***Defining Carbon Neutrality – A Comparative Analysis of Approaches***

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**Introduction**

Carbon neutrality is a concept of growing significance across many areas of society. With increasing awareness of the environmental impacts of greenhouse gas emissions has come increased demand for products, services and activities which look to minimise and mitigate these impacts. Transferring these products, services and activities to methods which are carbon neutral (produce no net carbon emissions) is a key way of achieving this. The heterogeneous nature of the operations involved requires approaches to carbon neutrality that are flexible, wide-ranging and robust. With a view to establishing a definition of carbon neutrality, this study will evaluate and compare three approaches to achieving carbon neutrality: the Company A standard for carbon neutrality (COMPANY A standard); the Company B (COMPANY B) in partnership with United Nations’ (UN) Climate Neutral Now initiative; and Company C’s carbon neutral approach. The aspects that will be considered for comparison will be: who or what the approach is aimed at or applicable to; the methods for measuring the carbon footprint; how each approach looks to reduce carbon emissions; how targets are set; the justification for emissions offsetting; and how the carbon neutral claim is verified.

In an ideal world the environment would be recognised in its function as the primary life support system for society. In the planning of businesses, organisations, products, services or activities, carbon neutrality would be integrated into the design as part of a wider ethos of having a positive impact on the environment, or at least of environmental neutrality. However it is only now, roughly 175 years after the start of the industrial revolution, and almost 30 years after the first real recognition of the environmental problems associated (Brundtland Report, 1987), that a global shift towards action has emerged.

The Oxford English dictionary defines carbon neutral as: ‘Making or resulting in no net release of carbon dioxide into the atmosphere, especially as a result of carbon offsetting’ (Oxford Dictionary, 2016). This will be used as a working definition and will be assessed and elaborated on to form a conclusive definition, upon the consideration of the three approaches listed above.

**Background**

The organisations behind the three carbon neutrality approaches should be understood before their approaches are compared, in order to appreciate their context. The Company A (COMPANY A) is the United Kingdom’s national standards body, creating standards for business and industry based on best practice and built with industry and consumer involvement (COMPANY A, 2012a). COMPANY A also carry out certification of a range of management systems, and produce commissioned standards such as the STANDARD for carbon neutrality (COMPANY A, 2012a). The Company B (COMPANY B) is a non-profit organisation created and run by a group of businesses who provide voluntary carbon reduction and offsetting measures (COMPANY B, 2016). They aim to promote best practice through conformance to their code of best practice, on which guidance and advice is given to COMPANY B by an independent advisory board (COMPANY B, 2016). COMPANY B works in partnership with the United Nations (UN) to deliver the Climate Neutral Now initiative. Company C (COMPANY C) is a company providing environmental programmes (carbon offsetting) to its clients. COMPANY C was also a founding partner of COMPANY B but has developed its own approach for achieving carbon neutrality (the carbon neutral approach).

**Who or what is it for?**

The way different organisations go about achieving carbon neutrality will vary depending on that organisation’s activity or the product they wish to certify. It is important therefore, that any approach which claims to be applicable across a range of activities or organisations is broad enough in its scope to encompass this range and is still robust in its application.

The three approaches cover a range of applications, although generally focusing on businesses and organisations. COMPANY A STANDARD has the most comprehensive application – described as universal, it can be applied at any level from organisations or local authorities to individuals, to products, services, buildings, etc. (COMPANY A, 2014). COMPANY B and the UN’s Climate Neutral Now initiative is also applicable to a wide range of subjects, covering individuals, companies, organizations and events, with different approaches offered for each (UNFCCC, 2015a). The carbon neutral approach from COMPANY C is aimed at enabling businesses and organisations to develop an agenda towards achieving carbon neutrality for their operations, activities or products, and provides certification for the process (COMPANY C, 2016).

