

Enterprise Carbon Management

Written By: **Ron Dembo**
Date: **March, 2006** Original Version
September, 2008 Current Version

EXECUTIVE SUMMARY

→ In a low carbon economy corporations, institutions, cities and governments will all need to measure their carbon impact on an ongoing basis. This calls for a new function, that of Enterprise Carbon Management. It also demands software to manage the generation, hedging and reduction of carbon exposure.

Carbon presents a new and fundamental challenge to business. It is a cost and a risk. For many companies, it is also an opportunity.

Carbon – which is a shorthand for greenhouse gases and sustainability – is linked with almost all of an organization’s activities, and is present in its supply chain, processes, premises, and ultimately in the products and services it produces. Therefore, carbon needs holistic enterprise-wide management.

Until now, in most countries and in most industries, carbon has had no price. Organizations have been able to produce emissions without cost, but this is changing. Kyoto and cap-and-trade schemes such as EU-ETS, are setting market prices on emissions. Further regulation or taxes will extend this, and drive the price of carbon up.

In addition to the risk of a rising price, carbon threatens organizations in other ways. Unchecked climate change brings with it the risk of altered and severe weather patterns, and physical risks such as flooding and storm damage. Changing public and consumer attitudes threaten those organizations perceived to be unprepared or unwilling to reduce their emissions.

Meanwhile, reducing carbon presents significant opportunities for many organizations. Decreasing emissions usually means cutting energy bills and improving efficiency. There are also opportunities in developing new green technologies and products, and in providing the finance and support services for such developments.

ENTERPRISE CARBON MANAGEMENT

→ In tackling carbon, we can look at models used successfully by various industries to manage other threats. In the 1990s, banks were faced with enormous risks and opportunities in financial derivatives. The industry responded by developing an enterprise risk management approach, which has since been adopted across all banking activities, and includes a board-level chief risk officer, and advanced systems for measuring, monitoring and managing financial risk.

A similar function - enterprise carbon management – is needed to respond to climate change. Organizations need a chief carbon officer responsible for not only measuring and reducing emissions, but for ensuring that carbon is taken into account in all future strategic planning. We need advanced systems that can manage the data, analyses and reporting of carbon across the enterprise.

As well as top-down action on carbon, we must not ignore the gains to be made by bottom-up initiatives. Organizations should engage their employees, suppliers, customers and other stakeholders who can bring about significant reductions in emissions by changing their working practices, commuting habits, product choices, etc.

A number of top companies are already moving towards enterprise carbon management. Some have appointed the equivalent of chief carbon officers. They have embarked on emissions reductions and green product development initiatives. Many participate in cap-and-trade schemes such as EU-ETS and the Chicago Climate Exchange. Moreover, they voluntarily disclose their carbon exposure information to investors and other stakeholders.

Advanced software is emerging to help top-down and bottom up approaches to enterprise carbon management across the life cycle of an organization's activities.

INTRODUCTION → Carbon presents a new and fundamental challenge to business. Suddenly, we have a commodity that every organization must account for. It signifies a cost and a risk. For many companies, it also offers an opportunity.

However carbon is not like a raw material, or like interest rates where the cost or the risk is easy to identify and quantify. Carbon is everywhere. It is in the supply chain, in processing and manufacturing, in offices and call centers, in employee work habits and executive travel, and in the packaging and final disposal of products. Carbon spans the balance sheet. As we move towards an era of carbon regulation and taxes, carbon is clearly a liability. But as the world drives towards a low-carbon economy, there are also many opportunities and if managed in the right way, for some organizations, carbon can become an asset.

This ubiquity of carbon in all that a modern organization does, and the fact that it impacts companies in positive and negative ways, means that it requires a holistic enterprise-wide response. Carbon must be measured, monitored and managed across the board. It must be tackled top down and bottom up. In short, it requires enterprise carbon management.

WHAT IS CARBON?

→ By carbon we mean carbon dioxide (CO₂) – the greenhouse gas that is the major contributor to global warming. In addition, carbon has become a common shorthand for greenhouse gases in general. For convenience, the environmental impact of other greenhouse gases, such as nitrous oxide and methane, are usually converted to their carbon dioxide equivalent (CO₂e). So although the current focus is on carbon dioxide, the issues apply to all greenhouse gases.

