Making Sustainability Sustainable: Passion and Process in Environmental Management at IBM

by

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Submitted to the Engineering Systems Division in Partial Fulfillment of the Requirements for the Degree of

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ABSTRACT

Sustainability is one of the greatest challenges we are faced with. To be successfully addressed, a variety of stakeholders, including business, must be involved. With this in mind, this thesis seeks to further our understanding of how a firm's response to sustainability can, in addition to making business sense, be effective and sustainable. This inevitably entails dealing with the classic tension between "passion" and "process." Therefore, the thesis explores how a balance between these two may be found by examining IBM's extensive and long-sustained environmental management experience.

IBM has a recognized record of environmental responsibility that has matured over almost 40 years, surviving periods of great difficulty for the company. Its environmental sustainability program and its commitment to corporate responsibility, a continuum from legal and compliance activities to engagements that help the company develop value-creation opportunities, is clearly strategic. Its efforts – a combination of activities that address immediate and future business pressures – are in tune with what the literature considers to be "best practice" in environmental corporate sustainability. IBM's experience confirms both the importance of nourishing an emotional commitment to sustainability and of establishing a process – in its case, an environmental management system – that enables the company to systematically identify and manage the environmental impacts of its operations. On the one hand, its long-sustained record of environmental commitment, combined with its dedication to being a recognized environmental leader, has instilled a strong passion for sustainability across the company's organizations and employees. On the other hand, IBM's pursuit of a demonstrable record of performance, combined with a commitment to continuous improvement, has led to the development of a carefully designed, effective environmental management system. IBM seems to have optimized the balance between passion and process through a commitment to scientific, fact-based, decision-making, which has allowed the company to design and implement goals and procedures that will have the most impact given its resources and footprint.

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Many have contributed to making this work a reality – and I am indebted to them.

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I am especially thankful towards IBM's Wayne Balta, Edan Dionne, Diana Lyon, and Patrick Aurrichio. Their help and support has been critical. Most importantly, they opened the door to IBM's environmental management program when they accepted our research proposal. They have devoted a tremendous amount of time and effort to this project. Patrick provided me with a thorough explanation of IBM's Environmental Management System, without which I would have certainly been lost. Edan and Diana have given me access to many IBM documents, even when these were not readily available to them. Edan was also fundamental to contacting key people across IBM and designing an extensive interview schedule that I could work with. Wayne, Edan and Diana provided thorough feedback on various outlines and drafts that preceded this thesis. There really are no words that can describe everything they have done to help, or how grateful I am towards them. All I can say is that I have grown to deeply appreciate, admire and respect them and their work.

Participating in the Sloan Sustainability Research Group was an important part of my experience at MIT – my understanding of sustainability and its challenges grew during our thought-provoking and constructive conversations. I will miss the group's sessions, and I am thankful for the opportunity to get to know its members and to learn with and from them – their passion and efforts are humbling and inspiring.

I would also like to acknowledge the Jack Kent Cooke Foundation, which granted me a full scholarship to study in the Technology and Policy Program. Without the foundation's support it is unlikely that I would have had the freedom I enjoyed as I furthered my academic interests and engaged in projects that mattered to me – this one in particular. The Foundation is but one organization that has influenced me; many others have entrusted me with similar gifts – the United World Colleges, the Shelby Davis Scholars Program, Wellesley College, and the Watson Fellowship. They have changed my life, to say the least.

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To all of you, thank you. I hope to make you proud.

"Think about the six words that have helped me:
In my career: vision, focus, and accountability.
In my life's roadmap: learn, earn, return."

Shelby M.C. Davis, Investor & Philanthropist

"Uncurious people do not lead examined lives; they cannot see causes that lie deeper than the surface. They believe in blind faith, and the most frightening thing about blind faith is that it in turn leads to an inability, even an unwillingness, to accept facts."

Yvon Chouinard, Founder & CEO of Patagonia

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"Isn't it true that the hardest part of driving any kind of change is whether the individual – the employee, the citizen – feels the need to change at a deeply personal level? And in hindsight, when the circumstances that cry out for change are gone, when things have returned to 'normal' – don't we always wish we had been bolder, more ambitious, gone faster, gone further?"

Sam Palmisano, IBM Chairman & CEO

1 INTRODUCTION

The world has experienced tremendous economic growth, witnessed vast technological innovations, and become increasingly interconnected. This has benefitted many of us; among others, it has improved our health, furthered our knowledge, and created opportunities that would have been unimaginable years ago. Unfortunately, however, such economic and technological changes have also overtaxed our environment and social systems – not everyone and everything has been positively touched by them.

It is difficult to argue that our world is not in peril. In the past three decades, one-third of the planet's natural resources have been consumed (Hawken, Lovins and Lovins 1999). The presence of endocrine disruptors is widespread; our addiction to energy-intensive processes is evident. Climate change and water scarcity cannot be ignored. Nor can deforestation or biodiversity loss – to do so would be irresponsible, and the consequences irreparable. In addition, the gap between the "haves" and the "have-nots" continues to increase. It is incredibly disconcerting that the world's 200 richest people have greater wealth than the combined annual income of the world's poorest 2.5 billion (Senge, et al. 2008). Educational, gender and technological inequalities continue to contribute to the widening of the gap.

Our current lifestyle is economically, environmentally, and socially unsustainable. What can be done about it? How do we make our processes and institutions – our way of living – sustainable? This is a challenge of multi-dimensional character, which will only be successfully addressed with the collaboration of governmental, non-governmental and international institutions, as well as that of the private sector and the public at large. Each of these groups needs to – and is trying to – better understand how to live within the limits imposed by our finite environment. How can we continue to further growth and innovation without socially and environmentally stifling our planet?

The answer is obviously complex, and while it requires us to take "the whole system" into consideration, it can also be broken down into smaller pieces. This thesis focuses on one of such pieces – the role of business in environmental sustainability. The overall goal is to gain a better understanding of how businesses' approach to environmental sustainability can, in addition to making business sense, be effective and sustainable.