In only considering businesses and organisations, COMPANY C’s approach differs from the other two approaches considered here. A more targeted approach like this could be beneficial as it can be more prescriptive in its requirements, allowing for less room in interpretation of the aspects of the protocol. However, the broad approaches could gain more credibility from being applicable to all, where an individual can be encouraged by the fact that a large multi-national corporation is using the same approach as themselves to carbon neutrality. Indeed, this may motivate more individuals or small organisations to take up these broadly applicable standards, as the involvement of large, high profile organisations, can lend credibility to other subjects under the standard. The Climate Neutral Now initiative takes a different approach for individuals and small organisations within its own initiative, with a simple online calculator and carbon offset purchasing offer.

**Carbon Footprinting**

It is vital for an organisation to measure its carbon emissions or that associated with a product, if it wishes to become carbon neutral, in order for it to understand where the emissions are generated. This knowledge allows a targeted approach to the reduction and minimisation of emissions.

COMPANY A’s STANDARD standard requires the inclusion of greenhouse gas (GHG) emissions relevant to the subject as follows: 100% of Scope 1 (direct) emissions; 100% of Scope 2 (indirect) emissions; and Scope 3 emissions making up more than 1% of the total carbon footprint (COMPANY A, 2014a). The standard has the additional requirements that: the measured carbon footprint must account for at least 95% of the subject’s emissions; the 95% rule applies to the remainder of emissions where one source is responsible for more than 50% of the total; and that all exclusions and their justification must be documented (COMPANY A, 2014a). A list of example footprinting methodologies that meet the requirements of STANDARD are offered in Annex C of the standard, consisting of the international and British standards for carbon footprinting and other methodologies as relevant to the different applications of the standard (organisations, products and Services, land use, and projects) (COMPANY A, 2014a). This is a robust approach to carbon footprinting, encompassing broad accounting boundaries, which provides the basis for a credible carbon neutral certification.

Climate Neutral Now’s approach to carbon footprinting differs between large organisations and small organisations or individuals. Individuals and small organisations can use the online footprinting tool to calculate their carbon footprint based on: the country of residence; number of persons; and time period for footprint – for a simplified calculation (UNFCCC, 2015b). The calculator also offers a more detailed calculation, including the simplified parameters in addition to: weekly miles travelled in different transport modes; a qualitative measure of recycling for waste associated emissions (recycle almost all, much, or hardly any); emissions associated with energy use from electricity consumption and heating (from fuel type and floor area); and a qualitative measure of lifestyle from preferred diet (meat lover, vegetarian, or vegan), mostly buy local produce (yes or no), and mostly buy organic produce (yes or no) (UNFCCC, 2015b). It should be noted that air travel is not included and users are directed to the Company F’s carbon emissions calculator (COMPANY F, 2016). This is a reasonable direction as air travel is an emissions intensive activity and for those who fly regularly, the associated emissions will likely be the biggest single source of emissions, so it is important to use this more accurate route based calculator for a closer emissions estimate for air travel. However, there is no way to then include the result in the emissions offset which is offered at the end of the Climate Neutral Now calculator, and no offset is offered through the COMPANY F. The individual and small organisation approach to carbon footprinting from Climate Neutral Now is too over simplified to provide an accurate measure, thus an associated claim of carbon neutrality cannot be given credibility in this respect. However, it does facilitate action from individuals and small organisations who may otherwise be discouraged by the complexity of carrying out an in depth carbon footprint assessment, while offering the credibility associated with large, high-profile organisations explained above. Through the Climate Neutral Now initiative, large companies and organisations are directed to COMPANY B and a range of environmental management companies for advice on measuring their carbon footprint. An organisation following this path could measure their carbon footprint in a relatively unregulated manner, potentially allowing for a carbon neutral claim associated to the initiative which does not have great integrity.

The carbon neutral approach from COMPANY C requires the measurement of the subject’s carbon footprint to be carried out in accordance with different standards as appropriate to the subject. The GHG Protocol is one standard which can be used for entities, products, or activities, and is produced by the Company E (COMPANY E) and Company D (COMPANY D), based on the principles of relevance, completeness, consistency, transparency and accuracy (COMPANY D/COMPANY E, 2004). Other standards meeting the requirements of the carbon neutral approach include the Company G (COMPANY G) 14064-1 specification for carbon footprinting in organisations (COMPANY A, 2012b), and COMPANY G’s 14067 technical standard for carbon footprinting of products (COMPANY A, 2014b), amongst others (COMPANY C, 2016). Boundary setting for the carbon footprint is defined and comprehensive, although flexibility in product footprinting is allowed for ‘cradle to customer’ or ‘cradle to grave’ subjects, and for all applications is required to be ‘consistent with the definition of the subject’ (COMPANY C, 2016, p.25). Similar to the STANDARD method, this is a robust and globally recognised approach to carbon accounting that can build the framework for a carbon neutral certification with integrity.