On a deeper level, carbon is also a shorthand for sustainability. Climate change is our most urgent and dangerous threat, but there are other environmental impacts that also pose significant dangers and business risks. Loss of water resources is already causing conflict in some parts of the world. Poisoning of ecosystems, accumulation of waste, loss of biodiversity are other dangers. While the focus of attention is on global warming, other sustainability issues are likely to rise up the agenda in the coming years, and a successful strategy for carbon will likely provide a model for how we deal with water, waste and other environmental impacts as regulation and public attitudes to these things change.

COST OF CARBON

→ Until now, carbon has been free. Like other many other environmental impacts, such as damage to ecosystems and reduction of biodiversity, the cost of emitting carbon is what economists call an 'externality' – something not factored into the price of goods and services.

As a result of carbon being free, there is no incentive to measure or constrain its output. Now this is changing. The Kyoto agreements set the first internationally agreed constraints on carbon output, and the subsequent European Union Emissions Trading System (EU-ETS) set an initial price. However, it is early days. EU-ETS initially covered only carbon and no other greenhouse gases, applied to only a limited number of sectors (primarily power generation manufacturing), and was over-generous in its allowances, so the price has been unrealistically low.

But this will not last. The Europeans are tightening the constraints for EU-ETS, while other voluntary schemes, such as the Chicago Climate Exchange in the US, are exploring their own price levels.

Whether it is through emissions trading schemes or government tax, carbon will find a price, and that price will only rise as the effects of climate change become more severe and the pressure for action grows.

The external cost of carbon is the price that organizations will have to pay for their emissions under reduction schemes such as Kyoto or future tax regimes. But

organizations must also take into consideration the internal cost of reducing emissions at their source.

The internal cost of carbon will differ according to the nature of an organization's activities, its starting point in terms of systems and processes, and the regulatory regime under which it falls. Costs will include the implementation of new processes or technologies to reduce emissions, possible work on premises to increase energy efficiency, efforts to change work habits of staff, etc.

Many major organizations are already taking the first step towards calculating their cost of carbon by quantifying their emissions. Europe's largest supermarket chain Tesco estimated that its direct emissions amounted to 4.13 million tonnes of carbon equivalent for the year ending February 2007. So far, the price of carbon on EU-ETS has fluctuated from \$1 to \$30. If Tesco were forced to cover its emissions by buying credits on the market, it would have had to pay between \$4m and \$120m.

To prepare for a future when the price of carbon becomes fixed and universal, some companies are starting to factor in a "shadow carbon price" to their business and investment decisions.

In 1999, Shell decided that as an energy company it could no longer view carbon emissions as free. "They are clearly a potential cost and they have to be accounted for as such. They have to be measured, quantified and valued," said Mark Moody-Stuart, former Chairman of the Committee of Managing Directors of the Royal Dutch/Shell Group of Companies at the time. The company decreed that any proposed project with emissions above 100,000 tonnes of carbon a year had to carry a weighting for a range of carbon cost levels (\$5, \$20 and \$40 a tonne).

The world is feeling its way towards a carbon pricing regime. Currently, there are several prices covering limited sectors and jurisdictions, and much volatility. Various factors will influence the evolution of the price, such as cap-and-trade schemes, tax changes and incentives for technology research and development. But eventually the price will settle. As the Stern Review, the UK Government's 2006 report on the economics of climate change, says: "The next ten to twenty years will be a period of transition, from a world where carbon-pricing schemes are in their infancy, to one where carbon pricing is universal and is automatically factored into decision making."

RISK OF CARBON → In addition to measuring the cost of carbon, organizations need to understand its risks.

First, there is the direct risk of climate change. Does the company have facilities that are vulnerable to the increased intensity of hurricanes, floods or other severe weather? How exposed are its suppliers or customers? How will insurance premiums be affected, etc.?

Price is a major risk, of course. Could cataclysmic climate events cause the price of carbon to rocket from current levels to, say, \$80 a tonne – the level some believe necessary to effect the major change needed? Organizations will have different exposures to price risk. A power generator will be more directly exposed to the price than a software developer, for example. A manufacturer with a local customer base, and therefore low distribution-related emissions, could be less exposed than a competitor based offshore.

