Carbon Game is On!

Companies on the move to be carbon neutral

Final Report

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Foreword

Companies play a key role in achieving climate targets. Innovations, products and solutions will promote sustainable practices, improve the competitive edge, create new business and boost a managed transition towards a carbon-neutral society. This may sound easy, but in fact, the transition requires companies to rethink a lot – both strategically and in practice. In order to help companies in the transition towards carbon neutrality, Sitra is building tools and testing them in practice with leading Finnish enterprises.

There is no shortcut on the road to carbon neutrality. But neither is there one single, correct way to make the transition. Globally, the phrase *carbon neutrality* is interpreted in many different ways, and there are disputes on how and when to use it. This report clarifies the rules of the carbon game and highlights some best practices.

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Summary

The term *carbon neutrality* has become widely established in the companies' public relations, media and public debate albeit its content and scope varies a lot. In the literature, carbon neutrality is often understood as zero net greenhouse gas emissions to atmosphere. The task of assessing carbon neutrality is approached at least from two different perspectives. According to several definitions, it can be achieved through *a three step process* of calculating, reducing and compensating (i.e. offsetting) greenhouse gas emissions. In today's business life, however, carbon neutrality is often seen more broadly as a long term *strategic vision* or target for future activities that can be achieved through continuous improvement of operations rather than through a relatively short term process strictly based on the three steps mentioned above.

Starting from the early years of the new millennium the focus of carbon neutrality has indeed shifted from being a relatively easy means to gain the green image for a company by buying offsets to a more strategic vision or an ultimate business goal for a company to commit to sustainability, continuous improvement of operations and development of efficient products and innovative solutions. The more deeply the company builds carbon neutrality approach into its long-term strategy the more it has an impact on how the company actually operates and how the company will position itself in the future.

Moving towards carbon neutrality provides many benefits to companies. In addition to reduced energy use and increased cost efficiency companies gain new competence and better awareness of the supply chain and also their own operations. Furthermore, they benefit from the increased demand for new carbon-free products, and are in the position to lead the development of new products. At its best, the pursuit of carbon neutrality generates new business opportunities and brings a diverse set of business benefits. Today, there is a new global trend that companies – at least starting with very large and visible ones - invest in their own renewable energy production via solar energy or wind power, which has recently become very price competitive. "Powered by renewables" is a slightly different claim than "carbon neutral" but seems to have at least as much credibility and recognition in the marketplace.

The current attitude of sustainability experts in Finnish companies is positive and open toward the carbon neutrality approach. They have a common understanding on the meaning of carbon neutrality as a strategic vision that needs a more detailed roadmap to be realised. In Finland, the compensation step, i.e. buying offsets, has not raised an interest among companies but it could be seen as a transitory means in the journey towards real carbon neutrality – a society where offsetting would not be needed anymore. More important than offsetting are the everyday business operations: how companies take control over their own production, their suppliers and the products that they sell. Carbon neutrality is not just cutting emissions but a promise towards climate friendly business and continuous improvements in climate change mitigation.

Due to the lack of common rules, companies have developed their own interpretations of carbon neutrality. Although companies rely on the international standards for carbon footprint calculation and reporting, the communication of the concept in public relations may vary a lot. Nevertheless, it is of great importance to the companies' public relations and reputation. The unwritten rules in communicating carbon neutrality have been transparency, honesty and openness. Companies should begin by communicating what they think carbon neutrality means for them. No matter what the ultimate goal or definition of carbon neutrality for a specific company is it must be

communicated openly. Vague or unclear claims of carbon neutrality will eventually lose credibility for both the claim and the company.

Setting specific targets with clear timetables is challenging. This is partly due to the uncertainty related to the development of climate change mitigation in different sectors and countries but also due to the overall society transitions to a bio-economy, solar economy and circular economy. What does the general development in society and in certain business sectors mean for carbon neutrality and how does that change contribute to the target setting in the future. We would need more precise path for carbon neutrality in different sectors that would be valid still after 20 years for companies in order to develop their specific carbon neutral targets. So far, the target is set as an ultimate goal in the future that will be gained step by step. Thus, carbon neutrality is an aspiration for the business rather than a very detailed target setting procedure. Sub-targets and milestones are of course needed to reach the ultimate goal and these targets should be examined in relation to science-based targets in order to assess the level of actions that the company or sector is achieving. However, beyond greenhouse gas emission reductions there is always the view of profitability. Thus carbon neutrality should be measured not only in terms of greenhouse gas reductions but also in terms of added value, and benefits to customers should be made visible as well.

After all, carbon neutrality is not only about reducing emissions but it is the overall picture on how a particular company does business in climate friendly ways. A set of solar panels on the roof may help to bring the net carbon emissions to zero but what really matters is the overall sustainability of a company, its processes, its sourcing of raw materials, and the quality and efficiency of its products. With energy efficient and innovative solutions companies can also help customers to decrease their own carbon footprint – and measure and communicate this effectiveness as a positive handprint. Although yet not widely used, this approach is raising interest also among Finnish companies.

1 Carbon neutrality –reality or green vision?

In recent years, the global concern about climate change and the challenge of keeping global warming below the level of two degrees has raised interest towards 'carbon neutral' concepts in society and business life. On the basis of literature carbon neutrality is not restricted to carbon dioxide emissions (e.g. Alhola & Seppälä, 2014). Overall, carbon neutrality refers to conditions with net zero emissions of greenhouse gases in a certain time frame (typically one year). Moving towards carbon neutrality is a process including the calculation of the overall greenhouse gas emissions for the organization (including entity, product, etc.), reducing emissions as much as possible, especially through increasing the energy efficiency and renewable energy production, and compensating the remaining emissions by authorized offsets or credits.

The carbon neutrality concept has been in public debate since the beginning of the 21st century and is today widely used in companies' public relations and communication on their sustainable responsibility. Indeed, efforts towards carbon neutrality have enabled companies to achieve their sustainability targets and also provided them with cost-efficiency due to savings in energy and resources and optimization of their value chains. Companies have formulated a range of methodologies to calculate carbon footprints and to claim their carbon neutrality. Some companies calculate emissions from a wide range of sources including also the supply chain and following the recommendations of the GHG Corporation Standard[1], while others have set narrower boundaries for the footprint calculation (this refers typically to the Scopes 1 and 2, omitting 3, as defined in the GHG Protocol). There is also the distinction between those companies that take a real effort to cut their emissions and those that choose to offset emissions with no actions for energy efficiency or emissions reductions.

In recent years several national and international guides, standards and programmes have been developed to help companies to calculate their carbon footprint and to set their carbon neutrality targets. Despite this guidance provided by authorities as well as private companies, the term carbon neutrality in a company communication to the public is still often defined by a common usage as there are no internationally accepted rules for using the claim of carbon neutrality. The lack of transparency, especially in outlining the organizational boundaries and main indirect emissions, measurement of emissions, efforts to achieve internal emission reductions, and the type of offsetting for residual emissions, have all affected the credibility of carbon neutrality claims. Simple carbon-neutrality claims do not inform consumers on how much energy efficiency actions have been done or how much GHG emissions have been compensated by buying offsets. Neither does the carbon neutrality approach set any requirements for the implementation of such internal energy reduction efforts. This may also have an effect on how willing companies are to apply the concept of carbon neutrality in their organization for their own operations.

Due to the aspects mentioned above there is a need to clarify the use of carbon neutrality from many viewpoints. Is carbon neutrality a clear enough term to be used in communicating sustainability targets and achievements or is it just a buzzword? What other messages should be presented in communicating about company's sustainability issues? Should we only talk about carbon footprint or also all the positive actions that companies perform by developing and

[1] The GHG Protocol Corporate Standard classifies a company's GHG emissions into three 'scopes'. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

launching their efficient products? Do the current carbon neutrality targets really help to maintain the level of 2 degrees threshold in rise of temperature according to IPCC?

Despite the challenges associated with the term, carbon neutrality is commonly used in different settings. Companies use carbon neutrality in order to communicate about their sustainability issues in a simple and understandable manner to stakeholders. On the other hand, carbon neutrality does not cover all important sustainability aspects (e.g. impacts on biodiversity). Furthermore, the use of the term relies on companies' own interpretations and may have different meaning and focus in communication to customers, business to business, investors and society as a whole. Thus, more precise rules for the 'carbon neutral game' are needed in order to develop the concept further.

This report reviews the state of the carbon neutrality concept and its applications in business in Finland and internationally. It looks for the level of standardization, guidance and tools available in the calculation and implementation of carbon neutrality, and a search for good and best practices of companies applying this approach. The background study builds upon previous studies (Alhola & Seppälä, 2013 and Seppälä et al., 2014) and the companies' sustainability reports and public relations materials. In addition, this report gives insight into the interpretations of the term in large Finnish companies, and their expectations towards carbon neutrality. This part is done by interviewing eight Finnish based globally operating large companies. The companies were asked how carbon neutrality is implemented and communicated in the company, and how the company has benefitted from carbon neutrality and sustainability targets. Concrete tools to advance carbon neutrality were discusses as well as the companies' expectations for the carbon neutrality approach. These issues were further discussed in a workshop organized by Sitra on April 15th and concluded in this report.

2 Carbon neutrality equals to zero net emission to the atmosphere

A variety of organizations have defined the term 'carbon neutrality' (Table 1). According to these definitions, carbon neutrality indicates that the subject (e.g. an organisation or a product) has contributed zero net greenhouse gas emissions to the atmosphere during one year (a year is a typical time frame). Common for all definitions is the calculation of greenhouse gas emissions caused, reductions of emissions and compensation, i.e. the possibility to offset remaining (unavoidable) emissions.

The calculation of greenhouse gas (GHG) emissions in companies varies from Scopes 1 and 2 to covering all the indirect emissions of Scope 3 in the GHG Protocol. The calculations of Scopes 1 to 3 correspond to the carbon footprint that is a measure of the exclusive total amount of GHG emissions that is directly and indirectly caused by an activity or is accumulated over the life cycle of a product (ISO 14021). It is important to notice that the scope of the emissions considered in the definitions includes carbon dioxide but also other greenhouse gases, such as methane (CH_4), dinitrogen oxide (N_2O) or sulfur hexafluoride (SF_6).

Table 1 Definitions of carbon neutrality

Definitions for carbon neutrality	Reference
"Carbon neutral" refers to a product (as a product system) that has a "carbon footprint" of zero or a product with a "carbon footprint" that has been offset. It requires that all the GHG emissions from all stages of the product life cycle, and within the specified product system, have been reduced, removed or accounted for through a system of offsets or credits, or by other means. Determination of "carbon neutrality" is based on, first, the calculation of a carbon footprint (defined in the standard), then the deduction of offsets equivalent to the emissions of the carbon footprint. Alternatively, carbon neutrality can be achieved by a product whose "carbon footprint" is zero.	*SFS-EN ISO 14021 p. 49*
Through a transparent process of calculating emissions, reducing those emissions and offsetting residual emissions – net carbon emissions equal zero.	*Defra, 2009b p.4*
A condition in which there is no net increase in the global emission of greenhouse gases to the atmosphere as a result of greenhouse gas emissions associated with the subject.	*PAS 2060*
Estimate greenhouse gas emissions (all six Kyoto protocol gases: CO_2, CH_4, N_2O, HFCs, PFCs and SF6.), undertake efforts to reduce greenhouse gas emissions to the greatest extent possible, and analyse the cost implications and explore budgetary modalities of purchasing carbon offsets.	*UNEP, 2014*
"Cancelling out the harm done to the earth's atmosphere by one type of greenhouse gas –generating human activity, through another human activity that: either reduces CO_2 emissions by an equal amount; or prevents an equal amount being generated by an essential CO_2 procuring human activity by substituting a non- or low carbon producing alternative."	*Murray & Dey, 2009 p.238*
Being carbon neutral involves calculating your total climate-damaging carbon emissions, reducing them where possible, and then balancing your remaining emissions, often by purchasing a carbon offset.	*Strandberg Consulting*
Carbon neutral is when net greenhouse gas emissions of an organisation or a product are equal to zero, by reducing emissions and then acquiring and retiring carbon offsets to match the remaining emissions.	*Low Carbon Australia*
Calculating the overall carbon footprint; reduce that as much as possible, largely through energy efficiency; and then offset any residual emissions that cannot yet be removed, so that their net emissions equal zero.	*Ernst & Young*
Business's action to reduce carbon emissions to net zero. Carbon footprint (also known as greenhouse gas assessment) includes the total sum of greenhouse gas (GHG) emissions.	*The Carbon Neutral Company*

The following Table 2 contains a (non-comprehensive) list of organizations that work in the field of carbon neutrality and by their activities support the movement towards carbon neutrality in companies.