1.1 Problem Statement

Projects that take place only because they are "exciting" and "good" can easily fall through. The imminent threat of climate change, combined with what until recently were soaring energy prices, have made it fashionable to address environmental sustainability – for individuals, organizations, and even corporations, "green is the new black." This hype is a double-edged sword. While paying attention to sustainability challenges is popular today, it may not be so tomorrow – particularly in light of the current economic crisis – even if the challenges remain ever present. In addition, individuals and organizations with good intentions may forget about the long-term effects of their actions in the midst of their excitement, potentially making it even more difficult to address environmental problems in the future.[1]

Sustainability entails very hard work. With regards to corporate environmental sustainability the literature, on one hand, encourages nourishing an individual and organizational commitment to

[1] For a discussion on unintended consequences see (Sterman 2000).

sustainability based on what "the right thing to do" is, and argues for rallying the organization around "the cause of sustainability." On the other hand, it recognizes that policies and procedures are necessary for a company to know what its environmental performance is and to identify how to improve it. Companies must therefore deal with the tension between such "passion" and "process" when responding to environmental issues. While this classic tension has been documented for many years in the innovation literature, it has not been as deeply explored in the sustainability literature.

The goal of this thesis is to further explore the balance between passion and process in sustainability initiatives by investigating in detail how one firm – IBM – has responded to environmental issues. We use this company's experience – which appears to be a great example – to extract lessons that can help build our understanding of how business can respond to sustainability, and how its response can be both effective and sustainable.

1.2 Research Methodology & Data Collection

Case studies are but one of several methodologies for conducting social science research. For many, they are effective tools for understanding complex social phenomena because they allow researchers to paint a holistic picture of a situation based on a variety of evidence – including documents, interviews and observations – and which may take individual experiences and organizational processes into consideration (Yin 2003). Case studies are particularly useful "when 'how' or 'why' [research] questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context" (Yin 2003, 1).

In the case of this thesis, the questions explored relate to how a company pursues sustainability and to the reasoning behind its decisions and actions. The researchers[2] had no control on the events taking place during the period of investigation, and were mere observers – not participants – of the company's experience in environmental management. Research on corporate sustainability is focused on challenges that firms are faced with today. The issues are contemporary – even pressing – not only for business, but for the rest of the world as well. Because of this, we determined a case study research methodology would be useful in our quest to better understand how environmental sustainability can take shape within the corporate world.

The use of the case study as research methodology does not come without controversy. Critics argue that case study research lacks rigour in procedure and objectivity. Another obstacle faced by case-based research is that, given that the person, community, or organization being studied is unlikely to be representative of its peers, particularly if not randomly selected, the case study may be criticised as biased. The objection is that case studies do not provide a basis for drawing generally-applicable conclusions, especially if one relies on a single case study instead of multiple ones (Yin 2003, Siggelkow 2007).

The merits of using a single case study – as is done in this thesis – cannot be ignored, however. In response to the criticism of case studies being biased, we can argue that "it is often desirable to choose a particular organization precisely because it is very special in the sense of allowing one to gain certain insights that other organizations would not be able to provide" (Siggelkow 2007, 20). While relying on a single case study presents the obstacle of examining "too small a sample" to be convincing, doing so

[2] These include the author (Paulina Ponce de León Baridó) and her advisor (Professor Rebecca Henderson).

gives researchers the opportunity to highlight a very powerful example (Siggelkow 2007, 20). Inevitably, conclusions drawn from a single case study will be limited, but this does not mean the findings will not be useful and of interest to others – in Siggelkow's words, "[t]he specialness pays off [...] if it permits particular insights that allow one to draw inferences about more normal firms" (Siggelkow 2007, 21).

1.2.1 IBM as Case Study

This thesis presents a case study of IBM's environmental management program. IBM is one of the few information technology companies with a history dating back to the early 1900s. With more than $103 billion in revenue and nearly 400,000 employees worldwide, it is the largest and most profitable information technology (IT) company in the world (IBM 2009). In 2008, IBM was ranked #15 among the largest corporations in the United States and #46 worldwide by Fortune Magazine (CNN 2009a, CNN 2009b). In 2008, IBM received 4,186 US patents – more than any other company in the world for the sixteenth consecutive year.[3] It goes without saying that IBM is not representative of many companies.

The opportunity to study this organization and its experience with environmental sustainability is invaluable nonetheless. The company has sustained an impressive and highly regarded record of environmental sustainability (outlined below). In addition, IBM's story is important because of its resilience. During the 1990s, when the firm was experiencing a period of tremendous difficulty, its environmental program gained momentum and became stronger, rather than being put aside as more pressing issues were given priority. This goes to the heart of the question explored in this thesis – how do corporate sustainability efforts become sustainable themselves? By studying IBM's experience, we hope to better understand how and why the company's commitment to environmental leadership has stood the test of time, something that is particularly relevant given the current global financial crisis and its threat to corporate social responsibility programs.

IBM has a recognized record of environmental responsibility that has matured over almost 40 years, and an environmental program that is responsive to a business model that is constantly changing, and that, as was just mentioned, has survived periods of great difficulty for the company. IBM has received an enviable number of awards recognizing its global leadership in environmental matters since at least 1990, when it was presented with the World Environment Centre Gold Medal Award for International Environmental Achievement (IBM 2008). IBM's leadership has also been celebrated by the Environmental Protection Agency (EPA), the World Business Council for Sustainable Development (WBCSD), the World Wildlife Fund, and the Climate Group, among others. The firm is listed in the Dow Jones Sustainability Index, and is amongst the top ten companies ranked by the KLD Sustainability Index, which recognizes environmental, social, and governance performance. In 2008, IBM was identified as one of the companies "best positioned to sustain competitive advantage on a combination of cash returns, industry structural positioning and environmental, social and governance (ESG) performance" in the Goldman Sachs's GS SUSTAIN Report[4] (Goldman Sachs 2008), and earned the highest client-friendly

[3] Figures for 2008 are not yet publicly available. The information for 2007 is available at (IBM 2009).

[4] Goldman Sachs' GS SUSTAIN focus list includes "companies from established industries, which have been selected by incorporating [Goldman Sachs'] ESG framework into long-run industry drivers and returns-based analysis and valuation, in order to pinpoint structural improvement and sustainable competitive positioning" (Goldman Sachs 2007). For more information visit: http://www2.goldmansachs.com/ideas/environment-and-energy/gs-sustain/index.html.

score amongst electronics manufacturers given by Climate Counts[5] (Climate Counts 2008). Most recently, CERES ranked IBM as #1 in climate change governance practices among 63 of the world's largest consumer products and information technology companies in 11 industry sectors (CERES, RiskMetrics Group 2008).[6] A sampling of these recognitions is found in Table 1 and Table 2.