There are competitive risks in how well an organization responds to the challenges of carbon compared with its peers. Will a competitor steal a march by cutting its cost of carbon more effectively and using this to cut its prices?

Then there is the risk to keep reputation. As climate change rises up the agenda, and concern grows among the public, a company's image becomes vulnerable to how it is perceived to be responding to global warming, with some sectors far more vulnerable than others.

A study by The Carbon Trust, a UK government-funded organization for promoting a low carbon economy, concluded that up to 50% of an airline company's market value could be at risk from how it is seen to respond to climate change.

This compares with food and beverage companies where 10% of their market value is at risk, and banking and telecommunications with just 2-3% of market value at risk. (However, given the size of banks and telecoms companies, even a small percentage of market value equates to billions of dollars.)

But brand is only one aspect. Reputation risk can impact relationships with business customers, staff, suppliers, shareholders and regulators. Oil and gas companies may have a much lower brand risk than airlines, but their carbon intensive nature makes them vulnerable to reputation-related risks such as the ability to attract talent and the degree to which politicians and regulators focus on them.

The Carbon Trust study also raises the critical question of the lead-time to take appropriate action. Supermarkets might need only a matter of months to find new sources of supplies if food miles becomes a paramount issue, whereas an airline would need many years to replace its fleet if airline fleet energy efficiency became a major consumer driver.

OPPORTUNITIES OF CARBON

→ For many organizations, carbon can present significant opportunities as well as threats. For a start, cutting carbon emissions is usually about reducing energy consumption and increasing efficiency. Science-based products and services company DuPont reduced energy consumption by 7% below 1990 levels, and in doing so is saving more than \$2 billion, including at least \$10 million a year by using renewable sources. General Electric has installed its own energy-efficient fluorescent bulbs in its large facilities, cutting power consumption by half. The list of companies that have already saved money by cutting carbon is long, but it is only part of the story.

There are entrepreneurial opportunities for green technologies and services, and for financial institutions that back them. Many leading banks and investment firms have dedicated funds that are providing venture capital for green technology development, and loans and project finance for emissions reductions and renewable energy schemes.

Then there are the opportunities in the new emissions markets such as the EU-ETS. Already, most major banks and brokers have carbon trading desks, and the market expects to trade around \$40 billion-worth of carbon dioxide permits in 2007, growing to \$200 billion a year by 2010.

In fact, some have come to the conclusion that, overall, carbon has more positive possibilities than dangers. A January report titled "A Call for Action" by the United States Climate Action Partnership, an alliance of major businesses, environmental and climate groups, including DuPont, General Electric, Chrysler and Johnson & Johnson, states: "In our view, the climate change challenge, like other challenges our country has confronted in the past, will create more economic opportunities than risks for the U.S. economy. Indeed, addressing climate change will require innovation and products that drive increased energy efficiency, creating new markets. This innovation will lead directly to increased U.S. competitiveness, as well as reduced reliance on energy from foreign sources."

The Stern Review attempted to quantify this opportunity, concluding that “The market for low-carbon energy products are likely to be worth at least \$500 billion a year by 2050, and perhaps much more.”

MODELS WE CAN USE

→ Climate change has been compared with other major challenges that business has had to face, such as globalization or information technology. Carbon could well prove to be the greatest challenge of all. Meanwhile, there are models of how industries successfully responded to previous threats that we might find useful in developing strategies for today.

In the 1980s and early 1990s, banking seized on newly developed derivatives instruments, such as options and swaps, and quickly built up enormous markets selling them to their corporate customers who wanted to hedge their interest rate, currency exchange rate and other exposures. But the instruments were often complex and highly leveraged, with their true value opaque, and a series of major losses followed. With the regulators threatening to stifle this new and highly profitable line of business, the banking industry set about trying to put its house in order. The result was a new approach to managing risk that eventually spread far beyond derivatives to encompass the entire way in which a bank runs its business today.

