



# Beyond carbon neutral

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*Who can be wise, amazed, temperate and furious, loyal and neutral, in a moment? No man.*

William Shakespeare (Macbeth)

*People who demand neutrality in any situation are usually not neutral but in favour of the status quo.*

Max Forrester Eastman

*The hottest places in hell are reserved for those who in times of great moral crises maintain their neutrality.*

Dante

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## Summary

**In recent years, the climate challenge has appeared in ever sharper relief. Some scientists now advise that to stabilise the climate we need to aim for an atmospheric CO<sub>2</sub> concentration much below the current level. Some studies even suggest it will be necessary to stop emissions altogether.**

**In 2005, CarbonSense coined the term ‘carbon positive’ and suggested businesses should count carbon; manage decarbonisation; update their business models; engage all stakeholders; and aim for low carbon leadership. Now, there are growing calls not only for ‘low carbon’ but also for a ‘carbon removal’ economy.**

**Offsetting may appear to provide one way forward. However, the associated carbon accounting is based on a host of assumptions that do not stand up to scrutiny. Companies’ claims to be ‘carbon neutral’ often amount to little more than greenwash and this kind of conscience-salving distraction is not a sufficient aim for any responsible business.**

**While banks, traders and offset vendors continue to jump on the carbon neutral bandwagon, some other companies are starting to frame their objectives in terms of zero carbon. It is essential that we recognise and learn from false ‘solutions’ and develop the kinds of leadership that the climate challenge demands.**

# Beyond carbon neutral

In the autumn of 2005, CarbonSense was commissioned to write a ‘think piece’ on the subject of carbon neutrality.<sup>1</sup> A growing number of companies claimed to be ‘carbon neutral’ or advanced the idea that a particular product could be ‘climate neutral’, although such claims were also the subject of some criticism.<sup>2</sup> This prompted us to look more deeply into offsetting and some of the issues associated with it.

To achieve climate stabilisation, global carbon emissions need to be reduced. Offsetting appears to provide one way towards this that is economically efficient. Under the Kyoto Protocol, the carbon market provides mechanisms designed to enable investment from developed countries to help meet the needs of developing countries and deliver sustainability benefits. Outside this regulated market, voluntary offsetting offers broadly similar opportunities.

At the time of our investigation, barely a month went by without new scientific findings indicating that climate change was already upon us. Although the Kyoto Protocol had come into force earlier in the year, it was already apparent that the agreed timeframes and target setting for greenhouse gas emission reductions were not keeping up with the findings of scientists. The scale and urgency of response needed by governments and businesses would be far greater than had previously been anticipated.<sup>3</sup>

In that context, the growth of voluntary offsetting by companies appeared laudable. It suggested that businesses were able to see through the denial still being promoted in some quarters,<sup>4</sup> identify commercial benefits from taking early action, and demonstrate the kind of leadership and corporate responsibility that could make a positive difference (Fig. 1 - The journey to ‘carbon neutral’).

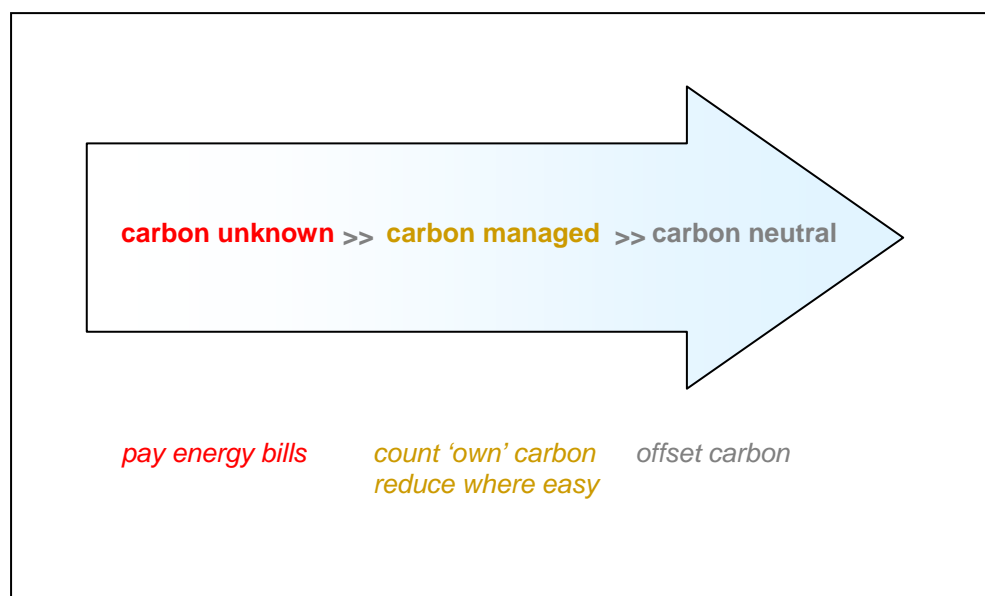


Figure 1 The journey to ‘carbon neutral’

## Positive solutions

By 2005, CarbonSense had already helped many businesses and other organisations to make sense of climate change issues, count carbon and put in place processes to manage and reduce emissions. We had facilitated the development of corporate carbon strategies and used innovative approaches to rouse the motivations of individuals. We had also looked closely at the developing monetisation of carbon and run events on the theme of ‘carbon as currency’.<sup>5</sup>

To consider what leadership on climate change might look like, we were able to draw on the experience of working on developmental pathways for businesses a decade previously. When standards for environmental management were being developed, attempts were also made to translate sustainable development into something meaningful at the level of an individual enterprise.<sup>6</sup>

This suggested that although effective management processes for new and complex issues – such as environmental impacts, supply chain ethics, and now carbon – need to be established, these processes in effect form only a baseline for any forward-looking company. We recognised that ‘carbon management’, once established, would be ongoing but not an end goal in itself. Once emissions are quantified, reported and reduced, the wider influence – up and down the supply chain and with other stakeholders – would also be the concern of a far-sighted business.

The notion of a restorative enterprise, i.e. a business that aimed to not only be sustainable but also to actively help repair the natural environment, had been around for some years.<sup>7</sup> Although no company had fully accomplished this, the fact that such ambitions had been expressed suggested that true leadership might involve an aim more far-sighted than offsetting and a goal more positive than neutrality.

We postulated that by actively engaging in the issues and developing new, decarbonising business models, a company might be able to move beyond just reducing emissions, and develop business geared towards more positive solutions.

## Offsetting – the problems

Offsetting appeared to be an integral part of this broader pathway to positive actions but our analyses suggested that in practice it was of limited value. Voluntary offsetting was mostly being undertaken by businesses with low direct emissions. The boundaries of the carbon being counted were very narrow.<sup>8</sup> The offset emissions were frequently described as ‘unavoidable’. Closer examination suggested that this usually meant ‘costly’, ‘inconvenient’, ‘calculated by our offset provider’ or, more fundamentally, ‘would involve changing our business model’.

The offsets purchased were generally low in cost and mostly appeared to be of marginal benefit in addressing the climate challenge. We also found that most offset vendors were more interested in selling offsets than in helping their customers to reduce emissions. This was not surprising as such a reduction in emissions could result in reduced sales for offset vendors.