Table 2 Organizations promoting and developing carbon neutrality

Organization	Reference
International Organization for Standardization (ISO) offers a set of standards guiding organisations on how to design and develop organisational GHG inventories (ISO 14064-1:2006), how to design and implement GHG project (ISO 14064-2:2006) and how to verify and validate both mentioned (ISO 14064-3:2006). Other climate neutrality-related standards are ISO 14065:2013 setting requirements for greenhouse gas validation and verification bodies and ISO/DIS 14001 setting requirements and guidance for EMS (Environmental management systems). The organisation also developed a product carbon footprint standard (ISO/TS 14067:2013) or LCA standards (ISO 14040:2006 series).	www.iso.org

British Standards Institute (BSI) is the company behind PAS 2050, and recently PAS 2060, protocols. PAS 2050 is a measurement tool/protocol for companies to make credible reduction commitments and achievements on life cycle GHG emissions of products, under a Product-Related Emissions Reduction Framework (PERF).[2]	www.bsigroup.com
World Resources Institute (WRI) is one of the two organisations behind the *GHG Protocol*. WRI is an international research institute, actively contributing to the discussion on the topic of climate neutrality.	www.wri.org
The Global Reporting Initiative (GRI) is a leading organization in the sustainability field. GRI promotes the use of sustainability reporting as a way for organizations to become more sustainable and contribute to sustainable development.	www.globalreporting.org
World Business Council on Sustainable Development (WBCSD) is one of the two organisations behind the *GHG Protocol*. The WBCSD is a CEO-led organization of forward-thinking companies that galvanizes the global business community to create a sustainable future for business, society and the environment.	www.wbcsd.org
United Nations Global Compact, among other activities, supports GHG reporting via GRI.	www.unglobalcompact.org
United Nations Environment Programme (UNEP) provides leadership and encourages partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations. It for example supports GHG reporting via GRI.	www.pef-world-forum.org
United Nations Principles for Responsible Investment (UN PRI). Its goal is to understand the implications of sustainability for investors and support signatories to incorporate these issues into their investment decision making and ownership practices**.**	www.unpri.org
The Organisation for Economic Co-operation and Development (OECD) promotes policies that will improve the economic and social well-being of people around the world. Among other activities OECD supports GHG reporting initiatives, such as GRI.	www.oecd.org
The Carbon Disclosure Project (CDP) is an organisation based in the UK which works with shareholders and corporations to disclose the greenhouse gas emissions of major corporations. It is said to disclose about ¼ of all anthropogenic GHG emissions. Sometimes criticised for the lack of transparency.	www.cdp.net
The PEF World Forum is a joint platform set up to foster and facilitate dialogue between international initiatives on how to assess, reduce and communicate the impact of goods and services on the climate and the environment.	http://www.pef-world-forum.org/

3 Three steps towards carbon neutrality – measure, reduce, offset

The concept of carbon neutrality in companies builds on the calculation of GHG emissions caused by an organization or a product/service, reducing the emissions as much as possible and offsetting the residual emissions. The concept is also used in the context of cities, areas, events and individuals (e.g. Defra 2009a). The core idea of the carbon neutrality approach is often described as a transparent process including the following three steps (e.g. Defra 2009b, PAS 2060):

1) measure - 2) reduce - 3) offset.

In addition, clear communication and transparent carbon neutrality claims as well as reviewing these systematically are considered as an important part of companies moving towards carbon neutrality (Figure 1).

[2] http://pprc.org/research/climatechange/rr-pas2050.pdf (accessed 16.4.2015)

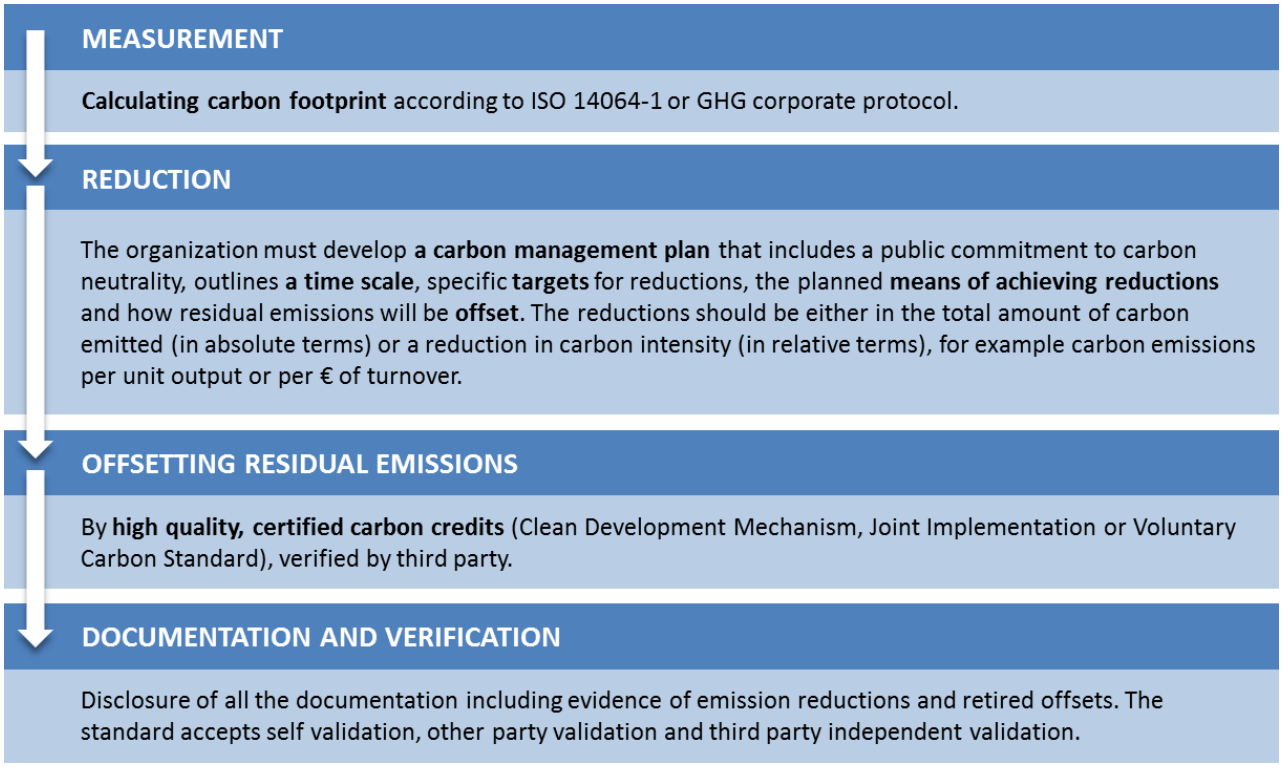

Figure 1 Process to carbon neutrality (PAS 2060)

3.1 Calculating and measuring carbon footprint is the basis for target setting

The first step and basis for carbon neutrality claims is a transparent emissions accounting in which different greenhouse gas emissions are converting to tonnes of carbon dioxide equivalent (tn CO2e).

The organization needs to decide the subject and scope for the climate neutrality targets and emission quantifying:

- *What is the time frame for emission reductions?*
- *What are the boundaries for the calculations, i.e. which emissions and from which sources should be included?*
- *How should emissions be calculated and measured?*

Several standards and guidelines exist for the calculation of carbon footprint. Probably the most common and internationally accepted approach to categorizing emissions is through the Greenhouse Gas (GHG) Protocol, developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD). GHG Protocol sets the global standard for organizations on how to measure, manage, and report greenhouse gas emissions in a way that double counting of emissions is avoided.

The GHG Protocol groups emissions into three different scopes:

1. Scope 1 (direct emissions): Including activities that are owned or controlled that release emissions straight into the atmosphere. Examples: emissions from combustion in boilers,

furnaces, vehicles owned/controlled, emissions from chemical production in owned or controlled process equipment.

2. Scope 2 (energy indirect): Activities which occur at sources not owned or controlled. Examples include emissions being released into the atmosphere associated with consumption of purchased electricity, heat, steam and cooling.
3. Scope 3 (other indirect): All other activities that release emission into the atmosphere as a consequence of actions taken, which occur at sources that are not owned or controlled and which are not classed as scope 2 emissions. Examples are business travel, waste disposal and use of sold products or services.

Standard ISO 14064[3] was launched in the spring 2006 for organizations outside the mandatory or regulated schemes such as the EU Emission Trading scheme, to monitor report and verify their Greenhouse Gases (GHG) i.e. carbon footprint. The ISO 14064 standards provide governments, businesses, regions and other organisations with an integrated set of tools for programs aimed at measuring, quantifying and reducing greenhouse gas emissions.[4]

ISO 14064 is comprised of three standards[5], respectively detailing specifications and guidance for the organisational and project levels, and for validation and verification. The ISO 14064 Standard has been approved as "good practice" in the industry. It provides a framework for the verification of GHG inventories and projects, which gives more credibility to the GHG-reduction process (Figure 2).

ISO 14067 standard specifies principles, requirements and guidelines for the quantification and communication of the carbon footprint of a product (CFP). According to the standard, all GHG emissions are included. However, offsetting is outside of the scope of ISO 14067.

[3] ISO (International Organization for Standardization) is a non-governmental organization and a network of the national standards institutes of 157 countries.