A major step on this road was a report in 1993 by the Group of Thirty (G30), a Washington-based think tank, on the practices and principles of handling derivatives, which came up with a number of recommendations, the key of which included:

- Senior management must have an adequate understanding of derivatives and the consequence of their use.
- There should be independent risk oversight.
- There should be clear lines of responsibility and authority on risk matters.
- There should be advanced systems to make risk management safer and more efficient.
- There should be full disclosure on the use of derivatives.

These recommendations were quickly adopted by derivatives departments, and were subsequently applied to other areas like credit and operations, where they proved equally effective. Eventually, banks saw the value of a consistent, integrated and holistic approach to risk. Now banks have a chief risk officer who sits alongside the chief financial and chief operations officers, and risk analyses

and forecasts feed into strategic thinking and the allocation of economic capital.

THE NEW CHALLENGE

→ Substitute carbon for derivatives, and business in general for banking, and we can plot a similar scenario. It goes like this.

Traditional business is faced with a new factor that has far-reaching implications – carbon.

Although there is a great deal of uncertainty around carbon, it is clear that how an organization handles this factor could lead to major losses and serious damage to reputation and brand. Furthermore, it is an area where regulation looms, if it has not already arrived. In other words, carbon presents a major cost and risk.

On the other hand, if handled well, carbon could provide significant opportunity – in reduced costs, if not in new business.

Given this situation, banking's response to the challenge of derivatives provides a useful blueprint for how an organization should respond to carbon. In essence, it suggests that where a new factor, like climate change, poses a major threat to business there must be an enterprise-wide strategy, initiated at board level and implemented across the organization; with clear lines of authority and reporting, supported by appropriately advanced systems; and with full public disclosure.

THE NEED FOR AN ENTERPRISE-WIDE RESPONSE

→ For an organization of any size, the task of managing carbon is clearly enormous. First, there is the need to identify, curb and track emissions across all operations. This can include upstream in the supply chain, as well as, downstream in the use and final disposal of products - should regulation or reputation risk dictate that the company is responsible for the carbon across the entire lifecycle of products.

In parallel, there will be the need to identify and exploit carbon opportunities. As the price of carbon rises and/or regulation begins to bite, the maximization of carbon assets will become more pressing.

Then there will be the need to factor carbon into business planning and investment using internal rate of return, marginal abatement cost curves or other methods of capital decision making. This will apply to all research and development, operating plans, acquisitions and divestitures. It will help, say, an electricity generator decide whether to invest in clean technology now for its

new power station, or to use traditional technology and retrofit scrubbing mechanisms at a later date.

Emissions that cannot be reduced, or where it may take some time to achieve reductions, may have to be compensated for by purchasing carbon credits on markets such as EU-ETS or Chicago Climate Exchange, or hedged using offsetting arrangements, such as the Clean Development Mechanism where Kyoto principles apply. Marginal abatement cost curves will show where it could be more economical to offset, at least until new technologies emerge or the price of carbon rises.

Companies will have to monitor their carbon hedges and properly account for them. Carbon transactions are often structured as call options, which can have tax implications in jurisdictions that allow for option premiums purchased as business hedges to be offset against income tax.

Then there is brand and other reputational risk and opportunity to consider. In summary, carbon has an impact across the organization, and therefore requires an enterprise-wide response.

ENTERPRISE CARBON MANAGEMENT

→ Enterprise carbon management will seek to bring all relevant carbon issues throughout a company into a central and holistic system of management. It will create board level responsibility for carbon, and ultimately organizations should appoint a “chief carbon officer” in the same way as today, they have a chief finance or chief risk officer.

In fact, this is already happening – although currently the position goes under a range of titles. Companies such as Dow Chemical, DuPont, Vancouver Port Authority and law firm Nixon Peabody have recently appointed “chief sustainability officers” (cf. carbon is a shorthand for sustainability), while US home improvement chain Home Depot has a vice president for environmental innovation and General Motors a vice president for the environment, energy and safety policy.

Each of these companies defines the role of their equivalent of a chief carbon officer differently; but each one has a responsibility for analyzing the impact of climate change on their organization, as well as for its strategic response to the risks and opportunities the organization faces. But whatever the exact title or job description of the person in charge, enterprise carbon management will have some basic requirements, including advanced systems, cooperation with the

supply chain, and emissions disclosure.

