term (in the media, governments and the business world), there seems to be a lack of consensus regarding a clear definition of what to include in the carbon footprint calculation. After an evaluation of several definitions and considerations, Wiedmann & Minx (2007) came up with a very straightforward concept for the term: “*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*.” (pg. 4). The authors argue that for practical reasons and clear solutions, they opt for the exclusive consideration of CO2 and maintain that if other GHG are to be included, then the term used should be “climate footprint”.

In its “Kick the Habit” report (2008), the United Nations Environment Programme (UNEP) presented a broader definition of carbon neutrality, in which they advocate the inclusion in the neutralisation idea of the other five GHG[[1]](#footnote-1), although CO2 is the most abundant and most emitted by anthropogenic activities, especially from consumption of fossil fuels. Therefore, they used the term “climate neutrality” instead.

In this case, perhaps the UNEP is correct to refer to this concept as climate neutrality – which comprises other gases along with CO2. Perhaps carbon’s abundance should not be ignored, but maybe there should be a dedicated term for each of the GHG limited by the Kyoto Protocol, whereby they would be accounted separately and neutralised as well (e.g. one should calculate the “methane footprint” in order to achieve “methane neutrality”). While such an undertaking is probably too laborious to be considered realistic, in this context, the term “climate” seems to be more appropriate.

## Organisational level

Regardless of which term (carbon-neutral or climate-neutral) an organisation chooses to work with, an essential step towards achieving the ultimate aim is to accurately assess their emissions of GHG.

There are various standardised frameworks developed by other organisations intended to guide companies in calculating their GHG inventory, thus reducing the effort associated with it and facilitating communication between companies and stakeholders. Some examples are the Carbon Trust, an independent third-party certifier which provides assistance in calculating GHG emissions and in the management of a strategy for the organisation worldwide (Carbon Trust, 2012); the UK’s Department for Environment, Food and Rural Affairs (DEFRA), which supports the UK’s organisations with a standard for calculating GHG emissions and recommendations for carbon offsetting (DEFRA, 2009); and the International Organization for Standardization (ISO), which has also developed a standard (ISO 14064) to address the quantification and reporting of GHG emissions (Wintergreen & Delaney, 2007).

All three types of organisation have one thing in common: their methodology is based on the Greenhouse Gas Protocol (GHG Protocol), the concept for which originated with the World Resources Institute and the World Business Council for Sustainable Development from the need for a consistent international standard on how organisations accounted and reported their emissions. GHG Protocol is a widely used international mechanism designed to quantify and report GHG emissions. The GHG Protocol Corporate Accounting and Reporting Standard provides a standardised framework aimed at the calculation of emissions from various organisations (private and public), including non-profit ones (GHG Protocol, 2004).

In this context, in order to guarantee the fulfilment of GHG Protocol accounting principles[[2]](#footnote-2) and the effectiveness of GHG management for further neutralisation, it is important to set clear organisational and operational boundaries and define which emissions will be included in the footprint (GHG Protocol, 2004).

The GHG Protocol (2004) established two approaches to define organisational boundaries: the Equity share, which will include emissions according to the organisation’s percentage of ownership of operations, and the Control approach, which accounts for 100% of the GHG emissions from activities over which an organisation has operational control. This latter approach categorises GHG[[3]](#footnote-3) emissions into three scopes:

* **Scope 1**: Direct GHG emissions, which result from activities within your organisation’s control, e.g. on-site fuel combustion
* **Scope 2**: Electricity indirect GHG emissions, e.g. emissions from the generation of purchased electricity consumed by the company
* **Scope 3**: Other indirect GHG emissions (optional) from sources outside the company’s direct control, e.g. extraction and production of purchased materials, transportation of purchased fuels, waste disposal

Assessing and quantifying emissions will highlight the sectors with the highest share thereof, providing the opportunity to implement mitigating activities to reduce them, thus taking a further step towards carbon neutrality, in addition to reducing financial costs by minimising energy usage and waste, for example.

The Publicly Available Specification (PAS) 2050 provides a consistent methodology to assist in the assessment and quantification of GHG emissions through life-cycle analysis (LCA) of products (services and goods) that could be considered under Scope 3 (BSI, 2011). Although inclusion of emissions under this Scope is optional and reductions can be difficult to accomplish, the decision to include them within the organisation’s carbon footprint calculation can bring benefits. By performing an LCA of a product, it may be possible to identify inefficiencies and areas for potential emissions reductions in the supply chain, and it can also lead to greater recognition from stakeholders, bringing financial benefits (Carbon Trust, 2012).

## Individual level

At an individual level, it is possible to find calculators available online to account one’s carbon footprint. Through a very simple questionnaire with direct questions, the user can enter superficial information regarding their own lifestyle, e.g. feeding habits, energy costs or journeys per year, and at the end the site will inform them of their total emissions (in CO2-e) and suggest some “green initiatives” that can be put into practice to reduce personal emissions.

Four examples of online calculators were tested (accessed on 13 December 2017): Calculator 1, Calculator 2, Calculator 3 and Calculator 4, to verify superficially their similarity and consistency of results. Noticeably, these calculators have different methodologies and approaches, some more specific than others, which immediately provide different results, i.e. different carbon footprints.

Consequently, how is it possible for someone to claim to be carbon-neutral when there is no standard method that would definitively appraise one’s carbon footprint? In terms of numbers, how would one know effectively how much should be neutralised? Furthermore, even on the assumption that all emissions are accurate, would that be enough to be considered carbon-neutral? The convergence between these calculators was that, except for one calculator, all three others offered offset projects right away in order to compensate for the unavoidable emissions.