Year	Award / Recognition Sampling
1992	• US President's Environmental and Conservation Challenge Award – the highest environmental honour in the United States. • One of four "green trophies" from the French Minister of the Environment.
1997	• First multinational to earn single global registration of its EMS to ISO 14001, only one year after the standard was published. • USEPA Best-of-the-Best Stratospheric Ozone Protection Award given out on the 10th year anniversary of the Montreal Protocol.
1998	• USEPA Climate Protection Award. This was the first year this recognition was given.
1999	• USEPA ENERGY STAR Computer Partner of the year, for the second consecutive year.
2000	• Recognized by environmental entities in Singapore, Canada, Mexico, and Australia, in addition to various states in the United States.
2001	• Received top honours in the annual Nikkei environmental survey of manufacturers in Japan, one of the country's most prestigious awards for corporate environmental efforts. • Included in the Light Green Advisor's Eco*Index (TM) investment fund, the first environmental leadership index fund in the United States for financially conservative green investors that includes representation from all major industry groups. It was also selected as one of the 30 companies in their Environmental Leadership Trust (TM) portfolio.
2002	• Included in the Calvert Social Index, which screens companies for their record on responsible business practices. • Earned one of the highest ratings in the UK Business in the Environment (BiE) Index, which is the leading benchmark of corporate environmental engagement for companies on the London Stock Exchange and leading companies in the UK, an honour it has enjoyed every year until 2005.
2003	• The company's climate change efforts, which had led to one of the greatest reported GHG emissions reductions (31% since 1990), were praised in the CERES report on "Corporate Governance and Climate Change: Making the Connection." • Ranked #1 in environmental issues and #2 in Intangible Value Analysis (which includes governance, human capital and emerging market issues) in "The Computer & Peripherals Industry" report issued by Innovest Strategic Value Advisors.
2004	• Recognized by the EPA as one of the "Top 20 Best Places to Work for Commuters."

Table 1: Sample List of IBM's Environmental Awards and Recognitions (1992-2004)
Source: IBM CEA

[5] Climate Counts is a nonprofit organization that brings together consumers and companies with the goal of creating deeper awareness about climate change, and motivate both to take action against it. For more information visit: www.climatecounts.org.

[6] CERES is "a national coalition of investors, environmental groups and other public interest organizations working with companies to address sustainability challenges such as global climate change." It directs the Investor Network on Climate Risk, a group of more than 70 institutional investors from the US and Europe managing over $7 trillion in assets" (CERES, RiskMetrics Group 2008). For more information visit: www.ceres.org.

Year	Award / Recognition Sampling
2005	• Recognized by the World Wildlife Fund Centre for Energy and Climate Solutions for attaining its Climate Savers goal. • Recognized by the World Resources Institute for its leadership in the purchase of Renewable Energy Credits which was the fourth largest corporate purchase in the US. • Climate Group's Low Carbon Leader Award • Included in the Dow Jones Sustainability Index (DJSI) World Index, the world's first equity benchmark to track the financial performance of sustainability leaders.
2006	• USEPA Climate Protection Award. First time a company received this recognition twice. • US DOE and USEPA Green Power Purchasing Award
2007	• USEPA SmartWay™ Excellence Award • Awarded the Green Initiative of the Year by CNET Networks UK for "Project Big Green" • Ranked among the top 10 holdings in the KLD Global Sustainability Index
2008	• Most climate-friendly electronics manufacturer according to Scorecards by Climate Counts, having earned 77 out of 100 points • Identified as "best positioned to sustain competitive advantage on a combination of cash returns, industry structural positioning and environmental, social, and governance (ESG) performance" in the Goldman Sachs' GS Sustain Report • Ranked by CERES as #1 in climate change governance practices among 63 of the world's largest consumer products and information technology companies in 11 industry sectors

Table 2: Sample List of IBM's Environmental Awards and Recognitions (2005-2008)
Source: IBM CEA

1.2.2 Data Collection

The information for the case study was obtained through primary and secondary sources on IBM's environmental sustainability efforts, including interviews with IBM employees, IBM internal documents, newspaper articles, and different types of case studies.

The interviews were conducted between June 6 2008 and December 10 2008, either in person or over the phone. Interviewees included, among others, the VP of Environmental Affairs & Product Safety and the VP of Corporate Strategy, the Director of Corporate Environmental Affairs, Program Managers for different IBM organizations, and various technical staff members, researchers, and engineers engaged in manufacturing, product development, global services, procurement, and internal site operations, among others. The objective was to interview a group that was as varied as possible. The list of people interviewed, and a set of general interview guiding questions, can be found in the Appendix.

The thesis presents a story of IBM that has been put together through the collection of experiences and opinions emanating from different organizational and geographic parts of the company. This has been complemented with information drawn from internal documents the firm shared with us, and from other IBM documents that are publicly available. The case study report has been reviewed for factual accuracy and validated by participants and informants in the case.

The research methodology used follows MIT's COUHES[7] research guidelines, which ensure that ethical and legal standards are respected in studies involving human subjects. This research project is part of a greater research project called "Made on Earth – Understanding Sustainable Business Practices," which is being conducted by the MIT Sloan Sustainability Research Group and has been approved by COUHES.

A non-disclosure agreement was signed between IBM and MIT to allow the company to share relevant confidential information with us during the study, and to explicitly classify all interview material as confidential.

1.2.3 Disclaimer

The author is solely responsible for any factual mistakes that may be found in the document. Likewise, although statements by numerous people are used throughout this thesis, the content and views expressed here are solely my own. I apologize in advance for any errors or misrepresentations I may have made.

1.3 Thesis Roadmap

This thesis is organized in five chapters. Chapter 2 reviews the literature on sustainability and corporate environmentalism. It includes a discussion of what researchers believe sustainable companies ought to be doing along with evidence of what different firms have been doing. In particular, it presents an overview of what has been written with regards to the following questions: What is sustainability and how has the literature suggested we should respond to the challenge? Should business care about sustainability, and if so, should it do something about it? What can business do? What is "best-practice"? What is the role of "passion" and "process" in environmental management, and how can firms balance the tension between them?

Chapter 3 illustrates IBM's experience in environmental management. Following a brief history and description of IBM, the chapter describes the company's approach to corporate social responsibility and to environmental management. It steps through the origins and current status of environmental management at IBM; the firm's environmental philosophy, goals, and challenges; its environmental management system; its new "green" businesses; and a detailed account of IBM's energy conservation and climate change initiative.