Many offset vendors were selling offsetting to companies by targeting the people with marketing budgets rather than those actually tasked with working on reducing emissions. When questioned, some offset vendors claimed that paying for offsets would focus corporate attention on reducing costs and thus on reducing emissions. Of course it made commercial sense for them to advance this argument regardless of whether it was true or not.

Although all of these actions were reasonable, together they added up to a picture in which the starting bar was very low. Marketing-led claims to be ‘green’ or ‘carbon neutral’ rarely had a sound foundation in effective carbon management and reduction. They often amounted to little more than greenwash - a gloss that might bring benefits in terms of image and reputation but lacked depth and integrity (Fig. 2 - The shortcut to ‘carbon neutral’).

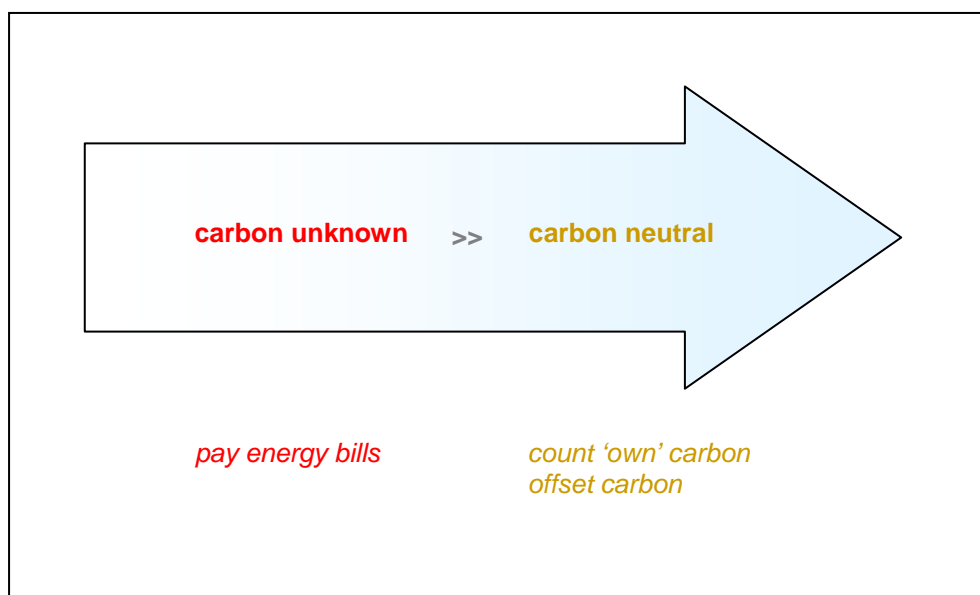


Figure 2 The shortcut to ‘carbon neutral’

In addition, there were many problems with the assessment of the carbon value of offset projects. Many dubious claims were being made. The carbon accounting processes involved in offsetting are based on a host of assumptions that do not stand up to scrutiny (Appendix 1 - Twelve issues associated with offsetting). For example, to consider all carbon to be equal over time is to ignore the changes of a dynamic system.<sup>9</sup> Global warming potential is compared over 100 years. This made sense when it appeared that we had several decades in which to start to take action but it makes limited sense now. A ten or twenty year comparison would draw more attention to the need to reduce methane emissions.<sup>10</sup> The concept of additionality is convenient but open to abuse.<sup>11</sup> In addition, the very processes of carbon markets encourage a kind of colonialism in which wealthy nations avoid action by investing in developing countries for their own purposes.<sup>12</sup>

Although there may be some exceptions, in our view offsetting and carbon neutrality were generally treated by businesses as a means to convey an impression, to tick a box, so that they could continue operating in much the same way as usual. As more players have entered the offset markets and the offsetting movement has grown, the problems have in some respects got worse.

## Carbon positive

Given the limitations of offsetting that we observed, a claim of carbon neutrality based on offsetting did not seem to be a satisfactory aim for business or government.<sup>13</sup> To make clear that we were concerned with a goal that was both more holistic and more ambitious, we coined the term ‘carbon positive’. We wrote a further paper about the ‘carbon journey’ in which we set out key actions for a business to take in order to move towards this carbon positive goal.<sup>14</sup>

By the time this paper was published, further investigation of carbon neutrality had led us to the view that there were similarities with the Kyoto Protocol. Both appeared to provide a mechanism to engage with the issues, but the flaws were so fundamental that there were serious grounds for doubting whether they would actually make much difference at all.<sup>15</sup> The entire emission reductions achieved through offsetting were marginal<sup>16</sup> and did not prompt any of the significant restructuring that is needed. Developed nations have continued to maintain unsustainable economies and lifestyles. The limited benefits for developing countries could have been achieved by other means. Indeed, it appears that offsetting could have the effect of slowing down responses to climate change rather than accelerating them.

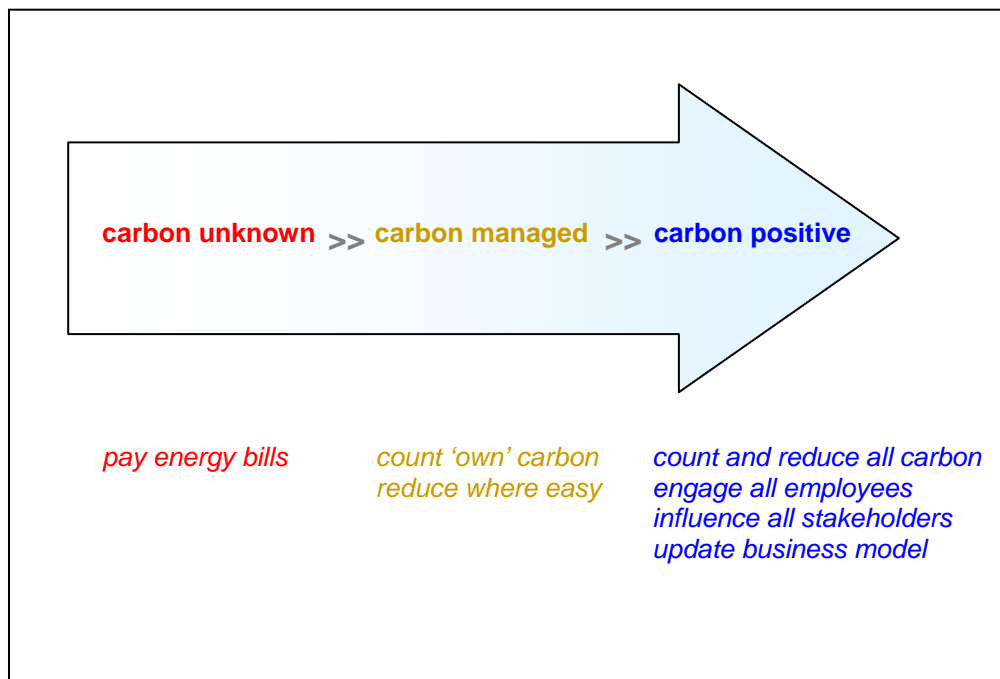


Figure 3 The journey to ‘carbon positive’

There has been a rapidly growing pro-offsetting lobby formed from those making money from offsetting services.<sup>17</sup> There have also been many published critiques of offsetting, the notion of neutrality and the limitations of attempting to address the climate challenge by focusing primarily on emissions.<sup>18</sup>

Many companies have sought our advice about the carbon journey. Although a small minority have gone on to make claims about neutrality, most have eschewed offsetting in favour of more integrated strategies (Fig. 3 – The journey to ‘carbon positive’).