**Emissions Reduction**

The reduction of carbon emissions associated with an organisation, product or activity can offer the benefits of increased efficiency. It is obvious that a business that can produce its products or deliver its services while reducing the amount of energy used for example, stands to increase profits. This in itself provides motivation for an organisation to reduce its energy consumption, although it falls foul of the laws of diminishing returns. As further reductions in energy consumption are sought, the measures employed to increase efficiency further or implement low or zero carbon technologies increase in cost.

The COMPANY A’s STANDARD standard requires subjects to use a carbon footprint management plan in order to formulate a reduction strategy and reduce their emissions output, and also requires that reductions are calculated and their nature (overall, activity based, or intensity based) stated in the qualifying explanatory statements used to justify the carbon neutral claim (COMPANY A, 2014a). Crucially, the standard considers that transferring aspects of an operation to a third party does not count as a reduction in emissions, unless the change results in an actual emissions reduction (counting the third party’s operation) (COMPANY A, 2014a).

The Climate Neutral Now initiative includes reduction as a feature, acknowledging the need to reduce emissions output (UNFCCC, 2015a). Again, the initiative directs businesses and large organisations to COMPANY B and a range of environmental management companies for advice on reducing their emissions output (UNFCCC, 2016). Although, for small organisations and individuals, there is no offer or link to advice on how to reduce their emissions linked to the online calculator, which is a weak point and a missed opportunity for a global initiative with the weight of the United Nations behind it.

Actual (internal) emissions reductions are also advocated by the carbon neutral Protocol through a GHG reduction plan, but not explicitly required (COMPANY C, 2016). The requirement is for the reduction of net GHG emissions to zero using a ‘cost-effective combination of internal emission reductions and the use of external environmental instruments’ (COMPANY C, 2016, p.28).

As more entities look to reduce their environmental impact, driven by increasing consumer and stakeholder awareness and demand, the law of diminishing returns will be overcome to some extent, as the market forces make further efficiency drives (and associated emission reductions) financially viable. With respect to the working definition of carbon neutrality, a requirement for actual reductions in GHG emissions should be incorporated.

**Setting Targets**

Carbon neutrality as a concept is aimed at reducing the impact of humans on global climate change. The setting of targets is key to this, with each of the three approaches to carbon neutrality setting some form of target. Naturally the setting and achieving of a target is a clear method of demonstrating progress towards a goal. The overall goal in this sense is the limiting of global temperature rise to less than 2⁰C, set following the ratification of the Paris Agreement on the 5th of October 2016 (UN, 2016).

It is a requirement of the STANDARD standard that specific targets for GHG reduction are defined for the subject and that these should be given timescales for achievement, as part of the carbon footprint management plan (COMPANY A, 2014a). The Climate Neutral Now initiative shares the headline goal of the Paris Agreement, as would be expected from a UN initiative, but does not require the setting of specific targets by subjects. Under the carbon neutral approach, subjects are required to commit to net zero emissions over the period of carbon neutral certification, as a compulsory target (COMPANY C, 2016). Further targets for the setting of absolute reductions in emissions with preference to emission intensity reductions are recommended but not required (COMPANY C, 2016).

Figure 1: Conceptual cases with equal final CO2 emissions and equal final cumulative CO2 emissions over a defined period (T) (Chicco & Stephenson, 2012, p.21)

The STANDARD standard shows the strongest approach with respect to the setting of specific targets, being the only approach of those considered to require it. There is scope for further improvement in target setting as regards a comprehensive definition of carbon neutrality. A Chicco and Stephenson (2012) study advocates the setting of cumulative reduction targets over annual reduction targets for GHG emissions, due to the potential for different paths to the same annual reduction figure disguising different cumulative emission levels (as shown in Figure 1). This is based on the fact that cumulative emission levels represent the actual environmental effect, showing a closer relationship to global temperature rise (Chicco & Stephenson, 2012).