In Chapter 4, IBM's experience is compared to what has been identified as "best-practice" in the literature. In addition, the chapter provides some thoughts regarding the company's sustainability program. It argues that IBM's approach is largely based on a commitment to environmental leadership and fact-based decision-making, to continuous improvement and a demonstrable record of performance, and to value-creation and innovation that matters. This is followed by a discussion of how IBM relies on scientific understanding to manage the tension between "passion" and "process" as it pursues its environmental goals. Finally, the chapter introduces questions that have been raised by IBM's experience.

Chapter 5 brings the thesis to an end, providing a brief summary of its conclusions.

[7] COUHES is MIT's Committee on the Use of Humans as Experimental Subjects. For more information visit: http://web.mit.edu/committees/couhes/.

2 LITERATURE REVIEW

What is sustainability? Why is it important, and why should business care? Most significantly, what should business do about it? Much has been written by academics and practitioners as response to each of these questions. Sustainability is broadly understood to refer to our obligation to meet "the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, 25). Advocates of sustainability believe we are pushing the limits of our planet and society; they argue proof of this is ever present, including increased pollution levels, loss of natural resources, and a changing climate. In their view, failing to meet the sustainability challenge would endanger not only our way of living but also the planet's ecosystem. While there is widespread agreement that our current lifestyle is unsustainable, there is some controversy regarding what the solution is, given that the path forward is not entirely evident.

Some believe technological improvements will suffice as answer – they believe substitutes for natural resources will be found and argue that science will lead the way to fixing any environmental problem we are faced with. According to the theory, sustainability will be achieved as long as we provide future generations with productive capacity and technological knowledge equal to or greater than our own (see, for example, (Solow 2005)). A more precautionary group, on the other hand, believes that while science and technology are essential to meeting the challenge of sustainability, natural assets – such as drinking water, breathable air, and a richly diverse ecosystem – are irreplaceable and no adequate substitute will ever be found (Hawken, Lovins and Lovins 1999). Meadows argues, for example, that "one limit may be overcome by conservation, substitution, technical advance, or regulation, but if growth continues, another limit will be encountered – or the same one reencountered... if problems induced by limits are solved by sweeping them under the rug, into the water or soil or atmosphere, over to the poor, or off to the future, those problems have not gone 'away'" (Meadows 1991, 31). This second group generally also argues that social and systemic change is in order. Doppelt states, for example, that, "at their core, climate protection and sustainability are about *new ways of thinking and behaving*;" he believes that rather than being about the natural environment, "sustainability is [about] *us*" (Doppelt 2008, xviii).

Many consider that, in addition to other stakeholder groups, business holds the power and responsibility to respond to this challenge – not only is it accountable for much of the environmental damage we witness today, but, perhaps most importantly, it is also one of the most influential institutions of our times, whose actions will have an impact for years to come. This statement is not free of controversy – critics argue that the sole responsibility of business is to generate profits, and that engaging in corporate social responsibility activities that could negatively affect the bottom line may even be illegal. While nobody questions the private sector has an obligation to pursue profits, many argue it can choose how it goes about doing so, and, furthermore, that this responsibility entails thinking about the firm's future, which inevitably leads to thinking about its sustainability and that of the world it operates in. They argue that what is good for society and the environment can also be good for business.

Though sustainability is a concept of multi-dimensional character, the focus of this thesis is on its environmental side. This work is chiefly concerned with what business can do to meet the challenge of environmental sustainability. This chapter includes a discussion of the literature on sustainability, followed by a review of corporate environmental activity. It then provides an overview of what researchers believe companies ought to be doing along with evidence of what organizations are actually

doing. From this, a description of what the literature suggests is "best practice" will emerge. It will become evident that striking the right balance between passion and coordination and control – a more "bureaucratic approach" – is particularly difficult. What this thesis will argue, however, is that, as IBM's experience shows, striving to reach such a balance is not only realistic, but highly desirable too. While the tension between "passion" and "process" has been documented for many years in the innovation literature, it has not been as deeply explored in the sustainability literature. IBM's experience can therefore contribute to furthering our understanding of this tension inherent to environmental sustainability programs.

This chapter steps through four ideas:

1. What is sustainability and how has the literature suggested we should respond to the challenge?
2. Should business care about sustainability and, if so, should it do something about it?
3. What can business do? What is "best-practice"?
4. What is the role of "passion" and "process" in environmental management, and how should firms balance the tension between them?

2.1 Sustainability

"Sustainability is an essentially vague concept," said economist Robert Solow, "and it would be wrong to think of it as being precise, or even capable of being precise" (Solow 2005, 506). Nonetheless, there is general agreement that sustainability is one of the greatest challenges we are faced with. Consider, for example, the following environmental issues highlighted by the United Nations Environment Programme (UNEP) in its 2007 Global Environment Outlook (GEO) (UNEP 2007):

- Climate Change
- Air Pollution
- Ozone Layer Depletion
- Land Degradation
- Water Scarcity and Pollution
- Exploitation of Aquatic Ecosystems
- Deforestation and the Threat to Biodiversity

The literature argues that these and other environmental challenges are intrinsic to our present way of life. As the GEO report states, "these unprecedented [environmental] changes are due to human activities in an increasingly globalized, industrialized and interconnected world, driven by expanding flows of goods, services, capital, people, technologies, information, ideas and labour, even affecting isolated populations" (UNEP 2007, 4). There is widespread recognition of the necessity to slow down if not reverse these trends; it is clear that our current lifestyle is economically, environmentally, and socially unsustainable.

Sustainability has become analogous to sustainable development, which, as defined by the Brundtland Report, is development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, 25). The Report states that "sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well a present needs" (WCED 1987, 25). The concept of

sustainability further evolved during the 1992 Earth Summit, whose resulting document, Agenda 21, called for "achieving sustainability by promoting clean and efficient production, pollution prevention, and commitment to best practices in industry; using investment as an instrument of sustainability; promoting technological innovations that enhance sustainability; instituting best practices worldwide; and disseminating these practices to suppliers, communities, and small businesses as well, wherever one does business" (Andrews, Darnall and Gallagher 1999, 5).