CarbonSense does not make any exclusive claims for the ownership or meaning of the term ‘carbon positive’. It is used by a wide range of organisations in various ways<sup>19</sup> including some contrary interpretations. Some organisations have been using the term ‘carbon negative’.<sup>20</sup> We have employed our carbon journey framework with a variety of organisations. The term carbon positive is most commonly used in the kinds of ways we have suggested, and more examples of aspects of the carbon positive approach are beginning to emerge (Tables 1 to 4 – Towards ‘carbon positive’).

## Tipping points

The challenge ahead is becoming more starkly defined. The climate system is changing faster than models have predicted. Feedbacks are being driven by other ‘positive’ feedbacks, adding to and accelerating the changes rather than holding them back.<sup>21</sup> Some scientists now advise that for the climate to be stabilised, we should aim for an atmospheric CO<sub>2</sub> concentration of no more than 350ppm.<sup>22</sup> That is significantly below the actual concentration of 385ppm and far below the 550ppm target of the EU. Nicholas Stern has acknowledged that, in his report to the UK Government, the pace of climate change was underestimated.<sup>23</sup> Other studies have suggested that to achieve climate stabilisation it will be necessary to stop CO<sub>2</sub> emissions altogether.<sup>24</sup>

In the U.S., the Earth Policy Institute has drawn up proposals for an 80% emission cut by 2020<sup>25</sup> and in the UK the Centre for Alternative Energy has mapped out an alternative energy strategy to achieve a Zero Carbon Britain by 2020.<sup>26</sup> In addition, rapid rises in oil and energy prices, and concern about Peak Oil and energy security are becoming increasingly allied to concerns about climate change. Escalating food prices – partly a result of climate change and the switch to biofuels<sup>27</sup> – are further spurring grassroots mobilisation in the UK and elsewhere.<sup>28</sup> There is also a growing movement advocating re-localisation, re-skilling for local resilience, and the decoupling of growth from carbon.

There are calls for not only a ‘low carbon’ economy but also a ‘negative-carbon’, ‘carbon absorption’ or ‘carbon removal’ economy.<sup>29</sup> There are demands for carbon sequestration at the point of emission and technologies that will enable carbon to be captured from the atmosphere. Questions are being raised about whether growth itself is a holy cow, about ‘post growth’<sup>30</sup> and ‘post carbon’.<sup>31</sup> As Lester Brown, President of the Earth Policy Institute, stated: “We are in a race between tipping points in natural and political systems”.<sup>32</sup>

<b>IKEA</b>	Customers' trips to and from IKEA's stores exceed the company's own emissions. IKEA has therefore set a goal of making at least 75% of its stores accessible by public transport. The company has also been funding local transit projects, informing customers about their travel options including by listing online customer ride-sharing, funding bicycle routes, establishing park-and-ride bus services and providing in-store public transit information boards. <sup>33</sup>
<b>DHL Express Nordic</b>	DHL Express Nordic operates trains, trucks, ships, and planes. It found that 94% of its total GHG emissions are from third-party delivery contractors. The company now scores contractors' performance to assess fuel types and usage, engine classes, loading capacities and loading factors. It works only with contractors achieving satisfactory scores. <sup>34</sup>
<b>University of Washington</b>	The University accounts for student, faculty and staff commuting; professional travel; off-campus medical facilities (operated but not owned by the University); emissions from National Science Foundation research vessels operated by the University; emissions and sequestration <sup>35</sup> associated with solid waste management; and sequestration associated with the largest tract of forest that it owns. <sup>36</sup>
<b>FTSE500</b>	FTSE500 companies reporting to the Carbon Disclosure Project accounted for a total of over 3.6 billion tonnes of (Scope 3) emissions arising from use and disposal of products and services, supply chain, external logistics and business travel. <sup>37</sup> About a third of this was accounted for by two companies – BP and Rio Tinto. Significantly, for companies such as Nissan, Unilever, Rio Tinto and Marks & Spencer, these kinds of indirect (Scope 3) emissions accounted for over 95% of their reported totals.

Table 1 Towards 'carbon positive' – count and reduce all carbon

<b>Thames Water</b>	All staff in a key department were invited to join a personal carbon footprinting process. The results were shared and prizes awarded, including personal carbon coaching.
<b>Interface</b>	Interface has invited employees to have trees planted in lieu of traditional length of service awards. It also provides half of the cost for employees who wish to offset the carbon emissions associated with commuting to work. <sup>38</sup>
<b>HSBC</b>	Graduates from around the world, on a development programme, engaged in 'the carbon challenge'. A wider-scale programme is planned to reach 25,000 employees. An e-learning module is also planned to help all employees reduce the corporate carbon footprint. <sup>39</sup>
<b>TNT</b>	TNT aims "to become the first zero emissions express and mail company in the world". Planet Me is the company's campaign to engage employees around the world in emission reductions. <sup>40</sup>

Table 2 Towards 'carbon positive' – engage all employees

<b>Honda F1 Racing</b>	Formula 1 is watched by hundreds of millions of people. The livery launched in 2007 has drawn attention to climate change and raised a considerable sum for environmental charities. <sup>41</sup>
<b>Fiji Water</b>	Amidst controversy about the social and environmental impact of bottled soft drinks Fiji Water has calculated the carbon footprint of its entire supply chain, from raw materials and packaging to distribution and recycling. <sup>42</sup> The company estimates that 75-80% of its emissions come from supply chain operations. It plans to encourage suppliers to find ways to reduce emissions. <sup>43</sup>
<b>BSkyB</b>	<p>Sky's climate change programme is directed towards operations, influencing suppliers and business partners, and inspiring customers. The company has also launched a carbon credit card to encourage employees to take action; a 'Switch Off!' campaign to encourage them to turn off PCs, TVs and lights when leaving the office; and a £1,300 cash back scheme to encourage them to buy a hybrid car.<sup>44</sup></p> <p>The company has also established a process to evaluate the environmental performance of suppliers and provided workshops to help them to improve. In January 2006, Sky News hosted Green Britain Week which was dedicated to explaining climate change at a local level in the UK and the company also sponsored a Rough Guide to Saving Energy.</p>

Table 3 Towards 'carbon positive' – influence all stakeholders

<b>BT</b>	BT is one of the UK's largest electricity users but since 1996 it has reduced its UK CO <sub>2</sub> emissions by 60% and plans are in place to achieve an 80% reduction by 2016. Through the BT Global Services Sustainability Practice it is offering consultancy services - the BT Carbon Impact Assessment - to help organisations to develop their own action plans. <sup>45</sup>
<b>Tesco</b>	Tesco bought a 25% share in Greenergy Fuels Ltd in 2002 and became one of the first UK supermarkets to sell biodiesel blends. By 2006, the company was selling biodiesel and ethanol blended into petrol and diesel at over half of its forecourts. In 2007, Greenergy opened a biodiesel refinery with a 100,000 tonne capacity at Immingham <sup>46</sup> . Greenergy claims many corporate road transport users, including other supermarkets, among its customers. (This business diversification began before Tesco had fully assessed its own corporate carbon footprint <sup>47</sup> and before awareness of the many negative consequences of biofuel developments had become widely recognised.) <sup>48</sup>
<b>M&amp;S</b>	Marks & Spencer joined with Oxfam to launch the M&S and Oxfam Clothes Exchange. Consumers are encouraged to recycle clothes to raise money for Oxfam and to reduce the one million tonnes of clothing that ends up in UK landfill each year. <sup>49</sup>
<b>GE</b>	In 2005, GE introduced Ecoimagination – a strategy to develop products and services with lower environmental impacts. These include energy-efficient engines, appliances, locomotives and wind turbines. GE has committed to doubling its research and development investments in these technologies and aims to double revenue from their sale to \$20 billion by 2010. <sup>50</sup>

Table 4 Towards 'carbon positive' – update business model

## Leadership

It is not yet clear whether companies sometimes promoted as climate change leaders, such as BP, DuPont, GE and Alcan,<sup>51</sup> are reconfiguring their businesses for a carbon constrained world, or simply making marginal adjustments under new headlines. Nor is it clear whether such businesses have the flexibility to adjust or reengineer as the drive to dematerialise takes hold.