[4] ISO 14 000 Environmental Management (www.iso.org)

[5] ISO 14064-1: Greenhouse gases - Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals

ISO 14064-2: Greenhouse gases - Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements

ISO 14064-3: Greenhouse gases - Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions

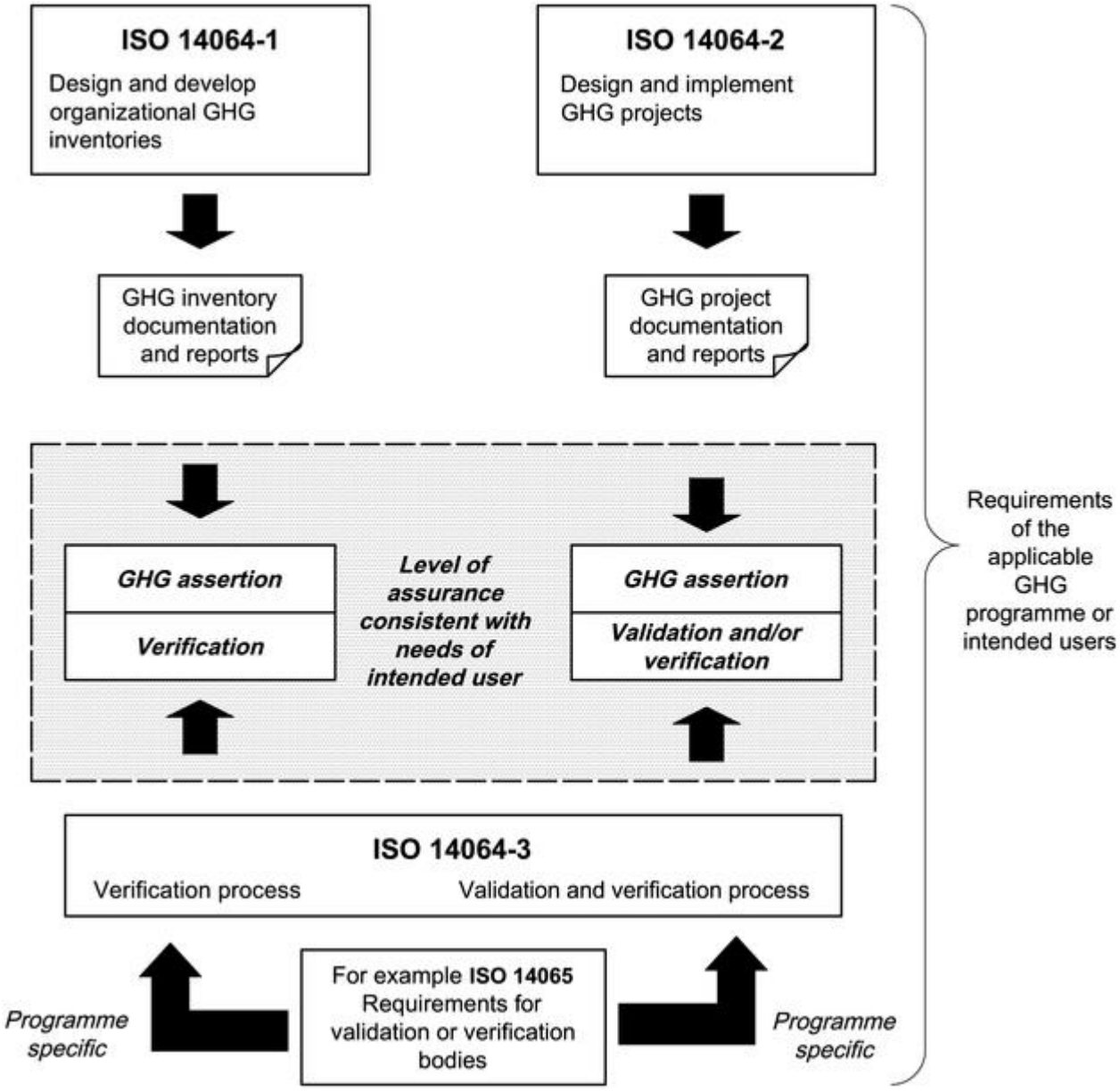

Figure 2 Content of ISO 14064 series

The commonly used footprint standards for organizations are the GHG Corporate Protocol or the ISO 14064-1 standard. For products and services it could be a PAS 2050-compliant life-cycle assessment (Defra, 2009b), an ISO 14044-compliant life cycle assessment, or an assessment which follows the GHG Protocol's product-level standard. (Table 3)

Table 3 Overview of standards, guidelines and declarations for carbon neutrality

Document	Level and focus	Scope and type
GHG Protocol (WBCSD/WRI)	**Organizations**; to measure, manage, and report greenhouse gas emissions.	International standard
ISO 14064-1	**Organizations**; to specify principles and requirement for quantification and reporting of greenhouse gas (GHG) emissions and removals. It includes requirements for the design, development, management, reporting and verification of an organization's GHG inventory.	International standard

PAS 2050 (British Standard Institution)	**Products and services**; to specify requirements for the assessment of the life cycle GHG emissions (builds on existing life cycle assessment methods established through BS EN ISO 14040 and BS EN ISO 14044).	UK / International guidelines
PAS 2060:2014 Carbon neutrality	**Organizations**; Specification for the demonstration of carbon neutrality	UK standard / international specification

3.2 Reducing carbon footprint is the heart of carbon neutrality

The second step of the process is to set emission reduction targets and implement the energy efficiency actions. It is recommended that a company gives preference to its internal efforts in achieving carbon neutrality through the reduction of its own emissions, energy efficiency improvements, production or process efficiency improvements and switching to the carbon neutral or renewable energy sources instead of fossil based energy sources. The actions should lead to the real GHG emission reductions, either a reduction in the total amount emitted in absolute terms or a reduction in carbon intensity in relative terms for example GHG emissions per unit output or per € of turnover (PAS 2060).

Organizations should develop and follow a carbon management plan that includes a public commitment to carbon neutrality, a time scale, specific targets for reductions and the planned means of achieving them. Generally, the carbon management plan would guide the company to overall carbon neutral transformation in the organization and its operations.

In practice, the target setting may be challenging and opinions differ about on what basis the reduction targets should be defined. They may also be dynamic in a sense that the targets are based on best practices and benchmark of a sector. This may be the case especially if the company aims at being a forerunner by setting targets that go beyond the emission reduction levels defined by regulation and general opinion. Nevertheless, the target should be ambitious, but achievable, as well a scientifically backed. The following Table 4 contains an example list of science-based accounting methodologies.

Table 4 Science-based accounting methodologies

Science-based accounting methodologies (www.sciencebasedtargets.org)	
The Sectoral Decarbonisation Approach (SDA) *Carbon Disclosure Project (CDP), WRI and WWF, technical support of Ecofys*	Freely available open-source methodology that allows companies to set emission reduction targets in line with a 2°C decarbonisation scenario (2DS) developed by the International Energy Agency (IEA)
The 3% Solution *WWF with CDP, McKinsey & Company, and Point380*	Identifies how US-based corporations can set GHG reduction targets that lead to a collective cost-savings of $780 Billion USD between 2010 and 2020, while aligning targets with IPCC's 2-Degree Celsius pathway
Carbon Stabilization Intensity (CSI)	The intensity is calculated in relation to our "value-added" as a company. Value-added is a measure of a corporation's contribution to GDP – a published figure in the UK.
C-FACT (Corporate Finance Approach to Climate-Stabilizing Targets) *Autodesk*	A step-by-step methodology for companies and cities for calculating GHG reduction targets that are in line with scientific climate-stabilization targets (85% GHG reduction by 2050 in industrialised countries (source IPCC), and in proportion to cities' relative GDP growth.

The Center for Sustainable Organization's *(CSO) context-based carbon metric Ben and Jerry's*	The context-based carbon metric was developed in 2006 and was the first science-based metric for assessing the sustainability of greenhouse gas emissions by organizations ever developed. Scopes 1, 2 and 3.
GHG emissions per unit of value added (GEVA)	GHG emissions per unit of value added" (GEVA) by 5% per year.
MARS method	A method based on the Planetary Boundaries model; based on IPCC science, scopes 1 and 2.

3.3 Offsetting the residual emissions

In the third phase, acquisition of carbon offsets can be used to compensate for the remaining unavoidable emissions. Carbon offsetting should be seen as complementary to efforts to reduce emissions internally[6]. Carbon offsetting provides an approach where carbon dioxide and other GHG emissions produced in the company can be offset by reductions achieved in another place. Carbon offsets are measured in metric tons of carbon dioxide-equivalent (CO_2e) representing the six primary categories of greenhouse gases. These offsets are achieved by preventing emissions that would have otherwise been released in 'business as usual', for example investing in renewable energy or in projects that bring environmental benefits.

The issues to be considered include, for example

- *What type of offsets will be bought?*
- *Is the carbon offset certified by an authorised standard (e.g. Gold Standard[7], VCS[8])?*
- *Will the offset be "additional", meaning a reduction that would not have happened without the purchase of the offset?*

There are basically two markets for compensation. First, the European Union Emissions Trading Scheme (EU ETS) is a mandatory trade program for certain sectors, which allows operators use of compliance *carbon credits* from Kyoto project based mechanisms (Clean Development Mechanism CDM[9] and Joint Implementation JI[10]). Secondly, industries, organizations and individuals are able to voluntarily compensate for their emissions through *Voluntary Emission Reductions* or Verified Emission Reductions (VERs). VERs are usually created by projects outside of the Kyoto Protocol but certified through a voluntary certification process (e.g. Gold Standard or VCS). One VER is equivalent to 1 tonne of CO_2e emissions.

[6] DECC, 2009. Guidance on carbon neutrality. Department of Energy & Climate Change UK, 30 Sept. 2009.

[7] The Gold Standard launched by WWF, is a label for carbon offsets/credits gained from high-quality emission reductions projects. It ensures that carbon credits are real and verifiable and make measurable contributions to sustainable development worldwide. http://www.goldstandard.org/

[8] Voluntary Carbon Standard (VCS) is launched by The Climate Group, IETA and the World Economic Forum. VCS-certified credits (also called VCUs Voluntary Carbon Units) aim to standardize the market and create a basic quality threshold. http://www.carbon350.co.uk/carbon-assets-and-offsets/vers/

[9] The Clean Development Mechanism (CDM) allows an entity with an emission-reduction commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project *in developing countries* and earn certified emission reduction (CER) credits, each equivalent to one tonne of CO_2. A CDM project may involve, for example, a rural electrification project using solar panels or the installation of more energy-efficient boilers. The project must provide emission reductions that are additional to what would otherwise have occurred. (UN, 2015a)

[10] The Joint Implementation (JI) allows an entity with an emission reduction commitment under the Kyoto Protocol (Annex B Party) to earn emission reduction units (ERUs) from an emission-reduction or emission removal project *in another Annex B Party*, each equivalent to one tonne of CO_2, which can be counted towards meeting its Kyoto target. (UN, 2015b)

3.4 Carbon neutrality claims with or without verification

Companies can use carbon neutrality claims in their internal and external purposes. In principle, the companies can act towards carbon neutrality in their business without verification process if the process is restricted to the internal use. In this case, companies can also arrange for self- or third-party validation of the process to ensure that the change will be according to decisions. When companies want to make carbon neutrality claims about their products, services or organisation in marketing and advertising, the use is external and according to PAS 2060 it requires independent verification by a third party.

The Quality Assurance Standard[11] is a comprehensive independent audit system for companies wishing to become carbon neutral through carbon reduction and compensation. QAS-approved products are checked against a 40 point checklist to ensure they meet the very highest standards in the world. The checklist (Appendix) consists of four topics:

- application checks
- emission calculations
- website checks
- renewal checks

A variety of private companies and non-profit organizations operate in the markets of carbon offsets. These companies and organizations are specialized in calculating companies' carbon footprint, advising for carbon reductions and allocating compensation of remaining emissions to different third party verified and validated projects that promote renewable energy production, after which they issue the company a certificate indicating the achieved carbon neutrality of the company. However, these certificates do not give much information about the means or the boundaries for emission reductions or the share of offsetting from the total emissions.

In public media, there is much debate on how could companies compensate emissions in a way that would cause genuine additional emission reductions without increasing emissions elsewhere, and avoiding double counting at the same time. Achieving carbon neutrality solely through offsetting is not endorsed. In an ideal case, offsetting can ensure that the "polluter pays" principle is realized, and can provide an incentive for more reductions of emissions. Offsets are meaningless unless carbon credits are validated and verified to be real, additional, permanent, measurable and not a subject to double-counting emissions along supply chains or life cycles (Interface, 2014).