ADVANCED SYSTEMS SUPPORT

→ One thing that financial enterprise risk management taught is that what we can't measure we can't manage.

The first step in measuring any risk is gathering the relevant data. Many organizations have already begun to collect detailed information on their emissions. In some cases, the regulations that have flowed from Kyoto have forced some organizations to do so, such as power generators and cement makers in Europe, meanwhile a growing number of companies which can see which way the wind is blowing are doing so voluntarily. Of the participants in the voluntary market of the Chicago Climate Exchange, Ford, Motorola and Safeway are good examples.

Gathering this information can be a daunting task. In many cases, emissions cannot be measured directly so must be estimated, and this can require a sophisticated system that is equipped with or has access to the various models and formulae that must be applied to calculating carbon emissions from various sources. In addition, the system must be aware of regional differences. For example, the emissions associated with the consumption of 1KW/hour of electricity in the US is different from France where a higher proportion of power is generated by nuclear stations. There will be the need for shared industry data and benchmarks.

When banks first started using derivatives, they initially managed the risks using simple spreadsheets to calculate exposures, monitor trades, etc. As the use of derivatives grew and the risks increased, these spreadsheets were no longer up to the task, and in fact became a risk in themselves. Instead, companies developed dedicated enterprise risk management systems. These have the ability to gather and integrate all relevant data, are equipped with the proper models to value exposures accurately, and can aggregate risks across the enterprise to give a holistic view, taking factors such as correlation and diversification across portfolios into account.

So far, we have been at the spreadsheet stage in terms of tools for carbon management. But now systems are beginning to emerge aimed at the enterprise, and which have appropriate scientific and market knowledge, as well as expertise built in. Some are based on existing applications, such as: supply chain management, manufacturing and logistics optimization, social networking

and there is also a growing knowledge base and set of standards, such as the Greenhouse Gas Protocol Initiative, for calculating and reporting emissions, that the applications can draw on.

In financial enterprise risk management, scenario simulation and stress testing have become key tools in planning and preparing for the future. For carbon, an organization defines likely future scenarios in terms of new legislation, carbon price movements, customer response, etc., and runs computer simulations of how the company would fare under the new circumstances. The technology will allow the organization to explore alternative strategies through “what-if” scenarios. For example, the company might say: what if the price of carbon went up by \$10, but we closed a heavy carbon emitting facility, installed solar panels at an alternative facility, introduced a new low carbon product, and were able to attract investment because of our new green credentials? It could compare the impact on the bottom line with the outcomes of alternative what-if scenarios.

Stress testing is the simulation of extreme conditions. What would be the impact on the company if various worst-case scenarios occurred such as a maximum rise in carbon price? Scenario simulation and stress testing can be powerful tools in planning for a low-carbon future.

TOP-DOWN VS. BOTTOM-UP

→ Carbon management almost inevitably requires the widespread engagement of staff. Although top-down executive-level decisions may be necessary for certain emissions reductions, an organization might also be able to achieve significant reductions through bottom-up innovation and action by employees, suppliers, customers and other stakeholders.

Behavioral change, such as turning off lights and equipment when not in use, car sharing or using public transport to commute, re-using and recycling keep about major carbon savings, which might be essential for an organization to meet its targets.

Leading reinsurer Swiss Re is not a big producer of emissions by the nature of its business, nor is its brand very susceptible to consumer pressure, and there are few top-down measures it can take to change its carbon profile. Nevertheless, it has an extensive program of incentives for employees to do things like drive hybrid cars, use energy efficient appliances and install solar panels. The program is driven by the company's belief that the potentially catastrophic effects of climate change pose a major risk to its industry and its customers, and that the

bottom-up initiatives are an essential part of its response. "The employee initiative reinforces the firm's essential message to stakeholders, aligns employees' actions with company priorities, and shows, to put it simply, that Swiss Re walks the talk," says the company.

Employees and other stakeholders can also be the source of innovation, for example in devising energy efficiencies and finding low-carbon alternatives to raw materials. But to take advantage of this, employees and other stakeholders must be fully engaged with the organization's carbon strategy, and have the means to participate and share ideas and incentives.