This implied simplicity of merely paying some money for an offset project can dangerously contribute to a relaxation of the sense of commitment to the need for emissions reduction, as individuals may no longer make effort to change their own behaviour for the sake of the environment (Vandenbergh & Steinemann, 2007).

# GHG offsetting

“*Offsets are discrete GHG reductions used to compensate for (i.e., offset) GHG emissions elsewhere*” (GHG Protocol, 2004 pg. 98). An organisation or an individual seeking reduction for their unavoidable emissions or those emissions that are outside an organisation’s control or supply chain (e.g., Scope 3) have the opportunity to achieve this reduction though external mechanisms, which can be trade in emissions allowance or project-based transactions, both potentially being Kyoto-compliant or not (Table 1) (Jindal et al., 2006).

In this context, the theory of reducing emissions and neutralising the damage through a well-intentioned project enough to achieve zero net emissions can be very useful, especially for Parties committed to the Kyoto Protocol, as growth in energy demand becomes a challenge for governments, industry and communities looking to mitigate climate change (Newton & Tucker, 2010).

Table 1: Four major kinds of transactions under carbon markets (source: Jindal et al., 2006)

|  |  |  |
| --- | --- | --- |
|  | **Trade in Emissions Allowances** | **Project-Based Transactions** |
| **Kyoto-compliant** | *Trade in carbon offsets under European Union Emission Trading Scheme, UK – Emission Trading System* | *All Clean Development Mechanism and Joint Implementation Projects* |
| **Voluntary, not for compliance under Kyoto** | *Trade in emission reductions on Chicago Climate Exchange, NSW Greenhouse Gas Abatement Scheme* | *Voluntary reduction projects, such as carbon sequestration projects in Africa* |

Examples of a trade in emissions allowance system are the case of an installation using high levels of energy (e.g. power stations and industrial plants), or airline companies aiming to meet an obligatory reduction target under the Kyoto Protocol. In addition to Parties’ national measures already in place, the Protocol offers a formal and legal framework – the EU Emission Trading Scheme – which allows the committed Parties to buy or sell a limited amount of their “assigned amount unit[[4]](#footnote-4)” (AAU) on a “cap and trade” basis, and this cap undergoes a linear reduction per year. This is a way to limit GHG emissions and encourage activities to decrease them.

On the other hand, during an analysis of a carbon-offsetting method suggested by one of the online calculators they tested, Murray & Dey (2009) provided evidence of how difficult it can be to trace the path of money intended to be used to support carbon-offsetting projects and to assess to what degree such projects are already operational and validated by the appropriate organisations responsible for carbon-offsetting monitoring. The authors claim it is sometimes not easy to identify officially recognised Clean Development Mechanism (CDM) projects or to understand the real value of the project in reducing emissions. The authors also recognise the issues innate in promising to offset current emissions with future projects, the success of which is not guaranteed, but do at the same time accept that any contribution to a lowering of atmospheric GHG should be viewed as a positive development.

# Conclusion

Carbon neutrality is a term full of mystery and uncertainty. Many companies are adopting sustainable initiatives, seeking emissions reductions and offsetting the remaining emissions in the belief that they can properly claim themselves to be carbon-neutral and hence improve their image and popularity. However, this concept seems very simplistic and should go much further than this.

No doubt, along with climate mitigation, carbon neutrality can bring benefits to governments, industry and communities. But how can the zero net emissions be achieved if there are uncertainties regarding which emissions should be considered? If the numbers are not clearly specified, the ideology of zero emissions cannot be accomplished. Being described as carbon-neutral can almost be compared with having an environmental management system certified with the ISO 14001 standard, which has received criticism for being a marketing tool rather than an indication of a genuine improvement in a company’s environmental performance (Arimura et al, 2016; Barla, 2007).

Consequently, what is the relevance for the term carbon neutrality if there is no guarantee that 100% of the emissions will be neutralised? Despite the wide range of benefits that reducing emissions outside an organisation’s control can bring, the inclusion of emissions under Scope 3 will increase the total quantity of GHG emissions considerably (DEFRA, 2009). If becoming carbon-neutral means having zero net emissions, would it then be economically feasible for a company to invest in the required offsetting projects? What if a company opts not to include these emissions in the carbon footprint calculations? Is it appropriate for a company to be called carbon-neutral if only 50% of its activities achieved carbon neutrality?

Due to many uncertainties such as those listed above, the concrete concept of carbon neutrality seems non-existent. This plethora of well-intentioned eco-friendly initiatives to reduce GHG emissions and offsets should rather be referred to as “climate-friendly” instead.

Nevertheless, independent of the complexity of calculating one’s carbon footprint (personal, business or product), and therefore perhaps never achieving carbon neutrality per se, it would not be fair to ignore the good intention behind reducing emissions and mitigating climate change. Certainly, the situation would be worse without this effort, so any attempt to promote an environmentally friendly way to combine sustainable activities in this increasingly capitalist world is a very much welcome development, especially for future generations.

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1. Five other GHG whose emissions were limited during the Kyoto Protocol’s first commitment period that, together with CO2, contribute to climate change: methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulphur hexafluoride (SF6). For the second commitment period (2013–2020), the Protocol included nitrogen trifluoride (NF3) on its list of GHG emissions to be limited. [↑](#footnote-ref-1)
2. GHG Protocol’s accounting and reporting principles: Relevance, Completeness, Consistency, Transparency and Accuracy (GHG Protocol, 2004). [↑](#footnote-ref-2)
3. GHG emissions not covered by the Kyoto Protocol, e.g. CFCs, NOx, etc. shall not be included in Scope 1 but may be reported separately. [↑](#footnote-ref-3)
4. AAU = one metric tonne of carbon dioxide equivalent. [↑](#footnote-ref-4)