There is also an increasing interest towards companies' positive handprint as one means of compensation, i.e. how much emission are avoided due to the companies' developing and selling more energy efficient products in the market and to what extent positive handprint could be taken into account when defining a company's level of carbon neutrality.

4 Companies on their path towards carbon neutrality

It is rather challenging to define what the best practice in carbon neutrality of companies really is. We considered the following aspects in the search for best practices:

- Clear target setting for carbon neutrality
- Broad scope of emissions included

[11] The Quality Assurance Standard for carbon neutral http://qascarbonneutral.com/

- Real efforts to reduce emissions (incl. credible plan, transparent track record of achievements, verified results)
- Offsetting (if needed after emission reductions) to provide genuine additional emission savings
- Transparent and clear communication of carbon neutrality claims
- Systematic follow-up and review of carbon neutrality targets and actions

The understanding of the concept varies between companies and therefore e.g. the scope of emissions included in GHG calculations differs. Perhaps it is worth differentiating between the best practice and a pro-active company. Companies which follow one of the widely accepted methodologies, such as e.g. the GHG Protocol, can be considered as *best practise*. However, the *pro-active* carbon neutral companies would go beyond the standards. Although being comprehensive, the standards and methodologies cannot cover all the aspects of operations of any company. Therefore strictly following them may in some cases lead to excluding some important sources of emissions. Best practices of carbon neutral companies include also a transparent and clear claim of the carbon neutrality, its content and achievements in the company.

A key issue in the target setting for carbon neutrality is timetables for emission reductions. To be a forerunner it requires that companies should commit themselves through the carbon neutrality approach to reduce GHG emissions more extensively and more rapidly than would be required in society. It is not the same if a company will be carbon neutral by 2050 or 2020. In addition to this, imago aspects related to timetables for becoming carbon neutral vary country by country. According the the United Nations Framework Convention on Climate Change (UNFCCC), rich countries such as Finland have promised to reduce their GHG emissions more rapidly than poor countries will do.

Today, good examples of companies on the journey to become carbon neutral can be found. There are also companies that state themselves as carbon neutral already but in many of these cases the offsetting of GHG emissions plays an important role. Thus, a key issue is to show how the state of carbon neutrality can be maintained year by year in companies. It is important to also notice that emissions of different activities are decreasing in time as emission reduction measures are being carried out. Therefore also compensation measures are to be adapted every year to the actual situation and requirements. Receiving carbon neutrality in one year does not mean that the company has reached the ultimate goal, and the work for additional emission reductions should be continuing so that year by year less offsetting will have to be done.

4.1 Pro-active company examples

A company called **Interface®**[12] produces modular carpets that are used e.g. in offices. The company, and its founder and chairman Ray Anderson, are known for their active approach towards minimizing their carbon footprint and for creating an overall sustainable business model. The company has created a concept called Mission Zero®, aiming at carbon neutrality. In order to become carbon neutral the company follows its own strategy called Seven Fronts of Sustainability (Table 5).

[12] Interface, 2015 (http://www.interfaceglobal.com/Sustainability.aspx)

Table 5 Seven Fronts of Sustainability, Interface®

	Action
Front #1	Eliminate Waste: Eliminate all forms of waste in every area of the business
Front #2	Benign Emissions: Eliminate toxic substances from products, vehicles and facilities
Front #3	Renewable Energy: Operate facilities with 100% renewable energy
Front #4	Closing the Loop: Redesign processes and products to close the technical loop using recycled and biobased materials
Front #5	Efficient Transportation: Transport people and products efficiently to eliminate waste and emissions
Front #6	Sensitizing Stakeholders: Create a culture that uses sustainability principles to improve the lives and livelihoods of all of our stakeholders
Front #7	Redesign Commerce: Create a new business model that demonstrates and supports the value of sustainability-based commerce

Interface® follows the GHG Protocol in calculating its emissions. Based on the calculations the company sets reduction targets and defines the mitigation strategy. For example one of the strategies is to use only renewable energy by 2020 (35%, as of 2013). The aim is to be achieved by improving energy efficiency and increasing the use of renewable energy (both procuring and installing renewable energy systems at their factories).

Although much of the company's efforts are targeted at quantifying and minimising real GHG emissions, carbon offsets are also purchased. A product line called Cool Carpet™ is sold as *carbon neutral* thanks to carbon offset projects, such as wind power installation in India or biogas energy recovery in the US.

The company applies life cycle assessment and eco-design in their everyday business. By 2013 it had reduced the carbon footprint per product by 25% compared to 2008. The company sends no waste to landfill and reduced the need of water in manufacturing by 87% since 1996 (per unit of production). The company buys carbon offsets for business air travel, company fleet and employees' commutes.

Through active public communication the company is proactive and tries to influence the whole industrial sector to change the way business it done.

Marks and Spencer (M&S) is often referred to in connection to carbon neutrality after it has announced in 2007 to become carbon neutral by 2012 as the world's most sustainable retailer. In 2013, carbon neutrality was extended to include all M&S operated and joint venture stores, offices, warehouses and delivery fleets worldwide. By 2020 M&S plans to reinvent its entire business model which should become carbon positive, circular and fair. M&S calculates its emissions based on the Global Reporting Initiative (GRI) guidelines, introduces energy saving and waste minimisation measures and offsets the currently unavoidable emissions.[13]

[13] Marks & Spencer: http://corporate.marksandspencer.com/plan-a/about-plan-a/carbon-neutral

Table 6 M&S journey to carbon neutral

Target setting	In 2007: To become carbon neutral by 2012 and the world's most sustainable retailer In 2013: Carbon neutrality was extended to include all M&S operated and joint venture stores, offices, warehouses and delivery fleets worldwide. 2014–2020: Engaging customers and moving towards new business models. 2020 onwards: New sustainable ways of doing business that are carbon positive, circular and fair.
Footprint calculation	GRI Global Reporting Initiative G4
Actions for emission reductions	By reducing emissions, sourcing renewable electricity and buying and retiring carbon offsets • Individual targets setting to every store for energy efficiency • Pioneering new technologies like ground-breaking fridges • Investing in new equipment in stores and offices; from air conditioning units to fuel efficient, aerodynamic teardrop-shaped truck trailers • Investing in solar energy: the UK's largest single roof mounted solar panel array on the East Midlands distribution centre will lower M&S's carbon footprint by 48,000 tonnes over 20 years
Offsetting	• Verified (seven) projects in developing countries (that would have not taken place without offsetting) through the Carbon Neutral Company
Actions beyond offsetting	• Sharing carbon-cutting expertise with suppliers through Supplier Exchange programme • Setting up eco factories around the world • Launching initiatives to help customers to cut emissions in the use of goods
Assessment of targets	• The energy efficiency of stores has increased 20 % • In the UK and Republic of Ireland operations these actions have saved over 160,000 tonnes of CO2 a year. • The solar panel investment will help M&S maintain its commitment of sourcing 100% of its electricity for UK and Ireland buildings from renewable sources, with 50% sourced from small scale renewable sources by 2020.

4.2 Best practise companies from abroad

Microsoft In mid-2012, Microsoft pledged to make its operations carbon neutral, with a plan that included the three common steps used by other carbon neutral companies: assess emissions, reduce emissions, and offset the remaining unavoidable emissions.[14] But then Microsoft added an important and novel element to its approach: introducing an internal "carbon fee", which "allocates the cost of reducing and offsetting the carbon emissions from our data centers, software development labs, offices, and business air travel to the business groups responsible for consuming the resources."[15] This price is determined by the cost of Microsoft's total strategy to reduce emissions via internal investments in efficiency and offset the remaining emissions. The fee is used to create a central internal fund which is then allocated to the best available internal projects, and to offsets for the remainder.

Microsoft went one important step further in December 2013, by publishing a guide to this process publicly so that other organizations can adopt and benefit from this approach. And in both 2013 and 2014 Microsoft announced significant deals to directly purchase the output from wind power projects.

WalMart, the world's largest retailer announced in 2010 that its long term competitiveness, value and costs will gain from a lower carbon footprint and thus it intends to cut 20 million tonnes of

[14] "Becoming carbon neutral: How Microsoft is striving to become leaner, greaner, and more accountable." Available from http://aka.ms/carbonwhitepaper.
[15] "The Microsoft Carbon Fee: Theory and Practice", downloaded from a link on this page: http://www.microsoft.com/environment/our-commitment/our-footprint.aspx

carbon dioxide emissions from its supply chain within five years. This lead Walmart's major suppliers like Fox Home Entertainment, Procter & Gamble, Unilever, Coca-Cola, PepsiCo, Kraft, Sony, Apple, HP, and Dell to focus on their own carbon emissions, energy efficiency, recycling and more efficient processes management. It is very likely to have a cascading effect throughout the economy. WalMart estimates that 90% of its carbon footprint comes from the supply chain, and this move will add to other measures it has taken on its own emissions, which include the installation of solar energy sources on the top of its stores and sourcing power from wind turbines as it seeks a move to 100% renewable energy, and take a whole range of other environmental measures. (Parkinson, 2010)

Google is another example of a best/good practice, although it does not report emissions and mitigation actions to e.g. CDP. Google measures its GHG emissions, increases energy efficiency of its datacentres and increases the use of renewable energy. However, with the growing demand for its services, Google's overall carbon footprint is growing sharply 1.5 Mt CO_2e in 2010, 2 Mt CO_2e in 2012 and 2.4 Mt CO_2e in 2013 (link). Despite of that, Google claims to be carbon neutral since 2007 (Google 2015). This has been possible through offsetting their GHG emissions (Figure 3). Moreover, Google works with the concept of *handprints* which it believes its products offer (enabling telework, email replaces printed mail etc.) (Figure 3).

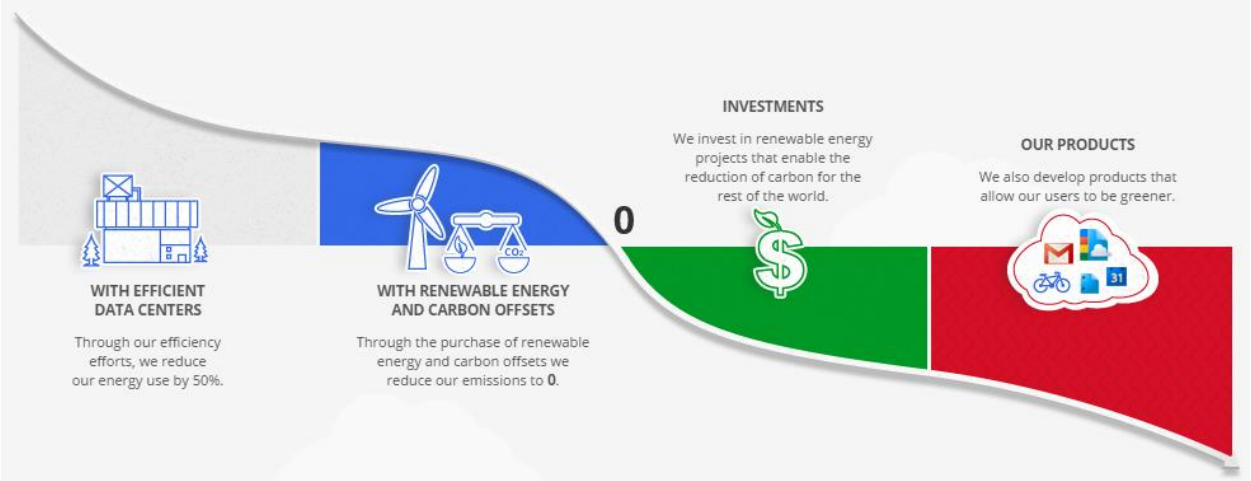

Figure 3 Google's visualisation of its climate neutrality approach (link).