A number of other established companies have begun to test their business models against the scenarios of carbon constraint and climate change. Nevertheless, there is a risk that they will be eclipsed by new players using disruptive technologies and new organising principles.<sup>52</sup>

In developing sectors we have already seen the rapid growth of businesses such as Google, Vodafone, eBay and BlackBerry.<sup>53</sup> Many 'green' start-ups are now developing propositions specifically related to carbon and climate change. Their impact could escalate as investors seek climate change-related opportunities<sup>54</sup> and a carbon literate society develops.

A phenomenal number of offset vendors, carbon traders, banks and other players continue to eagerly jump on to the offsetting bandwagon. There will undoubtedly be other mistakes and red herrings too, but if we are to rise to the challenge of climate change, we will need to quickly improve or reject inadequate 'solutions' and develop new ones.

CarbonSense has worked with many established companies by mapping their transition into the carbon positive space, and with others in emerging sectors and markets. Forward-looking companies are working towards decarbonising business models and starting to frame their objectives in terms of zero carbon and carbon positive. It is clear that the kind of leadership that the climate challenge demands entails looking beyond carbon neutral.

## Appendix 1 - Twelve issues associated with offsetting

<b>The climate is changing</b>	The global climate is changing now and the need for significant action is urgent. Calculations used in offsetting are based on various assumptions and conventions that, for example, treat a tonne of carbon as being equal to another regardless of when it is emitted and equate greenhouse gases to carbon dioxide over 100 years as if we have that long to reduce emissions and stabilise the climate.
<b>Geological vs biological</b>	Some offsetting is based on absorption into the terrestrial biological carbon cycle (by planting trees). This is not adequate compensation for carbon that has been released from the geological cycle because of the vastly different timescales involved. To equate them can be grossly misleading.
<b>Delay</b>	There are innumerable instances in which a carbon benefit was not or has not been achieved years after a payment for an offset has been made. Offsets are often sold in advance of any carbon benefit being achieved at all.
<b>Asymmetric timescales</b>	Ridiculous examples abound – such as offerings to consumers which purport to compensate for the emissions of a few hours flying by installing low energy light bulbs in a developing country, when the calculations are based on a forecast of carbon saved over several years or the lifetime of the bulbs.
<b>Counting boundaries</b>	The counting boundaries for carbon being offset usually exclude most of the value chain. As a consequence, a company's claim to be 'carbon neutral' gives a lay person the impression that all of the carbon emissions associated with its products and services have been offset, when this is not the case.
<b>Unavoidable emissions</b>	The term 'unavoidable emissions' is frequently used. In practice, 'unavoidable' typically means 'inconvenient', 'without changing our habits', 'costly' or 'without changing our business model' i.e. it is a view based on behavioural, administrative or economic considerations, rather than in terms of climate impact and effects.
<b>Calculators</b>	Most so-called 'calculators' currently available are owned by offset vendors. They are mostly presented to the public as if they are robust, accurate and definitive but they are not. They will never be accurate. The best that can be achieved is for them to conform to accepted conventions on reference data and for this fact, and the use of such data, to be transparent. At present these conditions are rarely met.
<b>Ownership</b>	There are several kinds of ownership issue. For example, offset vendors often buy and sell the carbon rights of trees but not the trees themselves, preferring to avoid taking on the responsibility for their cultivation. Some airlines downplay their responsibility for emissions and invite their passengers to pay for offsetting.
<b>Additionality</b>	The value, in carbon credits, of a project is based on what would have happened without the project. This comparison with a hypothetical scenario cannot be proven, is subjective and widely abused.
<b>Leakage</b>	There is a possibility that emissions may increase elsewhere as an indirect consequence of an offset project. The absence of this 'leakage' – which could nullify the value of a project - is often impossible to prove.
<b>Carbon colonialism</b>	Credits derived from low cost emission reductions in developing countries have become a commodity traded in the wealthy nations that have created the climate problem, enabling them to justify continuing to add to the problem.
<b>Compensation</b>	An offset is an attempt to compensate for emissions. Most offsetting does not succeed as satisfactory compensation.

## Endnotes

- <sup>1</sup> R Webb and A Turner *What would a genuinely carbon neutral BT look like?* CarbonSense, March 2006 <http://www.btplc.com/societyandenvironment/hottopics/carbonneutrality/carbonsense.pdf>
- <sup>2</sup> For criticisms of offsetting and claims of neutrality see, for example:
- Larry Lohmann *The Dyson Effect: Carbon 'Offset' Forestry and the Privatisation of the Atmosphere* Corner House Briefing, 15 July 1999 <http://www.thecornerhouse.org.uk/item.shtml?x=51971>
- Kevin Smith et al *Hoodwinked in the hothouse* Carbon TradeWatch, June 2005 <http://www.carbontradewatch.org/pubs/index.html#hoodwinked>
- Patrick Bond and Rehana Dada (eds) *Trouble in the Air: Global Warming and the Privatised Atmosphere* Centre for Civil Society (South Africa), October 2005 <http://www.thecornerhouse.org.uk/item.shtml?x=397683>
- Heidi Bachram *Carbon Offset Controversy at Phone Co-op AGM* 28 January 2006 [http://www.tni.org/detail\\_page.phtml?page=archives\\_bachram\\_controversy](http://www.tni.org/detail_page.phtml?page=archives_bachram_controversy)
- Trusha Reddy *Blinded by the light* News International, July 2006 <http://www.newint.org/features/2006/07/01/south-africa/>
- Mike McCarthy *Are carbon offsets an excuse to carry on polluting* Independent, 12 October 2006 <http://www.independent.co.uk/opinion/commentators/michael-mccarthy-are-carbon-offsets-an-excuse-to-carry-on-polluting-419653.html>
- <sup>3</sup> In 2004, Russia's ratification of the Kyoto Protocol turned the signatories' statement of intent into a legally binding commitment (beginning February 2005) to reduce six key greenhouse gases to an average of 5.2% below 1990 levels by 2012. The Kyoto Protocol included 'flexible mechanisms' to allow developed countries to meet their obligations by buying carbon credits from developing countries. However, while emissions globally continued to rise, progress in establishing carbon markets was very slow.
- <sup>4</sup> See, for example, the Royal Society's letter to ExxonMobil 4 September 2006 <http://royalsociety.org/document.asp?tip=0&id=5851>
- <sup>5</sup> These had been for academic groups, businesses and at HM Treasury.
- <sup>6</sup> See, for example:
- Stephan Schmidheiny *Changing Course* MIT Press, 1992
- Richard Welford *Environmental strategy and sustainable development* Routledge, 1995
- Peter Martin and Colin Hutchinson *Towards Sustainability* Office for Public Management, 1996
- <sup>7</sup> The most notable statement of this aim was probably made in 1994 by Ray Anderson, CEO of Interface [http://www.interfaceinc.com/getting\\_there/Ray.html](http://www.interfaceinc.com/getting_there/Ray.html)
- <sup>8</sup> The carbon emissions arising from fossil fuels being burnt 'on site' and the emissions associated with bought electricity were generally being included. However, transport fuels were often excluded; emissions in the supply chain and emissions arising from customers' use of a company's products and services were not being counted; emissions arising from employees' commuting to work were not being counted; greenhouse gases arising from sources other than the burning of fossil fuels e.g. methane, nitrous oxides, and the escape of refrigerant gases, were generally not being counted. While using a narrow definition of the scope of emissions to be offset was not unreasonable, the legitimacy of a claim to be 'carbon neutral' on this basis was questionable.
- <sup>9</sup> See, for example, the section on 'Start date & crediting period' in A Kollmuss, H Zink and C Polycarp *A Comparison of Carbon Offset Standards* WWF Germany, March 2008
- <sup>10</sup> When carbon dioxide alone is being referred to, it is usually referred to as 'carbon dioxide'. However, the carbon footprint of an organisation is commonly stated in tonnes of carbon dioxide equivalent, or CO<sub>2</sub>e. A thorough analysis would include, at least, all of the six gases regulated by the Kyoto Protocol: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>). They persist in the atmosphere for different periods of time. To arrive at a carbon