The literature suggests that because the points of intervention are manifold, sustainability will only be successfully addressed with the participation of governmental institutions, non-governmental and international organizations, the private sector, and the public at large. It has become increasingly clear that, ideally, the private sector should be an engaged partner in the drive towards sustainability (Elkington 1994, 91). This is because is widely recognized that business decisions have a significant impact on environmental and social quality; after all, they determine how human and natural resources will be used, and how waste will be managed. Since companies are key players in driving technological advancement and generally have a thorough first-hand understanding of the technical and economic intricacies behind innovation, they have the knowledge and resources to create better and more efficient solutions to environmental and social problems, and can therefore provide support to national and international regulatory processes that seek to further sustainable development. As a result, there is little disagreement that business' commitment to sustainability is essential (Hoffman and Bazerman 2006a, Levy and Newell 2005, Senge, et al. 2008).

2.2 Business in Society – Why Should Business Care?

Opinions regarding what the role of business in society should be are varied, ranging from profit-maximizing roles, to roles that make businesses socially aware by incorporating stakeholders and, in the extreme, engaging the corporation in community service. On the one hand, the purist profit-maximizing view argues that business has no social responsibility other than operating under the legal framework. This view was championed by Milton Friedman, who saw businesses' responsibility to its shareholders "to use its resources and engage in activities designed to increase its profits so long as it [...] engages in open and free competition, without deception and fraud" (Friedman 2002, 133). The socially aware view, on the other hand, argues that business decisions affect various stakeholders other than the shareholders, and that these decisions should consequently account for both the short- and long-term impacts they have on the interests of all parties. Some advocates of this view ask corporations to also take responsibility for public welfare shortcomings – to intervene when there is a need that has not been met by the government (Lantos 2001, 600-605).

The original framework for the interaction between business and society was provided by Adam Smith, who proposed that, "capitalism, by encouraging the pursuit of gain and efficiency, works to create greater wealth than any other economic system, and maximizes liberty by allowing individuals freedom of choice in employment, purchases, and investments, thereby benefiting the common good" (Lantos 2001, 596). However, critics argue that Smith's model took property to be individually owned and managed, while today's corporate organizations are usually led by executives responsible for making decisions on behalf of stockholders and which affect thousands of citizens (Miller and Ahrens 1993 in Lantos 2001, 599). In addition, they suggest that Smith's model did not consider market imperfections that lead to an inadequate valuation of natural resources (Lovins, Lovins and Hawken 1999), to environmental cost distortions (such as hidden environmental costs reported as *other* operating costs), and to expenses related, directly or indirectly, to the externalities of a firm's business, such as growing

mortality rates, illness, and pollution, for example (Bhat 1996). As Bhat explains, "these cost distortions force companies to choose wrong product mix and waste reduction options, use inappropriate inputs, and price products wrongly. [...] Until we have accounting systems that capture all costs, wrong decisions will continue to be made and industries will continue to be apprehensive about turning green" (Bhat 1996, 12).

As an alternative, for example, Lovins, et al., argue for "natural capitalism," an approach they describe as "what capitalism might become if its largest category of capital – the 'natural capital' of ecosystem services – were properly valued" (Lovins, Lovins and Hawken 1999, 146). This requires increasing the productivity of natural resources, thus reducing waste; using production models whose output becomes an input to nature or another manufacturing cycle (in other words, a "cradle to cradle" system which treats waste as "food" (McDonough and Braungart 2002)); shifting to a "solutions-based business model"; and, reinvesting in natural capital (Lovins, Lovins and Hawken 1999, 146-148). Natural capitalism entails treating waste as representative of inefficiencies in the system, or, otherwise, viewing pollution as equivalent to economic waste and lost opportunities for increased competitiveness (Porter and van der Linde 1995).

Little controversy exists regarding industry's fiduciary obligation to shareholders or its legal responsibilities. Nonetheless, there is much discussion surrounding publicly held companies that carry out "socially responsible" projects that could potentially exist only at the expense of their earnings. Those in favour of this type of activities imply that corporations have an indirect societal obligation (or corporate social contract[8]) and should be held to a higher standard of responsibility – something that many, such as Friedman, would disagree with (Lantos 2001). If we move beyond the question of whether corporations should be doing any socially responsible projects at all, however, we can further explore the points of disagreement regard the benefits and costs of such undertakings.

At the most basic level, socially responsible programs are motivated by ethical concerns that may, at times, be demanded by government regulation. At the other end of the spectrum, we find projects that are clearly going "above and beyond." The latter can generally be found to be either strategic or philanthropic in nature (see Figure 1). Advocates of both altruistic and strategic corporate activities suggest that with power comes responsibility. However, critics of altruistic CSR, such as Porter and Kramer, explain that the mutual dependence of corporations and society implies that "if either a business or a society pursues policies that benefit its interests at the expense of the other, it will find itself on a dangerous path [since] a temporary gain to one will undermine the long-term prosperity of both" (Porter and Kramer 2006, 84). The core argument is that altruistic CSR – "giving back" – does little for a company, while strategic CSR – "giving back because it is in the company's financial interest to do so" – adds value to a corporate organization (Lantos 2001, Porter and Kramer 2006). This last school of thought believes that to be sustainable, CSR must create shared value for both society and corporations; that is, it should merge companies' self-interest with the common good, which entails being strategic, not altruistic.

[8] As Lantos explains, "the corporate social contract concerns a firm's indirect societal obligations and resembles the 'social contract' between citizens and government traditionally discussed by philosophers who identified the reciprocal obligations of citizen and state" (Lantos 2001, 599).

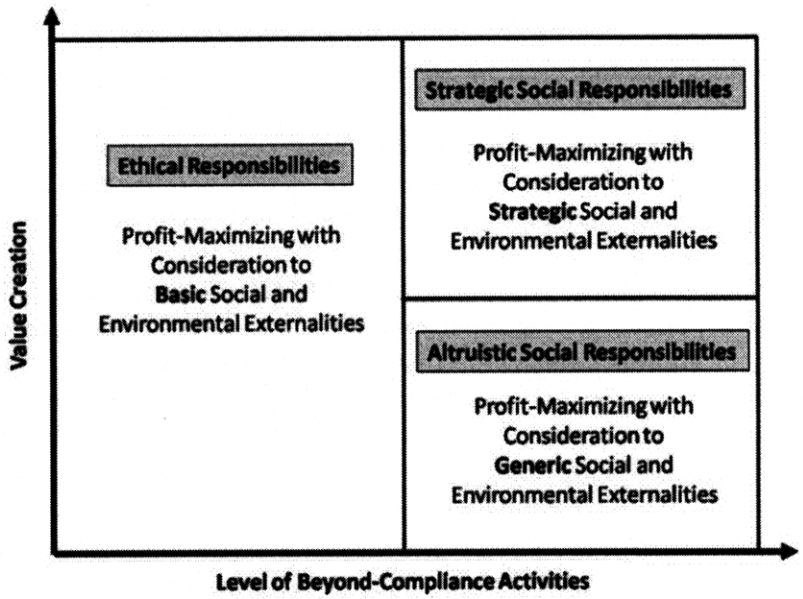

Figure 1: Levels of Corporate Social Responsibility

Generic externalities are those not directly nor significantly affected by a company's actions, and which have no impact on the company's long-term competitiveness. Strategic externalities are those significantly affected by corporate activities and that have a direct impact on the company's competitiveness. Definitions from (Porter and Kramer 2006, 85).