IKEA, a Swedish retail company, could be considered to belong among the leading brands in carbon neutrality. Carbon neutrality means for IKEA energy independence through production of renewable energy. It is committed to become 100% carbon neutral by 2020 and to produce as much renewable energy as they consume in their operations. Globally, IKEA has committed to 157 wind turbines and has installed around 550 000 solar panels on its buildings. In the fiscal year 2013, IKEA produced enough renewable energy to match 37 percent of its consumption. The target for 2016 is double that amount, i.e. 70%, and IKEA is on its way to energy independence. In addition to clear target setting IKEA specifies other actions that have been taken and the scope of the carbon neutrality target. (Kroh, 2013)

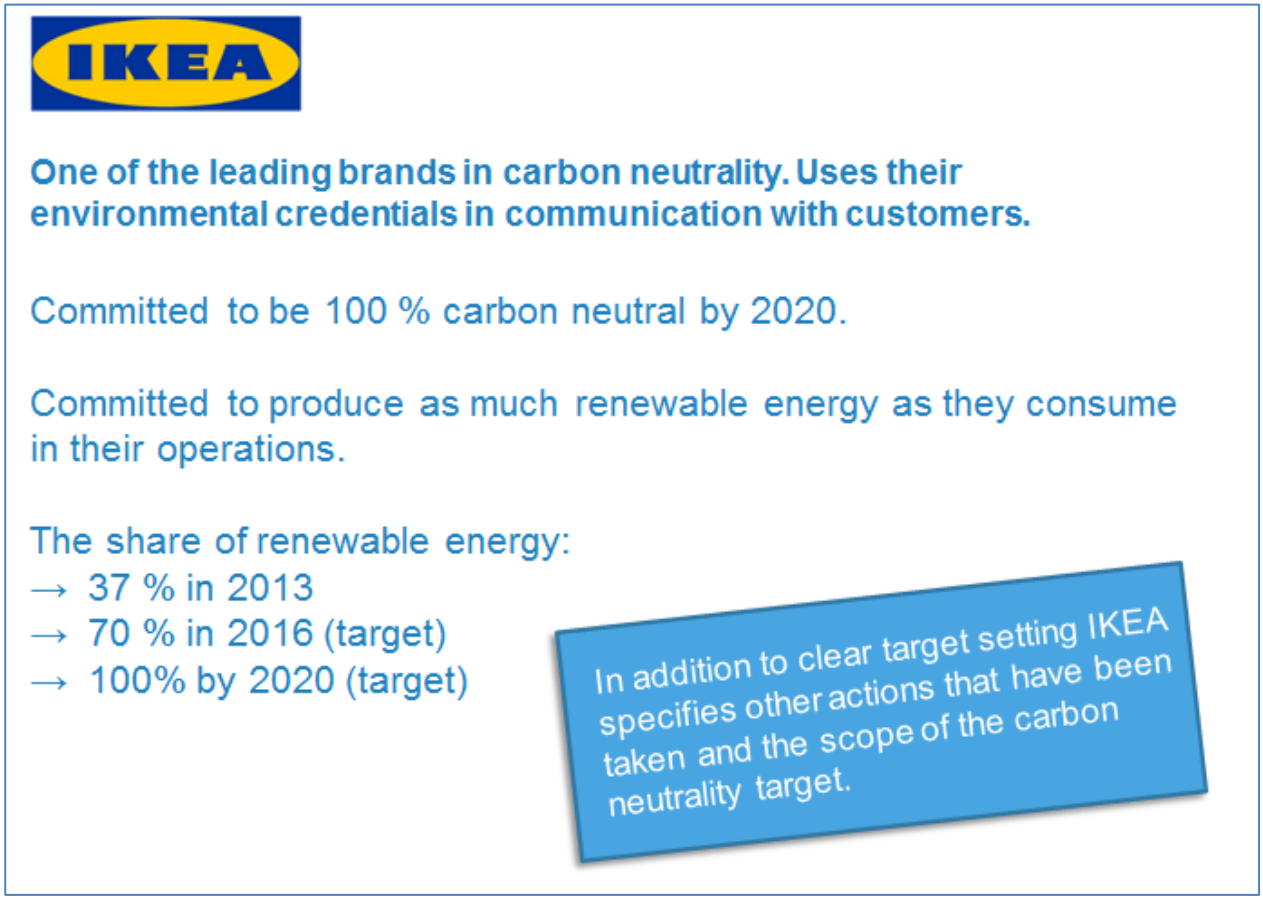

Figure 4 Example of clear carbon neutrality claim by IKEA.

Deutsche Bank serves as a good example on communicating the carbon neutrality target, means and achievements. The company sets clear targets for carbon neutrality aiming at minimising the negative impact of business operations on the planet as much as possible. In their public relations, Deutsche Bank claims to be carbon neutral, but uses also the term "low-emission economy".[16]

- *Overall goal:* Maintaining carbon neutrality through 2020. This will be achieved through continuing eco-efficiency efforts, the use of renewable energy, and supporting specific emission reduction projects in the developing world, and in addition, to raise employees' awareness of how to use resources responsibly.

- *Means:* Energy efficiency is improved by reducing energy consumption and switching to renewable energy. In addition, the consumption of water and paper is reduced, using environmentally friendly information technology, and aiming for a sustainable supply chain as well as improved waste management and making greater use of video conferencing. The numerous eco-efficiency measures that have been implemented throughout the group are not enough to completely avoid emissions of greenhouse gases. For that reason the company compensate any residual emissions by purchasing and retiring certified emission reductions (CERs).

- *Achievements:* The company had set a target to make operations carbon neutral by the end of 2012. The goal was achieved over a five-year period by reducing the Bank's global carbon footprint by 20 percent a year since 2008. The basket of climate change related activities earned Deutsche Bank a place in the Carbon Disclosure Leadership Index for the

[16] Deutsche Bank Responsibility 2015. https://www.db.com/cr/en/environment/carbon-neutrality.htm [2.4.2015].

second time in 2013, as one of 33 companies worldwide. In 2012, they also won Gold in the Best Green Intelligent Buildings Awards. In the GreenIT Best Practice Awards 2012, they took first place in the Visionary Overall Concept category. In 2013, 79% of their total electricity purchases come from certified renewable sources – mostly hydro and wind power.

Eden Springs is a workplace drinks provider. Since 2010 the company has promoted an environmental program in cooperation with The CarbonNeutral Company making its product CarbonNeutral across seven countries - the UK, Switzerland, Denmark, Finland, Sweden, Norway and the Netherlands. The company claims that it has become a low-carbon company with 100% of the environmental impact of their coolers compensated to net zero. In addition they have put into place several actions and practices to reduce CO_2 emissions. A carbon footprint assessment was done in 2010 and updated in 2012 in order to show that their efforts have given results. Based on the results from the first assessment the top 3 sources of CO_2 emissions are the cooler's electricity consumption, production of material and transport (Figure 5). The calculation included the totality of GHG emissions, directly or indirectly, emitted during the extraction, production, distribution and consumption of the product.

A typical glass of Eden Springs' water produced 30 g of greenhouse gases during the extraction, production, distribution and consumption stages, multiplied by 600 million litres of water to more than half a million offices in 15 countries across Europe a year has an impact on environment.[17]

In addition to the carbon offsetting, Eden has put in place several initiatives to further support its development as an ecologically friendly business. These measures include its 'Save a Cup' campaign to promote recycling amongst office-based customers, electronic billing, the development of low energy use water coolers and the introduction of 'long life' cooler bottles which can be cleaned and used up to 50 times before being recycled.

The company does not tell how large part of the emissions is compensated but they illustrate the annual savings, for example in Finland their 8 000 customers save 1 617 t CO_2-eq. which equals 161 700 trees that could cover the area size of Helsinki[18].

Figure 5 Eden Springs carbon footprint and certificate (Source: www.edensprings.co.uk)

4.3 Finnish examples

Many more companies can be considered as a good practice in their effort of becoming carbon neutral. These are for example the companies of *The A List* published by *The CDP (Carbon Disclosure Project) Climate Performance Leadership Index 2014* (CDP 2014). These companies are

[17] Eden Springs, 2015. http://www.edensprings.co.uk/what-matters-to-us/our-environmental-commitment/ [2.4.2015].
[18] http://www.edensprings.fi/hiilidioksidipaastosaastot-vertailu-puissa/ [2.4.2015].

called the global leaders in climate performance, according to the CDP. It is interesting that many of the leading companies are car manufacturers (CDP 2015). Five Finnish companies have been included in the list in 2014:

Table 7 Finnish companies on the A List of CDP.

Company	Sector; Subsector	GHG trend	Scope 1+2 (tCO_2e)	tCO_2e/M$ revenue	Disclosure score (max 100)
Finnair	Industrials; Airlines		2 361 189	741	92 (2012)
Nokia Group	Information technology; Communications equipment		157 200	9	97 (2013)
Vaisala	Information technology; Electronic equipment, instruments and components		7 063	19	99 (2014)
UPM-Kymmene	Materials; Paper and forest products		7 310 000	547	not found
Elisa	Information technology; Diversified telecommunication services	-	-	-	92 (2013 or 2014)

Finnair is on track to reduce per-seat CO_2 emissions by 24 percent between 2009 and 2017 (link). Actions: Efficient aircrafts, strict "weight watching", continuous descent, biofuels hub in Vantaa, offices consolidation (LEED).

Vaisala is accounting all GHG emission from Scope 1, 2 and 3. They use GWP_{100} characterisation factors and methodology of the GHG Protocol. Scope 3 emissions added up to 60% of all emissions of the company in 2014. Emissions reported in the "A List" of CDP, however, only take into account the Scope 1 and 2 emissions. It is important to note that embodied emissions from materials and components used in the products are not accounted for.[19]

Posti, a provider of postal and logistics services in Finland, aims to reduce its CO_2 emissions by 30% by 2020 (in relation to net sales compared to 2007). It offers a service called Posti Green, which essentially is a carbon neutral postal service. Posti purchases carbon offsets to make the service green. On the other hand, the company invests in fuel efficient fleet and introduces energy saving measures in order to become carbon neutral by 2015, on the national level (excluding foreign operations). The figure below illustrates a hierarchy based on which Posti treats its CO_2 emissions.