**The Role of Carbon Offsetting**

The offsetting of carbon emissions should be secondary to the avoidance of carbon emissions. Unless this hierarchical approach to achieving carbon neutrality is employed, the overall goal of minimising greenhouse gas emissions will not be achieved. It will be too easy for large corporations to choose to offset their emissions in preference to reducing them. The central driver for this is financial – as long as it is cheaper to offset carbon than avoid the emissions in the first place, this is what will happen.

This does not mean however, that the options employed for carbon offsetting are negative and indeed, some offsetting is necessary at least in the short term. At present most, if not all industries and activities supporting modern society involve the use of fossil fuels. While it is imperative that these support mechanisms for our society are decarbonised, in order to ensure a stable planet for current and future generations, it should be recognised that this process will take time. In light of this, carbon offsetting offers a method of limiting the impact of an organisations carbon emissions, until such time as these carbon emissions can be avoided.

The STANDARD standard explicitly does not allow carbon neutrality to be achieved through offsetting alone, apart from the first period of application (COMPANY A, 2014a). This compromise is made to encourage the uptake of the standard, and requires following periods of application to show actual reductions in emissions or emissions intensity (depending on the subject of application) (COMPANY A, 2014a). Allowing for subjects to bring forward their carbon neutrality claim solely by offsetting in the first application period has both positive and negative aspects. The positive aspects are that it promotes earlier tackling of emissions, allowing time for proper reduction strategies to be devised and implemented. It also allows time for the development of the behavioural aspect of emissions reductions and efficiency increases to become integrated across the organisation or operation, through training and awareness programmes. Another benefit of a flexible initial period is that it can be used to align subsequent application periods with financial years which makes accounting easier and comparisons to business performance more transparent. The same time period however, could also have a negative effect in allowing for an initial period where no actual reductions in carbon emissions are made, although some reductions could have been perfectly feasible. For example, the decision to switch to low energy lighting or optimised transportation routes could be made relatively easily and deployed on a timescale shorter than the initial period. Mitigating this to some extent is the flexible length of the initial period, with subjects encouraged to implement reductions as soon as possible. Other requirements for carbon offsets in the STANDARD standard are that they are: genuinely additional; permanent; not subject to leakage (do not result in GHG increases elsewhere); are not double counted; and are supported by substantiating documentation in these respects.

Emissions offsetting is at the core of the Climate Neutral Now initiative. Individuals and small organisations following this initiative are immediately offered offsetting with UN certified climate credits upon completion of the online footprint calculator (UNFCCC, 2015b). These certified emission reductions come from the UN Clean Development Mechanism (CDM), funding renewable energy projects, recycling and waste facility projects, and energy efficiency projects, in developing countries (UNFCCC, 2016).

One of the projects listed under Climate Neutral Now has funded a hybrid and electric bus system in China (UNFCCC, 2015c). Additionality is a potential problem for carbon offsetting projects – the benefits provided by many of the projects are such that the recipient may have intended to carry them out independently and a lack of their ability (financially) to do so has to be shown in order to prove genuine additionality.

The requirements for offsetting contained in the carbon neutral approach are similar to those in STANDARD: additional; legally attributable; measurable; permanent; unique; and independently verified (COMPANY C, 2016). In addition, the protocol bans dammed hydroelectric schemes and certain hydrofluorocarbon destruction schemes from offsetting projects, due to sustainable development and leakage issues, respectively (COMPANY C, 2016).

All three approaches have fairly similar requirements for offsetting schemes, sharing many in common such as the Clean Development Mechanism. What is missing in terms of offsetting though, is a tighter restriction on projects that qualify for specific subjects. Although climate change is a global issue and the CDM promotes the additional benefits that come with projects in developing countries, aligning with the UN Sustainable Development Goals (SDGs) (UN, 2014), proximity is another issue that should be considered. A more effective way of reducing emissions may be to share the carbon credit funded projects out more evenly, allowing reductions to be made by offsets where the emissions are generated, helping to avoid a scenario where the developed world continues to justify high fossil fuel consumption through the funding of ever increasing offset projects in the developing world. This will be reflected in the comprehensive definition of carbon neutrality, which will limit offsetting more firmly to a secondary role.