So, why should business care about this issue? It should do so partly because there is evidence that society's expectation of what business ethics encompasses has extended beyond the boundaries of productivity and profit generation. As has been previously discussed, people are concerned with how corporate activities affect society in ways other than just economically (Howard-Grenville, Hoffman and Bhattacharya 2006, Paine 2003). Moreover, the value of a company is largely based on brand and reputation – by the end of the 1990s "only 20% of a company's value [was] reflected in the accounting system" (Senge, et al. 2008, 109). Today, this reputation is greatly affected by the views and voices of different stakeholders (Senge, et al. 2008). Among the many issues these stakeholders give consideration to is the effect of wealth generation on the welfare of employees, clients, and other system participants, as well as on the environment's wellbeing (Lantos 2001, 597-598). Companies' customers – targeted by social and environmental non-profit groups as potential instigators of change – are increasingly becoming more demanding, caring about how a company "treats the animals it uses in tests, for instance, or the company's policies regarding global warming" (A. Murray 2006, 6). Citizens – including both customers and employees – seem to be less willing to tolerate companies' negative impact on both society and the environment (Senge, et al. 2008, 105). They are starting to insist – mostly through publicized CSR-performance rankings, media outcries, and activist campaigns that target company brands – that corporate citizens should meet responsibilities other than their economic responsibilities, at times even expecting companies to address a particular social problem the government has not.

What follows is a review of what the literature says about how business can effectively respond to this growing demand.

2.3 Corporate Environmentalism and the "Greening" of a Company

The origins of corporate environmentalism are commonly associated with the environmental and social movements of the 1960s and 1970s, and with the drive for organizational change based on "the perception that organizational entities have or could have significant impacts, whether positive or negative, real or imagined, on their respective ecosystems" (Starik and Marcus 2000, 539). By the mid-1980s, instead of viewing environmental pressures as a burden to be resisted, some firms began to treat them as opportunities for improvement and repositioning, and, in certain cases, for increasing profits. Policy statements, beyond-compliance goals, and greater investments of human and financial resources devoted to environmental affairs, among others, were used to capitalize on such opportunities. The environmental impact of an organization's processes and products became a growing consideration when making decisions pertaining to investments in research, development, manufacturing, and operations. As Starik and Marcus explain, "trends in corporate 'greening' included pollution prevention and toxic reduction programs, full cost analysis, auditing, design for the environment, product stewardship, collaboration between environmental organizations and corporations, policy formalization catalyzed by industry associations, greater CEO and board involvement, and pressure for responsibility from employees, regulation, accidents, and legal liability" (Starik and Marcus 2000, 540).

Researchers have observed that the motivation behind this shift in sentiment and approach towards environmental management is manifold. For some companies, improving their environmental performance was a way to secure competitive advantage through cost reductions, improved efficiency, and product differentiation, among others. For example, 3M has achieved $1 billion in first-year project savings with its Pollution Prevention Pays (3P) program, which seeks to eliminate pollution before it occurs, and is based on the belief that any action to reduce pollution will also produce financial savings. In addition to these economic savings, the 3P initiative has achieved environmental savings of 2.2 billion pounds of pollutants (Esty and Winston 2006). Government regulations, ethical concerns, and an interest in values from both employees and customers, in addition to economic benefits, also helped further corporate environmentalism (Starik and Marcus 2000, 240, Esty and Winston 2006, 101). In addition, by the early 1990s, the Brundtland report's call for sustainable development touched various organizations, encouraging them to pursue corporate sustainability. It was "the right thing to do."

This section focuses on what the literature says business is and should be doing to become sustainable. The goal is to begin to develop a picture of what may be best-practices for the "greening" of companies. In particular, it addresses the following questions:

1. How can investments in environmental sustainability create value?
2. What should a sustainable company look like? What is "best practice"? Do we know?
3. What are companies actually doing to become sustainable?

2.3.1 Creating Shareholder and Sustainable Value

The literature suggests that, based on companies' experience, the tension between the environment and the economy is more constructively framed as one that can lead to innovation, rather than one that merely imposes costs related to regulatory standards (Porter and van der Linde 1995, Starik and Marcus 2000, Esty and Winston 2006). The argument is that by aligning business priorities with those inherent to the natural environment and to our basic human needs and desires, "you create long-term sustainable value for all stakeholders, beginning with shareholders" (Senge, et al. 2008, 119).

Hart and Milstein illustrated the key dimensions of shareholder value (see Figure 2) that serve as source of creative tension for firms. The time dimension (the vertical axis in Figure 2) reflects businesses' need to balance short versus long term results, a dance between managing today's business demands and creating technology and market opportunities for the future. The space dimension (the horizontal axis in Figure 2) represents the balancing act between needing an internal buffer that protects and nourishes the firm's organizational and technical skills and capabilities, and needing to remain open to outside influences that may provide the company with valuable perspectives, knowledge, and insights, which may well lead to new disruptive models and technologies (Hart and Milstein 2003, 57).