[19] Vaisala Carbon Footprint http://www.vaisala.com/en/sustainability/environment/cdp/Pages/default.aspx

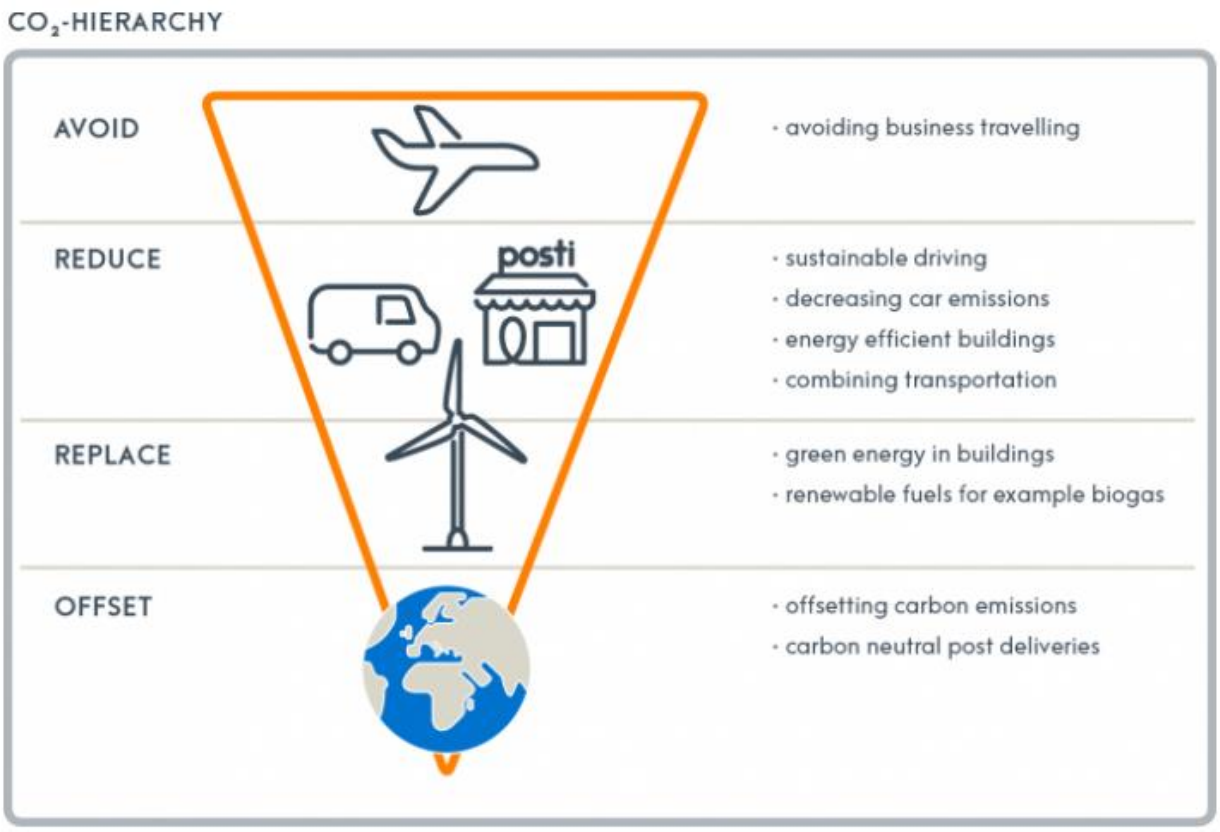

Figure 6 Posti's CO_2 hierarchy (Source: Posti's CSR report 2014).

5 Insights into carbon neutrality in large Finnish companies

Finnish companies are on track towards carbon neutrality but what does carbon neutrality really mean in today's business? Interviews were conducted with selected industry experts to identify this concept in eight Finnish based but globally operating companies and to provide understanding of their perceptions and expectations for the concept development. All of the interviewed experts have a good insight and experience on corporate sustainability issues. Most of these companies are members of the Climate Leadership Council which aims at affecting the Finnish businesses' and research organisations' competitiveness and ability to respond to the threats posed by climate change and the scarcity of natural resources, as well as to improve their ability to utilize the business opportunities related to these (http://clc.fi/en/). Thus, they are considered as forerunners in sustainability and carbon neutrality.

Carbon neutrality is seen as a strategic business goal or vision

The importance of emission reductions in business and society is widely recognized in the interviewed companies. They set long term sustainability targets that can be reached by continuous improvements in energy and resource efficiency. Indeed, in many companies carbon neutrality is seen as a strategic vision and considered as vital for the future business (Table 8).

Table 8. Examples of companies' sustainability visions, views and strategic goals

Company	Long term sustainability vision or target
Fortum, Road map to CO_2 free future	To be a CO_2 free power and heat company.
St1, Sustainability report, 2013	To be the leading producer and seller of CO_2 aware energy.
UPM Sustainability report, 2013	To lead the integration of bio and forest industries into a new, sustainable and innovation driven future.
Nokia, Sustainability report, 2013	To mitigate risks, minimize environmental impacts and maximize positive contribution.
Outotec, Sustainability report, 2014	Focusing on enabling the sustainable use of Earth's natural resources, and commit to sustainability.
Uponor, Sustainability report 2013	To develop and implement innovative and responsible solutions which improve human environments whilst reducing environmental impact.
Gasum, Sustainability report, 2013	Aim at a cleaner local environment, cleaner Baltic Sea and cleaner climate. Long-term objective is to become the most important player in the northern Baltic Sea LNG market and the most important provider of bio-based gases in Finland.
Neste Oil, 2014	Vision is to be the preferred partner for cleaner traffic fuel solutions.

In the companies, the current understanding of 'carbon neutrality' – although not consistently defined or communicated in public relations – strongly suggests that it is a long term strategic target for the company and a basis for their future business. A more detailed road map describing the process how to reach the target by continuous improvements of operations is needed. This differs from the more traditional way of considering carbon neutrality as a 3-step process of measuring, reducing and compensating emissions within a relatively short time. However, these (footprint calculation, reductions measurements and compensations) can be used as tools to reach the ultimate target of carbon neutrality. Overall, the conventional view of reaching carbon neutrality through emission reductions and compensations seems to be too narrow for a concept definition, and there should be a broader understanding about companies' climate and sustainability issues in order to develop the concept's direction further. (Figure 7)

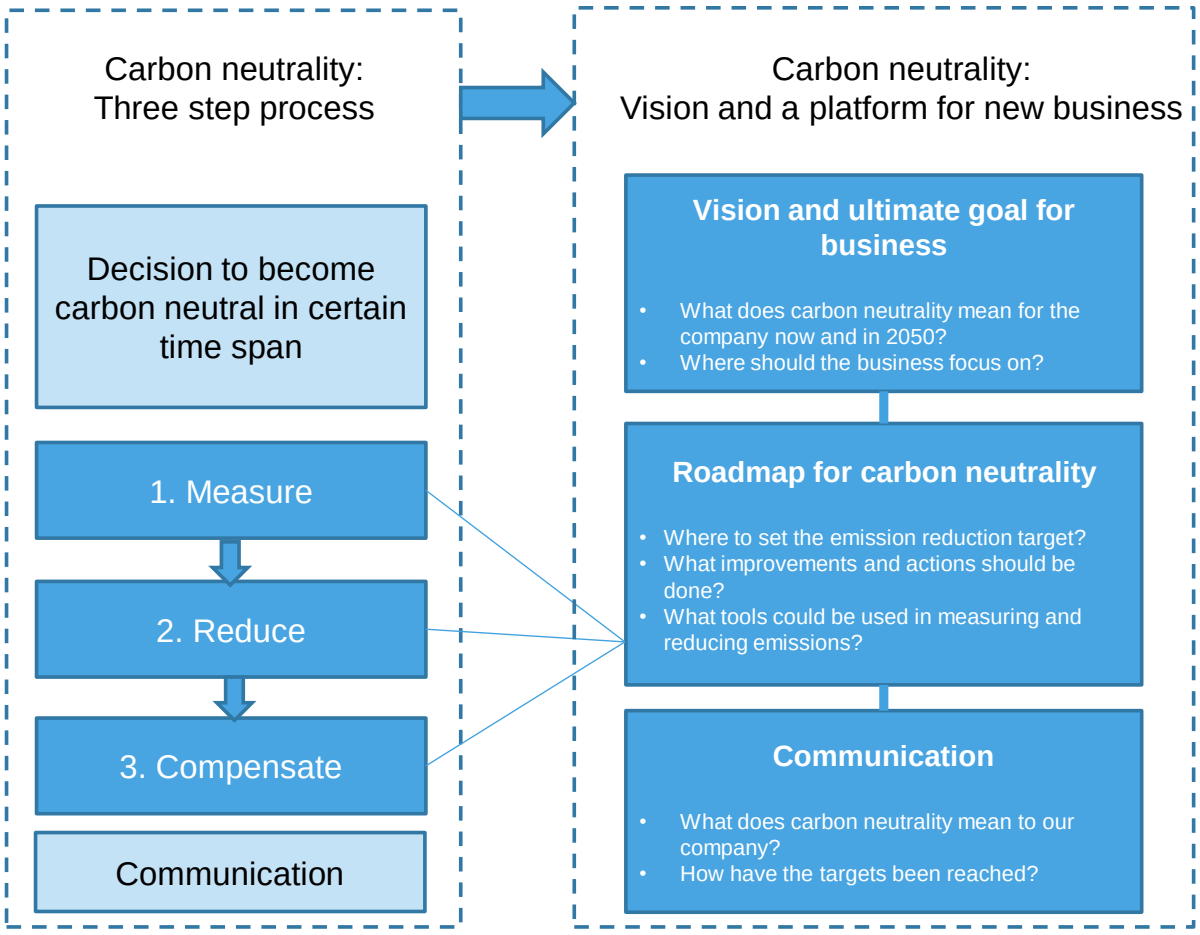

Figure 7 Moving from 3-step process view towards new business opportunities

Carbon neutrality provides companies with new business opportunities and state of the art products

Carbon neutral products are considered to be top class in terms of technical features, efficient production process and resources used. Carbon neutrality presents real opportunities for companies to develop products and renew processes to be more sustainable. It is also considered as a promoter for searching for new business opportunities and concepts that could replace the conventional business (example Figure 8). Also the expressions *carbon free*, *low carbon*, *bioeconomy* and *solar economy* are used to describe the shift from today's business to concepts that are based on renewable energy and carbon free solutions. Especially in energy sector, low carbon targets and their implementation can be vital for the companies' future business.

Carbon neutrality provides new business opportunities

Example: St1 Finland

Target:

To be the leading producer and seller of CO2-aware energy.

Goal:

To replace fossil fuels by recycling waste into the cleanest traffic fuel in the world and reduce fossil carbon dioxide emissions in the process.

Action:

Investing in local renewable energy (in new wind power production sites around Finland) and developing domestic energy products to replace fossil-based energy

Doing good for environment and compensating own carbon footprint:

- The company provides consumers and corporate customers with sustainably produced energy by recycling waste and leftovers to produce liquid fuel, and generating electricity using wind power.
- In 2014, the company's 25 wind power plants generated 215 million kWh of electricity. This equates to approximately 28% of the total amount of wind power generated in Finland.

Figure 8 Example of new business modes (Source: St1 sustainability report, 2014)

In the Finnish companies, the expression *carbon neutral* appears more often in the context of products and product development than in the context of organization. Drivers for developing and launching carbon neutral alternatives are based on customers' and investors' demand and interest towards carbon neutral products. Measuring the footprint of products and services and developing carbon neutral choices gives a message that companies are willing to take care of their environmental and social responsibilities.

Table 9 Examples of carbon neutral products

Fortum[20] has launched carbon neutral heat product, meaning that companies can purchase international emissions reduction units to offset the carbon emissions generated from the heating they use. The additional cost for the user is 5 €/MWh. Carbon offsets are verified by Golden Standard.
Gasum[21] has launched carbon neutral biofuel for transportation. The carbon dioxide emission reduction of biogas is approximately 80% in comparison with fossil fuels, calculated in accordance with the Renewable Energy Sources (RES) Directive.
Nokia Networks[22] has enhanced its Single RAN Advanced portfolio to enable operators to modernize their base station sites to achieve up to a 70% reduction in site energy consumption

[20] Fortum Annual Report 2013 http://annualreport2013.fortum.com/en/sustainability/gri-section/environmental-performance-indicators/products-and-services/

[21] Gasum – Energy of the future already available today http://www.gasum.com/Facts-about-gas-/Biogas/

and CO_2 emissions. The portfolio also allows for the first time a broader use of renewable energy sources like solar, wind and fuel cells, making them viable for powering base station sites.