**Verification of Claims**

In order for a claim of carbon neutrality to stand up to scrutiny and have credibility and integrity, it must be verified in some way. Some combination of third party auditing and public transparency provides the strongest backing to a claim of carbon neutrality.

STANDARD allows for verification of the carbon neutrality claim to be carried out through one of three methods: independent third party certification; other party validation (e.g. a trade body, or consultant); or through self-validation (applying COMPANY G 14064-1) (COMPANY A, 2014a). This range of verification methods enables the universal application of the STANDARD standard, by allowing those subjects without the financial ability for third party certification or other party validation to demonstrate conformance with the standard through the series of publicly available qualifying explanatory statements (QESs are required for all carbon neutral claims under STANDARD) (COMPANY A, 2014a). The standard does note the downside of this however, that if the self-validated claim is challenged, external validation may be required in order to prove the claim (COMPANY A, 2014a).

The Climate Neutral Now initiative is verified through a pledge, under which signatories are required to report their estimated GHG emissions, strategies for reductions, and offsetting every two years (UNFCCC, 2015c). This promotes a more ambassadorial role towards carbon neutrality, relying on the signatories own motivation in terms of the robustness of the approach they take.

The CarbonNeutral® certification process can be carried out either by COMPANY C themselves or by a secondary certifier, as authorised by COMPANY C who apply a due diligence process in assessing the suitability of a would-be secondary certifier (COMPANY C, 2016). Subjects are also recommended but not required to make their GHG inventories available to the public (COMPANY C, 2016). In not requiring full public disclosure of the methodologies employed in achieving a carbon neutrality claim, the carbon neutral approach lacks some of the transparency exemplified in the STANDARD standard. The reasoning behind this is likely to make the Protocol more appealing to businesses who may feel that disclosing full information on consumption and reduction measures could lead to the loss of a competitive advantage in their market. The protocol attempts to make up for this drop in credibility by tightening up requirements in other areas, such as the additional criteria for offsetting detailed above.

Verification is another aspect vital to making a robust and credible carbon neutral claim. Full public availability of the details of the claim in combination with independent third party auditing should form core aspects of the comprehensive carbon neutral definition.

**Conclusions**

The current approaches to carbon neutrality considered in this study represent a range of approaches relevant to the nature of their creators. The focus of STANDARD, being produced by a standards agency, is on a robust system that stands up to scrutiny and is widely applicable. However, it may not be realistic to apply the standard to individuals or small organisations which cannot afford third party auditing of their claim, as a self-verified claim does not carry the same weight. The UN’s Climate Neutral Now initiative is centred on gaining maximum participation in climate neutrality and is driven by action on climate change in addition to SDGs. Tackling a global problem with a global initiative is an appropriate response, although users should be aware that accuracy and subsequent effectiveness for individuals and small organisations using the online tool is reduced by its generality. COMPANY C’s carbon neutral approach is aimed at enabling businesses to help tackle climate change in a way which maximises the benefits to the subject and protects the business’ interests. This approach can create some distrust in the credibility of its claims, as outsiders may view it as a by-business for-business approach, particularly through the non-requirement for public transparency.

Carbon neutrality should be defined as: the measuring of the subject’s carbon footprint using a life cycle approach; followed by the minimisation of emissions through a clear plan, targeting the main contributing factors, using cumulative emission figures; only once emissions have been minimised should residual unavoidable emissions that are out with the subject’s direct control and influence be offset through projects which are relevant to the subject and can be shown to aid future decreases in the subject’s emissions; the process should finally be verified by a third party and fully transparent through public availability. A mechanism for free certification of carbon neutrality should be devised for individuals and small organisations in order to help those with a sustainable outlook develop and (in the case of small businesses) become stronger competitors in their markets.

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