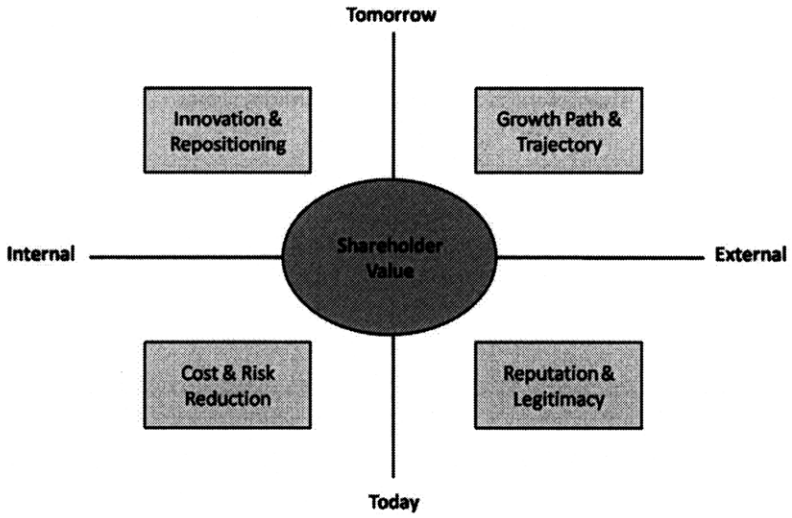

Figure 2: Key Dimensions of Shareholder Value
(Hart and Milstein 2003, 57)

The four dimensions of performance resulting from the combination of these time and space dimensions are necessary to creating shareholder value (see Figure 2). Cost and risk reduction are internal and near-term aspects that any firm must seek proficiency in. External and near-term tensions arise through reputation and legitimacy aspects, which are shaped by the firm's relationship with suppliers and customers across its value chain, as well as with government, NGOs, the media, and the general public. In addition, any company wishing to create shareholder value must position itself for the future, and should therefore devote resources to generating the products and services that will be demanded then. As Hart and Milstein explain, "the creation of shareholder value [...] depends upon the firm's ability to creatively destroy its current capabilities in favour of the innovations of tomorrow" (Hart and Milstein 2003, 58). Finally, the external and long-term considerations of firms should foment the development of a vision and growth trajectory for new technology and product development (Hart and Milstein 2003, 58).

Sustainability, like shareholder value, is a multidimensional challenge. Hart and Milstein argue that if the challenges associated with sustainability are "seen through the appropriate business lenses," they can be tackled so that they contribute to each of the four quadrants in the shareholder value framework (see Figure 3) (Hart and Milstein 2003, 58). Reinhardt, too, argues environmental strategy needs to be designed according to the situation confronting each particular company, much like any other type of

corporate strategy would be. He underscores the importance of recognizing that the issue is not black or white - safeguarding the environment will not always be profitable, nor will it always cost money, as some passionately argue. In his words, "managers should look at environmental problems as business issues," and ask, "under what circumstances do particular kinds of environmental investments deliver benefits to shareholders?" (Reinhardt 1999, 150).

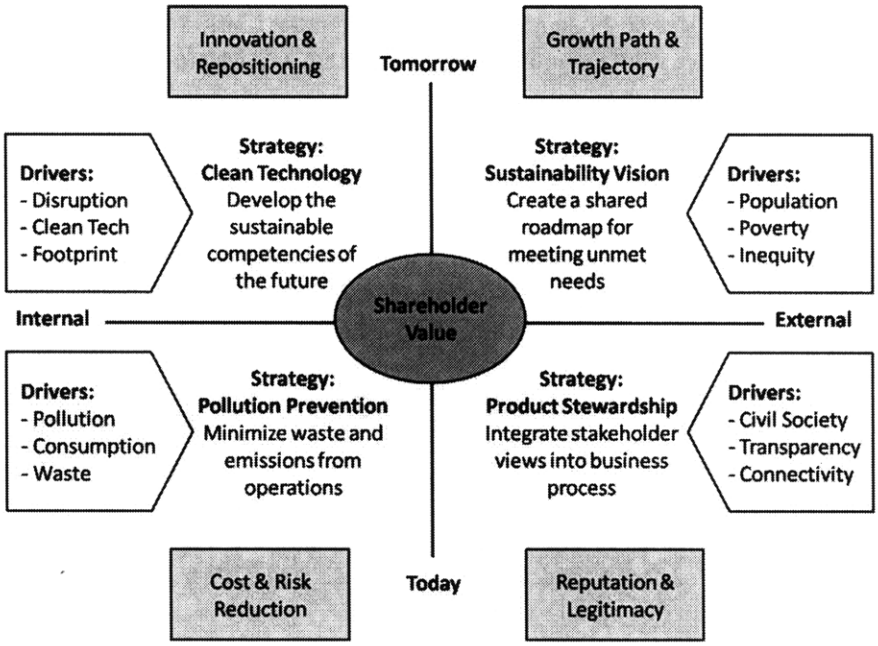

Figure 3: Sustainable Value Framework
(Hart and Milstein 2003, 60)

These arguments are based on empirical research of what companies are doing (Reinhardt 1999, Hart and Milstein 2003, Esty and Winston 2006). As shown in the lower left quadrant of Hart and Milstein's Sustainable Value Framework (see Figure 3), firms can generate value and further sustainable development through resource efficiency and pollution prevention. This enables organizations to save costs and manage environmental risks, which Hart and Milstein, along with Reinhardt, among others, argue can be a source of competitive advantage. As mentioned earlier, 3M realized significant bottom-line results through pollution prevention (Esty and Winston 2006, Hart and Milstein 2003). Another example is that of hotels replacing bottles of shampoo and lotion with bulk dispensers. In addition to reducing waste, this simple action has generated significant savings – one company reported annual savings of $37,000 after an investment of $91,000 for the installation of dispensers. Likewise, after Inter-Continental Hotels began using recycled packaging for amenities, it saved $300,000 on an annual basis at its properties in the United States and Canada (Reinhardt 1999). Xerox, for example, responded in 1990 to the pressures exerted by new market entrants with an environmental leadership program that focused on waste reduction efforts, product take-back initiatives, and design-for-environment guidelines. The program yielded significant savings and helped the company fight the erosion of its margins. By the mid 1990s, Xerox's large manufacturing complex in New York was sending only 2% of its hazardous waste to landfills (Reinhardt 1999). Similarly, DuPont achieved $3 billion in savings by keeping energy costs flat even as the company grew (Senge, et al. 2008). Examples such as these abound, and

the case for reducing environmental risks and cutting costs is easy to make – without acting on these issues, it is unlikely that companies' sustainability efforts will enjoy credibility (Senge, et al. 2008).