UPM BioVerno[23] is a renewable diesel fuel that can be distributed through the existing infrastructure. Unlike first-generation biofuels, it has no blending limitations.

In addition to manufacturing, companies may provide additional energy efficiency services or solutions that help consumers *in using their products* energy effectively. For example, Fortum among others, is developing solutions to reduce the climate impacts of energy use in housing, transportation and electricity distribution, and taking an active role in realising sustainable cities by developing the necessary technologies, and offering its customers eco-efficient heating and cooling solutions and climate-benign electricity and heat products.

Carbon neutrality provides companies with increased competitiveness and creates new competence

Companies' commitment to carbon neutrality approach has an impact on how they actually carry on with their daily operations. Low emission procedures mean less energy and resource intensity and fewer costs. In turn, they gain more customers and higher revenues due to innovative and efficient products and solutions.

When engaged to carbon neutral thinking, companies can easier contribute to their own operations whereas the bigger challenge is to control over the supply chain. In many companies a majority of GHG emissions is actually caused by the supply chain and/or in the use phase. Thus, in daily business, management of the supply chain is of key importance to companies' productivity. Carbon neutrality approach has provided companies with deeper understanding on the operations of the supply chain, i.e., the origin and sustainability of resources. For example Ecovadis is a web based platform that aims at improving environmental and social practices of companies by leveraging the influence of global supply chains. It enables companies to monitor the sustainability performance of their suppliers, across 150 sectors and 99 countries (Ecovadis, 2015)[24].

Companies measure the achievements of carbon neutrality not only in terms of reduced emissions but also in terms of cost savings and profits. Developing company's own competences is crucial in striving for carbon neutrality. This is highlighted especially in heavy industries but all sectors should have the consciousness and knowledge on the issues related to carbon neutrality in their business.

Conventional offsetting is not commonly used

Compensating emissions is often understood as buying offsets or voluntary credits for producing GHG emissions. However, this view is not widely used in Finnish companies. It is used in the interviewed companies only in terms of emission trading (in sectors that belong to emission trading scheme), for a specific product group, and also to some extent in terms of compensating emissions caused by travelling of personnel. Nevertheless, buying offsets and compensations

[22] Nokia Networks Single RAN Advanced http://networks.nokia.com/portfolio/products/mobile-broadband/single-ran-advanced
[23] UPM BioVerno http://www.upmbiopolttoaineet.fi/upm-bioverno/Pages/Default.aspx
[24] Ecovadis – Sustainable Supply Management http://www.ecovadis.com/website/l-en/home.aspx

could be seen as a transitory means in the journey towards the *real* carbon neutrality, a condition where the need for compensations would be eliminated, e.g. in transition from fossil fuels to the use of 100% of renewable energy.

Companies try to improve the environment also in terms of participating and launching projects for environment and/or social well-being (including projects initiated by e.g. WWF, Baltic Sea preservation, UNICEF). These are considered as part of their social and environmental responsibility rather than means to offset emissions. Overall, terms *offsetting* or *compensating* are not widely used in public relations.

Investing in own renewable energy production is a key for pursuing carbon neutrality

Companies' investments in their own renewable energy production are becoming a trend as one means of reducing or compensating the emissions caused by production. Companies are investing e.g. in solar panels to their premises and/or local wind power. This could present an opportunity for real emission reductions instead of offsetting, in a sense that the company genuinely invests in local or own renewable energy production. This could also provide opportunities for companies to offer new products to customers or even become a provider of carbon offsets.

Positive handprint approach is raising interest in public relations

In many industries, large amounts of greenhouse gas emissions are caused in the use phase of the product. Thus, when talking about carbon neutrality more emphasis should be given also to the products and their usage instead of focusing only on the production processes.

Positive handprint is a means to evaluate reduced emissions of effective products or solutions provided by the companies.[25] For example, in Outotec the focus is on maximizing the positive impact with customers to improve their resource efficiency, energy and water use and minimize emissions (Figure 9). 'Maximizing our handprint', is used in company communication illustrating the positive impacts of the company's solutions and services on resource efficiency and smaller environmental footprint. The company's Handprint is based on calculations of realised emission reductions that are caused by using the company's innovative products and applications for renewable energy and industrial water treatment, compared to a baseline.

[25] See, for example: http://living-future.org/news/environmental-handprinting

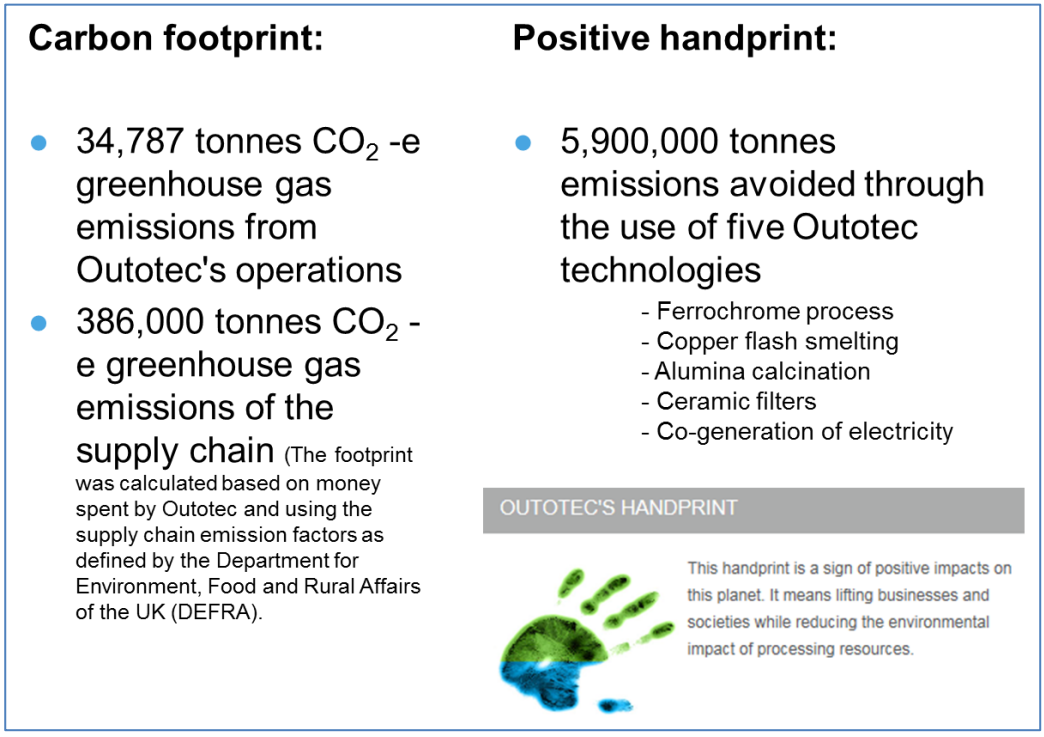

Figure 9 Positive handprint can be greater than footprint, example Outotec (Outotec, sustainability report, 2014).

Companies use internationally approved guidelines for calculation and reporting about carbon neutrality

The commonly used calculation procedure is the GHG Protocol according to which the Scope 1 and Scope 2 emissions are included – in some cases also the Scope 3 emissions. In reporting, the GRI G4 guidelines are followed. In addition, companies may have tools such as sustainability impact assessment of investments and Carbon Disclosure Project's Climate Disclosure Leadership Index that gathers and reports the GHG emission data from companies (CDP, 2015).[26]

As a more general means to achieve carbon neutrality companies develop their R&D and innovation processes and undertake concept development in co-operation with partners. They also invest in future carbon free solutions, produce own renewable energy and/or buy green electricity. For example, some companies buy 50 – 100% of their used electricity as based on green certificates.

Carbon neutrality is not only a business matter – also governmental support and leadership is needed

Society and legislation play an important role in 'carbon games'. The frame for carbon emission reductions is set on global and EU level and companies should reflect and adjust their own emission reduction targets to these objectives. In practice the steps that are taken in the society contribute also to current practices in business life. Thus, there should be a more detailed road map on how and in which time frame the society and different sectors aim at being carbon neutral.

[26] Climate Disclosure Project: https://www.cdp.net/en-US/Pages/HomePage.aspx

Indeed, carbon neutrality may have different focus in different sectors and businesses. The size of the business and the industry where a company operates definitely has a reflection to the content of carbon neutrality and appropriate means how to reach it. There is a continuous debate for example in the forestry sector and energy sectors about the carbon neutrality of biomass and bio-based energy. What are the frames in which the whole sector and companies operating in it would be considered as carbon neutral? Today, the definitions are based on companies' own interpretations but it would be vise to have a sector specific definition, targets and requirements for carbon neutrality that would be still valid after 15 – 20 years. This would guide companies to develop their strategy, processes and products towards the right direction instead of continuously adapting the business to the shifting view of the concept.

Today, the concept of carbon neutrality is still very much production oriented, whereas the focus should be more on the consumption side. Policy tools should be allocated to improve customers' possibilities to acquire carbon neutral solutions. For example, more efficient financial support is needed for the commercialization phase to provide references for new products and business concepts through carbon neutrality in companies. There is a call for more possibilities for pilots and scaling of technologies. In addition, open minded private and public buyers play an important role. Indeed, public procurement is one important means to boost carbon neutral solutions. For example, demand for low carbon fuels, technology neutrality in the definition of subject matter of the contract.

Policy tools for carbon neutrality should not be too limited. Companies invest increasingly in their own renewable energy plants to produce clean energy. This includes a great potential and opportunity also for customers, and thus it should be supported and not to be limited by regulation. In addition, regulation could be used to label products that are harmful to the climate for example with the claim: "engenders the planet". This kind of labelling has been used for example in the context of health (compare: tobacco products).

References for carbon neutral products and concepts should also be accelerated by creating 'windows to carbon neutrality' meaning reference areas and experiments provided by the society, for example 'carbon neutral projects'. Also long terms policy tools should direct the infrastructure and legislation towards low carbon solutions and conditions that would make the world less dependent on fossil based energy and promote the transition to bioeconomy. Also reference areas of carbon neutral traffic infrastructure and mobility solutions could be developed.

Power of the value networks and co-operation

Ambiguous goals have been set in the society to reach low carbon conditions in 2050. This requires a transition from the fossil based infrastructure and dependence on oil products to solar and biobased energy systems. In order to reach the goal the co-development of infra, solutions, business concepts and products is essential. The systemic change may be needed in order to gain the 'true' carbon neutrality is certain sectors.

Companies should strive for carbon neutrality together and create value networks that would provide possibilities to better achieve the common goal of carbon neutrality. Companies should be brave in recognizing new potential business opportunities and ways of reducing carbon footprint, for example investing in their own renewable energy production instead of offsetting.

6 Rules for carbon neutrality - discussion from the workshop

Target setting, means and tools for carbon neutrality and communication were focused in the discussion of Finnish industry experts in the carbon neutrality workshop.[27] The most important 'rules' of the game refer to the target setting, calculation methods and communications. Participants gave contribution to the further development of the concept by discussing about carbon neutrality from these viewpoints.

#1 The ultimate goal should be ambiguous but not necessarily restricted on time

The concept of carbon neutrality was highlighted by participants as having its greatest relevance as an aspiration for a company toward sustainability and as a direction for the business in the future. Each company should consider the meaning of carbon neutrality to its business and position themselves to the year 2050 when the use of fossil fuels is reaching its end, and analyze what the focus will be and what actions (product development) and strategic changes of direction is needed to get there. Connections of carbon neutrality to companies' actions and products should be built.