footprint, the relevant emissions of each of these gases are usually converted to CO<sub>2</sub>e by reference to their Global Warming Potential', or GWP, over 100 years. This convention developed during a period in which it was generally believed that it was most appropriate to consider changes to climate, and reductions in emissions, over that kind of time period. Now that greater urgency for action on emissions is being recognised, adherence only to a 100 year equivalence can create a misleading impression with regard to priorities over the next decade or two, particularly with regard to the effect of methane.

Global Warming Potential (GWP)			
Greenhouse gas	Time horizon		
	20 years	100 years	500 years
Carbon dioxide	1	1	1
Methane	62	23	7
Nitrous oxide	275	296	156
HCFC-22	4,800	1,700	540
CFC-12	10,200	10,600	5,200
SF6	15,100	22,200	32,400

Figures from the Intergovernmental Panel on Climate Change report  
*Climate Change 2001: Working Group 1: The Scientific Basis*  
[http://www.grida.no/climate/ipcc\\_tar/wg1/248.htm](http://www.grida.no/climate/ipcc_tar/wg1/248.htm)

- <sup>11</sup> Lambert Schneider *Practical experiences with the environmental integrity of the CDM* 15 June 2007 [http://ec.europa.eu/environment/climat/emission/pdf/4thmeeting/8a\\_lambert.pdf](http://ec.europa.eu/environment/climat/emission/pdf/4thmeeting/8a_lambert.pdf)  
 Barbara Haya *Failed Mechanism* International Rivers, November 2007  
[http://www.internationalrivers.org/files/Failed\\_Mechanism\\_3.pdf](http://www.internationalrivers.org/files/Failed_Mechanism_3.pdf)  
 Nick Davies *Abuse and incompetence in fight against global warming* Guardian, 2 June 2007  
<http://business.guardian.co.uk/story/0,,2093836,00.html>
- <sup>12</sup> *Carbon colonialism: the rush to make profits out of carbon-fixing engenders another kind of colonialism* Equity Watch, 25 October 2000  
[http://www.cseindia.org/html/cmp/climate/ew/art20001025\\_4.htm](http://www.cseindia.org/html/cmp/climate/ew/art20001025_4.htm)  
 Austin Williams *Down with carbon colonialism* Spiked, 28 September 2006  
<http://www.spiked-online.com/index.php?site/article/1724/>  
 Jim Green *Carbon colonialism: blaming the Third World for climate change* Geocities, 25 April 2001  
<http://www.geocities.com/jimgreen3/carboncolonialism.html>  
 Ricardo Carrere *Carbon Colonialism* Greenpepper Interactive Magazine,  
<http://squat.net/cia/gp/hom3c.php?artid=4&back=../hom.php>  
 Sophie Morris *The great carbon con: can offsetting really help to save the planet?* Independent, 3 April 2008  
<http://www.independent.co.uk/environment/green-living/the-great-carbon-con-can-offsetting-really-help-to-save-the-planet-803933.html>
- <sup>13</sup> Norway has set itself targets to reduce emissions of greenhouse gases by 30% by 2020 and become carbon neutral by 2050 – although the latter is to be achieved partly by offsetting. In 2006, Sweden set a target to wean itself off oil completely within 15 years. See also: Geoffrey Lean and Bryan Kay *Four nations in race to be first to go carbon neutral - Iceland, New Zealand, Norway and Costa Rica are all hoping to turn their economies green, but the challenges they face are formidable* Independent on Sunday, 30 March 2008  
<http://www.independent.co.uk/environment/climate-change/four-nations-in-race-to-be-first-to-go-carbon-neutral-802627.html>
- <sup>14</sup> A Turner, P Martin and F Durham 'The Carbon Positive Company', in *Cut carbon, grow profits: business strategies for managing climate change and sustainability* Oxford University Press, Nov 2006  
[http://www.carbonsense.com/films\\_resources.htm](http://www.carbonsense.com/films_resources.htm)
- <sup>15</sup> Larry Lohmann *The Kyoto Protocol: Neocolonialism and Fraud* April 2002  
<http://www.thecornerhouse.org.uk/item.shtml?x=52199>  
 Gwyn Prins and Steve Rayner *Time to ditch Kyoto* Nature 449, 973-975, 25 October 2007  
<http://www.nature.com/nature/journal/v449/n7165/full/449973a.html>

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<sup>16</sup> Many commentators argue that offsetting does not result in any emission reductions at all because it is a “zero sum” game. If, for example, a Chinese mine cuts its methane emissions under the CDM, there will be no global climate benefit because the polluter that buys the offset avoids the obligation to reduce its own emissions. See, for example: Patrick McCully *Discredited strategy* Guardian, 21 May 2008  
<http://www.guardian.co.uk/environment/2008/may/21/environment.carbontrading>

Furthermore, although the total quantity of offsets is growing, the total remains marginal when compared to the scale of global emissions. Offset trading volumes in 2006 were: Kyoto project (CDM and JI) 466 megatonnes CO<sub>2</sub>e; Voluntary projects 13 megatonnes CO<sub>2</sub>e (excluding Chicago Climate Exchange CCX transactions of 10.3 megatonnes CO<sub>2</sub>). (K Capoor and P Ambrosi *State and trends of the carbon market 2007* World Bank, May 2007; and [http://carbonfinance.org/docs/Carbon\\_Trends\\_2007- FINAL - May\\_2.pdf](http://carbonfinance.org/docs/Carbon_Trends_2007- FINAL - May_2.pdf)). One thousand megatonnes = one gigatonne. Global annual human CO<sub>2</sub> emissions in 2006 were 9.9 gigatonnes of carbon (David Spratt and Philip Sutton *Target practice: Where should we aim to avoid dangerous climate change?* Carbon Equity and Greenleap Strategic Institute, November 2007 with reference to Canadell, J. G., C. LeQuere, et al. *Contributions to accelerating atmospheric CO<sub>2</sub> growth from economic activity, carbon intensity, and efficiency of natural sinks* PNAS, 10. 1073/pnas. 0702737104, published online before print October 25, 2007)