The UK business lobbying organization Confederation of British Industry (CBI) recognizes the need to engage staff and the wider public as well. The sponsors of its November 2007 report *Climate Change: Everyone's Business* – 18 major corporate members who together account for 1% of total global carbon emissions – have committed themselves to work with their two million employees to help them reduce their greenhouse gas emissions at work and at home. "Our aim is to begin by identifying and promoting action to save [1 million tonnes of CO₂e] within three years. We will coordinate this work with our efforts to help all households cut their emissions," say the sponsors.

Making widespread carbon reduction is going to require ingenuity, innovation and commitment from all members of an organization. Modern Web-based systems could prove crucial in providing information, calculators and social networking software that will motivate and provide incentive to workers.

DISCLOSURE → A key element of financial enterprise risk management is that banks and corporations make full disclosure of their use of derivatives in order that investors, regulators and others are fully aware of their exposures via these instruments. Investors are already making similar demands on companies in terms of their carbon exposure.

For the past five years, the Carbon Disclosure Project (CDP), a non-profit collaboration of institutional investors with assets of \$41 trillion under management between them, has been asking companies to reveal their climate change-related risks and opportunities. Many top companies are taking such requests seriously. The CDP's 2006 information request resulted in responses from 83 of the FTSE100 alone, with 55 providing quantified emissions data. (Further down the scale of quoted companies the response was less

forthcoming, showing that it is the bigger organizations that tend to “get it” when it comes to climate change.) Now, the CDP is working with other investor and environmental groups to create an international framework for carbon and climate change reporting.

Disclosure of the risks and opportunities presented by carbon will become standard. Disclosure requires measurement of emissions, and calls for information on the organization’s strategy on its exposures. The sponsors of the CBI report realize this, and have committed themselves to promoting “effective reporting procedures that set the benchmark for reporting carbon emissions”.

The UK's Environment and Climate Change Minister, Ian Pearson has said that he expects a company's carbon statement to be as prominent as its financial statement in the future. “Climate change can affect a corporation's profitability and investors are right to be asking searching questions about how businesses are facing up to the realities, as well as the business opportunities of climate change,” he said.

BEYOND THE ENTERPRISE

→ Just as an organization must consider carbon at each stage of its activities, from design through to manufacture, storage and distribution, it will also need to take carbon into account in its supply chain and in the consumption of its products and services. It will be of little use if an organization individually gets its own house in order; but across the full life cycle of the product, service or project in which it is engaged, there is a negative environmental impact.

Consultancy and research organization Gartner talks of the need for a multi-enterprise approach to carbon management. Gartner believes a supply chain is a connected network of stakeholders servicing each other's requirements to meet an end-user’s need. In order to maximize the reduction of emissions across this network, the stakeholders will have to share data, and cooperate towards optimizing the entire life cycle for sustainability. This could include working together to reduce packaging and waste at each point in the supply chain, or reducing transport miles, etc.

Already, companies are trying to engage with and influence their supply chain. Home Depot, for example, gives preferential shelf space to green suppliers in its stores.

RECOMMENDATIONS → Just Carbon requires an enterprise management approach along the lines of those used to successfully manage risk and opportunity in other fields. As a step towards mitigating climate change we make the following six recommendations:

- Senior management must have an adequate understanding of carbon and the risks and opportunities it poses.
- There should be independent carbon oversight, with a chief carbon officer and clear lines of responsibility and authority on carbon matters.
- There should be advanced systems to handle the complexity of carbon management and make it more efficient.
- There should be a bottom-up as well as a top-down approach to carbon management.
- There should be full disclosure of carbon risk and opportunity.
- Carbon management must cover the entire life cycle of products and services.

CONCLUSION → Carbon poses significant risks to companies; as well as, offers enormous opportunities. However, carbon is ubiquitous, and cannot be isolated. Therefore, it must be tackled across the organization, top down and bottom up, using the most advanced tools. It is time to create a new function – enterprise carbon management.

ABOUT ZEROFOOTPRINT → Zerofootprint is a socially responsible enterprise whose mission is to apply technology, design and risk management to the massive reduction of our environmental footprint. We operate both in the for-profit and charitable domains through two entities, Zerofootprint Software and Zerofootprint Foundation using shared technology.