Target setting can be divided into company level and product level. The time period in which the company functions will be carbon free may differ from the time period needed for carbon neutral products. Time span of target setting for low or carbon free actions and operations depend also on the scope of emissions under evaluation, i.e. on which scope of emissions will become carbon neutral.

Thus the distant goal of carbon neutrality does not need to be restricted on time. It works more as an ambition of the daily work towards carbon neutrality, whereas more detailed and short-term step by step targets should be set on specific time in order to measure, assess and communicate the gradual achievements gained. Targets should not be set too low but they have to be realistic or otherwise it is misleading and bad for company's reputation. One idea was that realistic and measurable sub-targets could also work as a basis for bonuses.

An example or target setting:

Ambition in long term	Specific target in short term
Our vision is to become carbon free.	We will use 100% green electricity by the year 20xx.

It is logical that a company sets the targets based on its measured and/or current emission levels. The achievements should, however, be mirrored against the science based targets that has been set for example for the sector where the company operates, from the viewpoint of 2 degrees global warming threshold level. These science based targets are after all the reason for striving for carbon neutrality but as seen in the companies, they are not necessarily the appropriate base for a company's own target setting.

[27] Sitra workshop: Garbon game is on! in 15.4.2015 Helsinki. 20 participants were gathered in a workshop to discuss about the rules and procedures of using the carbon neutral concept in business.

Emission reductions could be measured in absolute terms but they should be communicated also in relative terms such as relative to turnover or relative to personnel, etc. It is important to show that the next product generation is more efficient than the former one especially in case the volume of the business is rising up and the absolute energy consumption is increasing in the near future. In addition to communicating the results or achievements annually, continuous progress towards the carbon neutrality target is essential in companies' communications.

#2 The initial goal of carbon neutrality should be communicated openly

Today, many companies set and communicate their low carbon targets and continuous improvements rather as *sustainability* than carbon neutrality. Also expressions such as carbon free, low carbon, bioeconomy and solar economy are used to describe the shift from today's business to forms that are based on renewable energy and carbon free solutions. Although some would prefer to talk about sustainability as an umbrella term, companies view was that carbon neutrality should be put into the title and used more often.

Nevertheless, it was seen that whatever the focus is for carbon neutrality in a company, it must be communicated clearly. Expression 'carbon neutral' can be used as long as the company opens the concept and calculation behind it clearly.

Examples of communicating the carbon neutrality target:

Communicating carbon neutrality	Opening the concept
Our company aims to be carbon neutral.	Carbon neutrality in our company means that we become 100% fossil-free energy user (by 2020).
Our vision is to become carbon neutral.	Carbon neutrality means increased energy efficiency and improved competence of selecting suppliers and renewable raw materials for production.

Companies working in a same industry or sector should have a transparent way of communicating about carbon neutrality. Currently there is no single definition or criteria for carbon neutrality, which hinders the comparability of different companies and/or products of the industry. Thus, an industry or sector specified content for carbon neutrality could help to mirror own targets and communicate the achievements, e.g. for retail sector, banking, forestry etc. Industry organizations could also push companies forward in implementing carbon neutrality.

#3 Steps towards carbon neutrality should be made visible throughout the year

Highlighted timely issues from reports throughout the year and participating in public discussion instead of just releasing a long report once a year would increase the openness and reliability of communication.

#4 Carbon neutrality is equally important as a message to investors as to consumers

Companies should communicate about actions and benefits of carbon neutrality clearly. Communication about the climate positive efforts of the company or the product's climate

positive characteristics to consumers should connect the benefits from carbon neutrality to the company's products in a simple and compelling way, trying to avoid confusion. Especially actions and tangible benefits should be told clearly. Especially in business to business communication, the customers could be helped to see the monetary benefits from using carbon-neutral or climate friendly solutions (such as energy efficient buildings etc.) in the long run. However, for new products this could be a challenge or even a burden. In business to consumer communication, it was highlighted, that carbon neutrality claims should be concise and kept simple.

Sustainability as well as financial reporting is highly valued in capital markets and hence important to listed companies, anecdotally to financial reporting. Today Internet of Things (ioT) offers new feed to reporting making it easier as more data becomes available such as car mileage, electricity consumption etc.

#5 Companies should feel confident about the means and methods they use for reaching and measuring carbon neutrality

The starting point for the discussion was that there are always environmental impacts in business operations, and a general balance between emission reductions and offsets cannot be set. Thus, in theory, a coal mine could offset the footprint and brand itself as carbon neutral and nobody could oppose this. The question is more about ***does the company itself feel confident about the means to reach the carbon neutrality target and/or do they trust on the methodology of calculating the targets*.** For example, the scope 3 emissions are difficult to account for and thus often excluded. This fact slightly distorts the balance.

Offsetting is not commonly used in Finnish (large) companies. However, it was seen and discussed as a potential means to be used to reach carbon neutrality especially as a transitory means and for certain products. If offsets were used, companies should be able to trust the offset service provider without a need to investigate whether the offsets are trustworthy, calculated correctly, additional etc. It is the job of the offsets provider and that one should be under the public control. In addition, it is important to specify *to whom* the offsets should be acceptable. The same offset may be not acceptable politically, but may be acceptable by the company or by its suppliers. Customers may also have a different view on what is acceptable. Interests differ between the stakeholders and thus, the balance of how much could be offset is not straightforward. But if used, *the share of offsets should be communicated to public audience*.

Communicating about positive handprint was seen important. However, it was seen that the one who pays for the product should get the credit. The question arises, could companies get carbon offsets/credits for their positive handprint if it was be possible to calculate the handprint correctly, and how would the double counting be avoided.

7 Conclusions

There are number of ways to interpret carbon neutrality in business life and media. The more conventional interpretation, and narrower in scope is the description of carbon neutrality as a process with clear start and end. It starts by measuring GHG emissions, reducing them as much as possible, and ends to compensating of the unavoidable emissions so that the net emissions equal zero. Such efforts can be done within a relatively short time period. On the other hand, long term and ambiguous emission reduction targets are also possible to set under this framework. Much emphasis is of course put on the reliability and openness of communication. There are indeed many companies in Finland and globally where this approach works well. This may be an attractive

approach especially in companies where the unavoidable emissions reductions are compensable at a moderate cost.

The wider scope for carbon neutrality as an ultimate goal for business is common especially among the larger companies. This approach highlights a series of key management decisions as a basis. The focus is on creating new businesses and competitiveness arising from carbon neutrality concept. Another difference between the conventional concept definition and the wider scope definition is that there is not necessarily a pre-set end but the work towards carbon neutrality is continuous according to a roadmap where the targets are set more clearly. According to this view, carbon neutrality can be achieved by doing ambitious emission reductions and climate friendly business without a need to compensate.

Making the decision to become carbon neutral is always a big step that may have significant contributions to the business and working manners. It requires courage and openness to adopt the concept of carbon neutrality and communicate it reliably. The internal drivers for carbon neutrality may be different that those arising externally. There are always only a few early adopters i.e. market leaders or market makers. Companies need the will and the courage to position themselves as first movers or forerunners both in applying low carbon approach throughout the business operations and in communicating these efforts.

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Appendix Carbon offset checklist of Quality Assurance Standard

Application checks

1. Companies applying with carbon offset products for approval must be registered with a national authority.

2. A board director must sign off the company's QAS applications and the QAS requirements.

3. Agreement made that carbon offset projects used against QAS-approved offsets must carry one of the following high quality certificates: CERs, ERUs, AAUs, EUAs, Gold Standard VERs or VCS version 2007 onwards.

4. Agreement must be made that no approved offsets will use project methodologies using hydro>20MW.

5. Agreement must be made that no approved offsets will use HFC23 project methodologies.

6. Agreement must be made that approved offsets based on land use employ sustainable REDD+ project methodologies.

7. Agreement must be made that the company is not promoting the purchase of carbon credits for investment purposes.

8. Agreement must be made that offline usage of the Quality Mark must be marked with the dates of approval and a permanent URL which carries a full description of the offset online.

Emissions calculations

9. QAS approved carbon offsets must be calculated from a particular activity over a defined period of time.

10. Emissions calculations must be based on the most recent datasets available.

11. Summary methodology information must be accurate and concise.

12. Emissions calculations must adhere to the hierarchy of emissions calculation methodologies provided in Annex 1 of the QAS ARRP.

13. Where standard emissions methodologies are not applicable, non-standard methodologies must be justified on reasonable grounds and this must be made clear at the point of purchase.

14. A Radiative Forcing Index (RFI) of 1.9 is recommended, any other RFI must be used consistently and transparently.

15. Country-specific emissions must be calculated from an appropriate dataset.

16. Organisation-derived emissions datasets must be appropriately calculated, eg data derived from airline fleets.

17. Uplift of 15% must be applied to car test cycle emission factors to convert to 'real-world' emission factor values.

18. Uplift of 8% to be applied to average flight distance or actual Great Circle flight distances to take into account indirect routing and delays.

19. Aviation calculations must take account of class of travel or other loading factors.

20. If the manufacturer standard European test cycle is used for car or van calculations, estimates must be included for emissions of CH4 and N2O from DCF Annex 6 or 7.

21. Average journey distances must comply with the data in Annex 1 of the QAS ARRP.

Website checks

22. All references made to a QAS approved offset must either refer prominently to the activity and period of time against which it is made, or link to a page where that information is displayed prominently.

23. All non-QAS offsets must be clearly separated from QAS offsets.

24. QAS Quality Mark must be used within brand guidelines, including only being used in association with approved offsets and linking to the approvals page on the QAS website.

25. Summary methodology information should be made available at the point of purchase.

26. Any non-standard methodologies must be made clear at the point of purchase.

27. Any RFI other than 1.9 must be made clear at the point of purchase.

28. Websites comply with the DEFRA Green Claims Guidance.

29. The appropriate dataset for any international emissions must be displayed prominently at the point of purchase.

30. The purchase of carbon credits for investment purposes is not advocated.

31. Pricing per tonne should be easily found and made clear whether inclusive or exclusive of tax Total price and price per tonne should be made clear as a minimum at the point of sale and in any case before the consumer is committed to purchasing an offset.

32. General information must be provided on the role of carbon offsetting in tackling climate change and the ethical importance of reducing native carbon footprints ('internal reduction') before carbon offsetting ('external reduction').

33. Information must be provided on how to reduce the measured carbon footprint; alternatively, clear signposting to a suitable information source should be made available to the consumer or organisation.

34. If social benefits are being claimed for VCS projects without double tagging (Social Carbon & CCBA accreditation), a specific disclaimer must be prominently displayed.

35. CO2 emissions must be clearly differentiated from CO2e.

Renewal checks

36. Statement of account for all QAS-approved offsets sold during the 12 month period of QAS approval must be signed off by a chartered accountant.

37. QAS approved carbon offset projects must carry one of the following high quality certificates: CERs, ERUs, AAUs, EUAs, Gold Standard VERs or VCS version 2007 onwards.

38. All credits sold during the 12 month period of approval must have been cancelled (retired) in an appropriate registry and direct evidence sought from that registry.

39. Carbon credits from contentious methodologies outlined at application must not have been used for QAS-approved offsets during the period of renewal.

40. All QAS approved offsets should undergo renewal 12 months later. If not, a note will be made against that offset on the QAS website.