<sup>17</sup> The number of companies making profits from offsetting has escalated rapidly. Also see, for example: Carbon Offset Providers Coalition (COPC) <http://www.carbonoffsetproviders.org/> ; International Emissions Trading Association <http://www.ieta.org/ieta/www/pages/index.php> ; London Climate Change Service Providers Group <http://www.entico.com/publications/lccs/html/introduction.html> ; proposals for a Carbon Stewardship Council [http://theclimategroup.org/index.php/news\\_and\\_events/event/carbon\\_stewardship\\_council/](http://theclimategroup.org/index.php/news_and_events/event/carbon_stewardship_council/)

<sup>18</sup> *Be Carbon Positive* and other articles in New Internationalist, 391, July 2006  
<http://www.newint.org/issues/2006/07/01/>  
K Smith *The Carbon Neutral Myth* Transnational Institute, February 2007  
[http://www.carbontradewatch.org/pubs/carbon\\_neutral\\_myth.pdf](http://www.carbontradewatch.org/pubs/carbon_neutral_myth.pdf)  
Todd Woody *The Corporate Carbon Offset Craze* Green Wombat, 7 March 2007  
[http://blogs.business2.com/greenwombat/2007/03/the\\_corporate\\_c.html](http://blogs.business2.com/greenwombat/2007/03/the_corporate_c.html)  
Jonathan Leake *Offsetting your carbon footprint takes decades* Sunday Times, 11 March 2007  
<http://www.timesonline.co.uk/tol/news/uk/article1496888.ece>  
*Indians make cool £300m in carbon farce*, Sunday Times, 22 April 2007  
<http://www.timesonline.co.uk/tol/news/uk/article1687531.ece>  
Fiona Harvey and Stephen Fidler *Industry caught in carbon ‘smokescreen’* Financial Times, 25 April 2007  
<http://www.ft.com/cms/s/0/48e334ce-f355-11db-9845-000b5df10621.html>  
Andrew Revkin *Carbon-Neutral is hip, but is it green?* New York Times, 29 April 2007  
[http://www.nytimes.com/2007/04/29/weekinreview/29revkin.html?\\_r=2&oref=slogin&ref=us&pagewanted=print&oref=slogin](http://www.nytimes.com/2007/04/29/weekinreview/29revkin.html?_r=2&oref=slogin&ref=us&pagewanted=print&oref=slogin)  
Kevin Smith *Profiting from pollution - The G8 nations and emissions trading* Red Pepper, June 2007  
<http://www.redpepper.org.uk/article223.html>  
Nick Davies *The inconvenient truth about the carbon offset industry* Propeller.com, 16 June 2007  
<http://science.propeller.com/story/2007/06/16/the-inconvenient-truth-about-the-carbon-offset-industry>  
*Live Earth is promoting green to save the planet – what planet are they on?* Daily Mail, 7 July 2007  
[http://www.dailymail.co.uk/pages/live/femail/article.html?in\\_article\\_id=466775](http://www.dailymail.co.uk/pages/live/femail/article.html?in_article_id=466775)  
Jasper Copping *Carbon offsetting schemes not so green* Sunday Telegraph, 20 August 2007  
<http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2007/08/19/ncarbon119.xml>  
*Fighting false solutions – an interview with Kevin Smith and Jutta Kill* Celsias.com, 7 January 2008  
<http://www.celsias.com/2008/01/07/fighting-false-solutions-an-interview-with-kevin-smith-and-jutta-kill/>

<sup>19</sup> BT - <http://www.btplc.com/ClimateChange/WhatsBTdoing/FAQs/index.htm>

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Honda F1 Racing -

[http://www.hondaracingf1.com/loband/news.php?pagest=80&pageIn=10&item\\_id=1793&year=2007](http://www.hondaracingf1.com/loband/news.php?pagest=80&pageIn=10&item_id=1793&year=2007)  
and <http://www.lowcvp.org.uk/news/596/honda-claims-leadership-in-greening-formula-one/>

Thomas Matthews - <http://www.thomasmatthews.com/>

South West of England Regional Development Agency - <http://www.southwestrda.org.uk/what-we-do/policy/south-west-c-carbon.shtm>

Business in the Community -

[http://www.bitc.org.uk/what\\_we\\_do/where\\_we\\_work/south\\_west/get\\_involved/carbon\\_positive.html](http://www.bitc.org.uk/what_we_do/where_we_work/south_west/get_involved/carbon_positive.html)

ITC - [http://www.itcportal.com/sustainability\\_report\\_2007/chairmans-page01.htm](http://www.itcportal.com/sustainability_report_2007/chairmans-page01.htm)

The term 'carbon positive' has also been used for products eg. Océ 600 series -

<http://www.oce.com/uk/campaigns/sustainability.htm>

<http://www.printweek.com/digital/news/747113/OcE%E2%80%99s-6000-series-first-go-carbon-positive/>

and wine (by offsetting / tree planting) <http://www.treecanada.ca/news/11-05-2007.htm>

- <sup>20</sup> Fiji Water received unfavourable press coverage after being featured in a Fast Company article that included comments such as: "Fiji Water produces more than a million bottles a day, while more than half the people in Fiji do not have reliable drinking water" <http://www.fastcompany.com/magazine/117/features-message-in-a-bottle.html>. The company states that it is going to be 'carbon negative' - not just 'neutral' - beginning in 2008. Fiji Water says it will account for the carbon footprint throughout the entire lifecycle of its products and then, through a combination of reductions, "carbon-reducing land use" and renewable energy projects, will make the production and sale of each bottle of Fiji Water result in a net reduction of carbon in the atmosphere. <http://www.environmentalleader.com/2007/11/07/fiji-water-to-go-carbon-negative/>

- <sup>21</sup> David Wasdell, (in 'Summary for Policy Makers' in *Feedback dynamics and the acceleration of climate change*, Peter Cox, Deepak Rughani, Peter Wadhams and David Wasdell, All Party Parliamentary Climate Change Group, 2007), quotes from a recent paper co-authored by a team led by Professor James Hansen, Director of NASA's Goddard Institute for Space Studies: "The Earth's climate is remarkably sensitive to global forcings. Positive (amplifying) feedbacks predominate. This allows the entire planet to be whipsawed between climate states. Recent greenhouse gas emissions place the Earth perilously close to dramatic climate change that could run out of control." See also, for example:

Ed Pilkington *Climate target is not radical enough* Guardian, 7 April 2008

<http://www.guardian.co.uk/environment/2008/apr/07/climatechange.carbonemissions>

Graeme Pearman *Evidence of accelerated climate change* The Climate Institute (Australia), November 2007

[http://www.climateinstitute.org.au/images/stories/CI056\\_EACC\\_Report\\_v1.pdf](http://www.climateinstitute.org.au/images/stories/CI056_EACC_Report_v1.pdf)

Steve Connor and Michael McCarthy *Review of the year: Global warming* Independent, 29 December 2006

<http://www.independent.co.uk/environment/climate-change/review-of-the-year-global-warming-430141.html>

Fred Pearce *Climate change: 'One degree and we're done for'* New Scientist, 27 September 2006

<http://environment.newscientist.com/article/mg19125713.300>

- <sup>22</sup> In 2007, CO<sub>2</sub> concentration in the atmosphere reached 385 parts per million.

[ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2\\_mm\\_gl.txt](ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2_mm_gl.txt)

In December 2007, James Hansen of NASA proposed that 350ppm should be regarded as the maximum safe limit. Hansen has also noted that the UK is responsible for the highest per capita cumulative CO<sub>2</sub> emissions in the world. See: <http://blog.wired.com/wiredscience/2007/12/nasas-james-han.html> and linked letters to Gordon Brown and Angela Merkel; and also:

James Hansen et al *Target Atmospheric CO<sub>2</sub>: Where Should Humanity Aim?* 7 April 2008

[http://www.columbia.edu/~jeh1/2008/TargetCO2\\_20080407.pdf](http://www.columbia.edu/~jeh1/2008/TargetCO2_20080407.pdf)

For comment on the inadequacy of the UK's target of a 60% cut in CO<sub>2</sub> emissions by 2050, see Kevin Anderson *Drinking in the last chance saloon* Tyndall Centre for Climate Change, The University of Manchester, 19 July 2007 <http://www.surf.salford.ac.uk/documents/RethinkingUrbanism/Anderson.ppt>

- <sup>23</sup> Michael Wynn *Climate expert says he underestimated threat* Reuters, 16 April 2008, at <http://uk.reuters.com/article/domesticNews/idUKGOR65702120080416?pageNumber=2&virtualBrandChannel=0&sp=true>

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- <sup>24</sup> A team from the University of Victoria used a computer model to determine the extent to which emissions must be limited to avoid exceeding a 2°C increase. Only when emissions were entirely eliminated did the temperature increase remain below 2°C. From Arthur Girling *Reducing CO2 emissions to zero is the only option* Centre for Alternative Technology <http://www.zerocarbonbritain.com/content/view/60/35/>
- <sup>25</sup> Lester Brown *Plan B 3.0: Mobilizing to Save Civilisation* Earth Policy Institute, 2008
- <sup>26</sup> Tim Helweg-Larsen and Jamie Bull *Zero Carbon Britain – an alternative energy strategy* Centre for Alternative Technology, 2007 <http://www.zerocarbonbritain.com/>
- <sup>27</sup> Jean Ziegler, the UN special rapporteur for the right to food, has claimed that biofuels are "a crime against humanity" because they raise global food prices. <http://news.bbc.co.uk/1/hi/world/americas/7065061.stm>
- <sup>28</sup> Steven Erlanger *UN addresses food production, poverty and rising prices* International Herald Tribune, Europe 16 April 2008 <http://www.iht.com/articles/2008/04/16/europe/food.php> The prices of basic foods like rice, wheat and corn have risen sharply. This has set off popular protests in countries including Haiti, Egypt, Cameroon, Ivory Coast, Mauritania, Ethiopia, Uzbekistan, Yemen, the Philippines, Thailand, Indonesia and Italy.
- For developments in the UK, see, for example, Rob Hopkins *The Transition Handbook: from oil dependency to local resilience* Green Books, 2008 and also <http://transitionculture.org/>; also:
- Go Zero Chew Magna at <http://www.gozero.org.uk/>
- Ashton Hayes, Cheshire [www.goingcarbonneutral.co.uk](http://www.goingcarbonneutral.co.uk)
- Totnes, Devon [www.transitiontowns.org/Totnes](http://www.transitiontowns.org/Totnes)
- St Davids, Carmarthenshire [www.eco-city.co.uk](http://www.eco-city.co.uk)
- Martin, Hampshire [www.futurefarms.org.uk](http://www.futurefarms.org.uk)
- Stoke on Trent [www.coolstoke.co.uk](http://www.coolstoke.co.uk)
- Oxford [http://coinet.org.uk/projects/action\\_groups](http://coinet.org.uk/projects/action_groups)
- Bovey Tracey, Devon <http://www.boveyclimateaction.org.uk/>
- <sup>29</sup> David Wasdell *Climate Stabilisation Meridian Programme* 22 May 2007 <http://www.meridian.org.uk/PDFs/Stabilisation.pdf>
- Bruce Sterling *The Algae Hummer* Viridian <http://www.viridiandesign.org/2006/12/viridian-note-00480-algae-hummer.html>
- Michael Obersteiner, Christian Azar, Kenneth Möllersten, Keywan Riahi *Biomass Energy, Carbon Removal and Permanent Sequestration - A 'Real Option' for Managing Climate Risk* <http://www.iiasa.ac.at/Admin/PUB/Documents/IR-02-042.pdf>.
- <sup>30</sup> See, for example:
- The Prevailing Growth Fetish and the Post-growth Society [http://www.opendemocracy.net/the\\_prevailing\\_growth\\_fetish\\_and\\_the\\_post\\_growth\\_society\\_0](http://www.opendemocracy.net/the_prevailing_growth_fetish_and_the_post_growth_society_0)
- John Grant *Thinking the Unthinkable – Post 'Growth' Economics* 25 March 2008 <http://greenormal.blogspot.com/2008/03/thinking-unthinkable-post-growth.html> and also <http://wordpress.com/tag/post-growth/>
- <sup>31</sup> See, for example, <http://www.postcarbon.org/>; and <http://www.relocalize.net/groups/toronto> and Richard Heinberg *Powerdown: Options and Actions for a Post-Carbon World* New Society Publishers, Canada 2004 and <http://www.richardheinberg.com/endorsements/powerdown>
- <sup>32</sup> All Party Parliamentary Climate Change Group, House of Commons, 5 March 2008. See also: <http://www.earth-policy.org/Books/PB3/index.htm>
- <sup>33</sup> IKEA emissions in tonnes CO<sub>2</sub>e – Scope 1 = 80,692; Scope 2 = 421,142; Scope 3 reported = 2,306,592. <http://www.wri.org/publication/content/7749>

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<sup>34</sup> DHL Express Nordic emissions in tonnes CO<sub>2</sub>e – Scope 1 = 25,447; Scope 2 = 4,969; Scope 3 reported = 440,095. <http://www.wri.org/publication/content/7749>

<sup>35</sup> The biosphere, geological formations and the oceans are the three main reservoirs which sequester carbon from the atmosphere. The planting of trees has been widely claimed as a means of sequestering carbon and used as a means of offsetting. There are many contentious aspects to this, including doubts about the stability of this sink because of the effects of climate change on trees, and because they are at risk from potential future human activities. Technologies, such as for the removal and subsequent storage of carbon dioxide from the flue gases of large stationary sources such as power stations, have also been proposed as a means of reducing emissions.

<sup>36</sup> R Hammerschlag, M Van Sickle and A Cullen *2005 Inventory of Greenhouse Gas Emissions Ascribable to the University of Washington* University of Washington, October 2007  
[http://www.washington.edu/about/environmentalstewardship/UW\\_GHG\\_inventory\\_2005.pdf](http://www.washington.edu/about/environmentalstewardship/UW_GHG_inventory_2005.pdf)

<sup>37</sup> Companies cause greenhouse gas emissions by, for example, on-site fossil fuel combustion and the leakage of refrigerant gases. Emissions also occur indirectly through their consumption of electricity and other products which caused emissions during their production. The accurate accounting and reporting of companies' carbon footprints is required to guide effective climate change policy, business management and investment. For greenhouse gas accounting and reporting purposes three Scopes were defined by the World Resources Institute (WRI) in their 2004 Greenhouse Gas Protocol:

Scope 1 accounts for direct GHG emissions from sources owned or controlled by the company.

Scope 2 accounts for GHG emissions associated with the generation of electricity, heating or cooling, or steam purchased. These emissions usually occur at the generating site.

Scope 3 accounts for all other indirect GHG emissions that occur as a result of the activities of the company – the company's use of goods and services – but are from sources not owned or controlled by the company.

Scope 3 emissions are part of the product lifecycle and are therefore critical for calculating and managing lifecycle and value-chain emissions. The importance of Scope 3 will increase with the need to manage the financial impacts of carbon pricing in the supply chain, to close loopholes for carbon trading, and to avoid greenwash.

GHG emissions reported to the Carbon Disclosure Project (CDP5) amounted to 6,977,346,712 tonnes of CO<sub>2</sub>e, of which 3,632,850,676 tonnes were counted as Scope 3. See <http://www.cdproject.net/cdp5reports.asp>

The Carbon Disclosure Project (CDP) has subsequently announced the findings of its Supply Chain Leadership Collaboration. Cadbury Schweppes, Dell, HP, Imperial Tobacco, L'Oréal, Nestlé, PepsiCo UK & Ireland, Procter & Gamble, Reckitt Benckiser, Tesco and Unilever have worked through CDP's Supply Chain Leadership Collaboration, requesting information from their suppliers in order to measure carbon risks and liabilities in the supply chain. 144 suppliers responded to the information request, including 95 that have not previously reported through CDP and many suppliers apparently addressing climate change issues for the first time. [http://www.eurekaalert.org/pub\\_releases/2008-04/cdp-cdp042808.php](http://www.eurekaalert.org/pub_releases/2008-04/cdp-cdp042808.php)

<sup>38</sup> Interface is the largest commercial carpet manufacturer in the world, operating in over 100 countries and with manufacturing facilities on four continents.  
<http://www.epa.gov/stateply/documents/events/oct2006/meezan.pdf>

<sup>39</sup> <http://www.personneltoday.com/articles/2007/06/11/41057/cutting-carbon-emissions-engaging-employees-in-the-crusade.html>

<sup>40</sup> See [www.tntplanetme.com](http://www.tntplanetme.com)

<sup>41</sup> See <http://www.hondaracingf1.com/earthdreams/html/earthdream.html>

<sup>42</sup> See, for example <http://www.fastcompany.com/magazine/117/features-message-in-a-bottle.html>

<sup>43</sup> <http://www.greenbiz.com/news/2008/04/17/fiji-water-discloses-supply-chain-carbon-footprint-plans-reduce-environmental-impact>

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- <sup>44</sup> See <http://www.jointhebiggerpicture.com/HealthyEnvironment/Landing.aspx> and [http://www.jointhebiggerpicture.com/assetLibrary/healthy\\_environment/environment/pdf/CarbonNeutral%20Sky.pdf](http://www.jointhebiggerpicture.com/assetLibrary/healthy_environment/environment/pdf/CarbonNeutral%20Sky.pdf)
- <sup>45</sup> BT has announced a Climate Change Vision - “To harness communications to reduce climate change” – in effect portrays business development as a solution. For many companies, such an approach would not be credible. However, BT’s approach to environmental management has provided a serious basis for carbon management. The company set its first carbon reduction target in 1992. It achieved a 60% emission reduction on 1996/97 levels by 2005/06. In this context, the company’s vision and its aim to achieve a further 20% reduction (i.e. to achieve an 80% reduction compared to 1996/97) by 2016 is credible and commands respect. See <http://www.btplc.com/ClimateChange/WhatsBTdoing/Visionandstrategy/index.htm> ; [http://www.btglobalservices.com/business/global/en/products/carbon\\_impact\\_assessment/index.html](http://www.btglobalservices.com/business/global/en/products/carbon_impact_assessment/index.html) and <http://www.biggerthinking.com/docs/en/BT%20Carbon%20Impact%20Assessment.pdf>
- <sup>46</sup> [http://www.first4farming.com/frontier/pages/pageprintn.jhtml;jsessionid=M4QEYOYCFMVKRZWNJH4WCFEQ?section\\_name=news&article\\_id=500006&print=yes](http://www.first4farming.com/frontier/pages/pageprintn.jhtml;jsessionid=M4QEYOYCFMVKRZWNJH4WCFEQ?section_name=news&article_id=500006&print=yes)
- <sup>47</sup> <http://www.tesco.com/climatechange/carbonFootprint.asp>
- <sup>48</sup> [http://www.biofuelwatch.org.uk/files/greenergy\\_factsheet\\_1.pdf](http://www.biofuelwatch.org.uk/files/greenergy_factsheet_1.pdf)
- <sup>49</sup> <http://plana.marksandspencer.com/index.php?action=PublicPartnerOxfamDisplay>  
[http://www.oxfam.org.uk/applications/blogs/pressoffice/2008/01/24billion\\_items\\_of\\_unworn\\_clot.html](http://www.oxfam.org.uk/applications/blogs/pressoffice/2008/01/24billion_items_of_unworn_clot.html)
- <sup>50</sup> GE Ecoimagination: <http://www.wri.org/publication/content/7748>
- <sup>51</sup> See for example, *Corporate Governance and Climate Change: Making the Connection*, CERES, March 2006  
<http://216.235.201.250/netcommunity/Document.Doc?id=91>
- <sup>52</sup> See, for example:
- F Capra ‘A Systems View of the World’ in *Resurgence* No. 151 p34-37, The Resurgence Trust, 1991
  - F Capra *The Turning Point* Simon & Schuster, 1982
  - C Hutchinson ‘Integrating Environment Policy with Business Strategy’ in *Long Range Planning*, Vol 29, No. 1 Elsevier, 1996
  - R Stacey *Managing Chaos* Kogan Page, 1992
  - Ricardo Semler *Maverick* Arrow, 1993
  - Dee Hock *Birth of the Chaordic Age* Berrett-Koehler, 1999
  - Janine Benyus *Biomimicry* HarperCollins, 1997
- <sup>53</sup> In 2008, Google became the world’s top brand worth \$86.1bn. GE came second at \$71.3bn. Vodafone (UK’s leading brand) was in 11<sup>th</sup> place and valued at \$36.9bn; eBay was 65<sup>th</sup> at \$11.2bn. BlackBerry grew most rapidly achieving 51<sup>st</sup> place and worth \$13.7bn - up 390% in one year.  
<http://www.millwardbrown.com/Sites/Optimor/Media/Pdfs/en/BrandZ/BrandZ-2008-Report.pdf>
- <sup>54</sup> John Grant and Jules Peck *Hope & Glory? Green Ventures UK – the next ten years for carbon-positive entrepreneurs* Glasshouse, 18 December 2007  
<http://www.theglasshouse.net/downloads/hopeandglory18dec2007.pdf>