Organizations are also influenced by various stakeholder groups who demand greater transparency and consideration for the needs of the general public and for the fragility of the planet, as represented in the lower right quadrant in Figure 3. By providing information and responding to stakeholders' demands, firms can strengthen their reputation, and, by increasing the public's expectations of product and corporate environmental stewardship, they can manage their competitors and redefine markets. Companies in the Chemical Manufacturers Association (CMA), for example, developed an initiative dubbed Responsible Care for the association's members to adopt in 1988. Responsible Care asks for companies to comply with guidelines for pollution prevention, process safety, and emergency response, among others – otherwise, their membership is terminated. As reported by Reinhardt, between 1988 and 1994 this program led chemical companies to decrease their toxic materials output by almost 50%, a reduction above the United States' national average. In addition, these companies improved their competitive standing – they now spend less money on environmental safety improvements and in monitoring, reporting, and administrating their compliance efforts. Equally important is the enhanced image they've earned thanks to these results (Reinhardt 1999). Another example is that of Nike, who used product-stewardship strategies to restore its reputation after the public outcries against its labour and environmental practices during the 1990s. It started scoring its footwear design against a product-stewardship scorecard, and introduced initiatives to collect and recycle used shoes. Profits from this last example were used to fund the company's foundation (Hart and Milstein 2003).

Companies can also gain an advantage through present and future product differentiation that relies on environmental attributes, as shown in the upper left quadrant in Figure 3. Innovation can also be spurred through research and development of new clean technologies (such as nanotechnology, genomics, biomimicry, and renewable energy) so that the firm's internal sustainable competencies are nourished for the future and can contribute to reducing human's footprint on the planet. For this to be successful, however, customers need to be responsive to environmentally friendly products, and the firm must be able to effectively communicate the benefits of their products and services, while at the same time safeguard its investment from potential imitators. Patagonia, for example, has established itself through its commitment to conservation and the continuous pursuit of simpler, more efficient and effective products (Chouinard 2005, Reinhardt 1999). Stonyfield Farm has done something similar – it is committed to using only natural and organic ingredients, and uses its profits to safeguard arable land from pollution (Hirshberg 2008). Toyota and Honda have invested in hybrid technology for their vehicles, and BP and Shell are recognized for their investments in renewable energy technologies (Hart and Milstein 2003). DuPont, on the other hand, is relying on biotechnology, genomics and biomimicry to move away from fossil fuels and become a renewable-resource company striving for sustainable growth, addressing what it deems will be the market trends of the future: a demand for renewable energy and materials, increased safety and security, and larger quantities of food production (Hart and Milstein 2003, Senge, et al. 2008).

Finally, as shown in the upper right quadrant of the Sustainable Value Framework, firms can also generate value by addressing issues of inequality and poverty, using unmet needs as inspiration for future innovations. Unilever, for example, has used "the voices of the poor and disenfranchised [as] a source of creativity and innovation" (Hart and Milstein 2003, 63). It has focused on meeting the needs of the rural poor, and now provides products such as affordable shampoos and soaps. The results are remarkable; in 2003, for example, 50% of the revenue of one of Unilever's subsidiaries came from customers at the bottom of the pyramid (Hart and Milstein 2003). In addition, the firm is testing low-

impact farming methods that have helped some of its farms double their yield while at the same time reducing consumption of pesticide by 90% and water by 90% (Esty and Winston 2006).

A different way of thinking about how companies create sustainable value emphasizes the management of both the "upsides" and "downsides" of environmental issues in the near and long term (see Figure 4). The afore-mentioned examples also spread across this framework. From this perspective, companies can decrease the environmental costs and regulatory burdens they face, in addition to managing environmentally driven business risk, as a way to decrease the negative influence environmental issues may have on the firm. At the same time, firms can take advantage of opportunities born from environmental concerns, thus driving revenues through "green" products, services, and innovations, and, at the same time, create intangible value by strengthening its brand and reputation (Esty and Winston 2006).

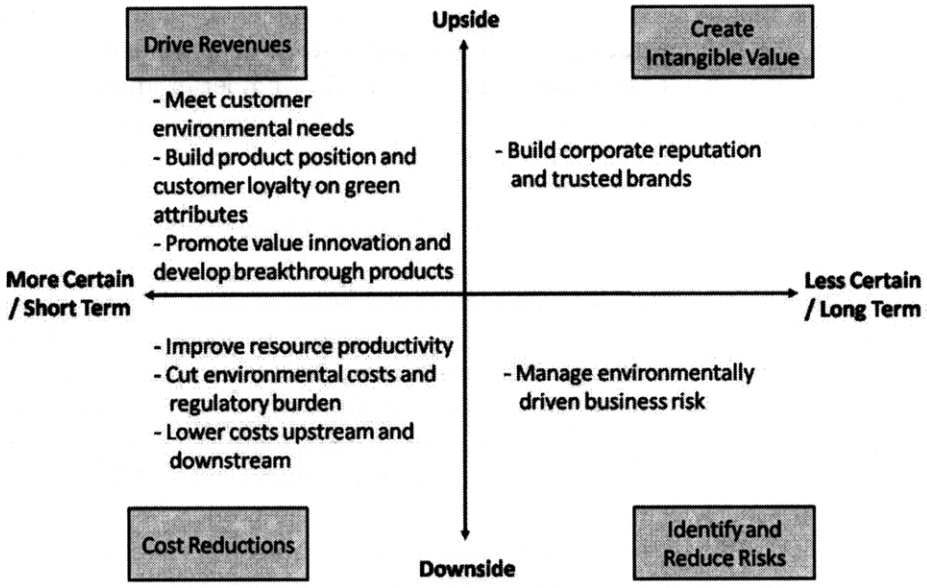

Figure 4: Framework of Corporate Environmental Strategies
Adapted from (Esty and Winston 2006, 102-104))

2.3.2 Realising the Potential for Sustainable Value Creation

How do firms go about implementing these strategies and realising the potential for sustainable value creation? What does it actually take for companies to become sustainable? The literature suggests that the activities of sustainable companies are also multifaceted: a combination of senior corporate support, workforce buy-in, organizational commitment, clear vision, stretch goals, product standards, and organizational learning through performance evaluation, among others, is necessary for corporations to become sustainable.

2.3.2.1 Senior-Level Engagement & Organizational Buy-In

Senior-level support and engagement is deemed to be essential to the development and implementation of a firm's sustainability vision and strategy. The CEO, in particular, is identified as a key

driver of the company's efforts. A study based on a 31-company survey and 6 detailed cased studies found that more than 60% of the respondents considered the CEO and management team to be the "initial champions for the idea of developing [a] corporate climate-related strategy" (A. J. Hoffman 2006b, 37). DuPont's employees, for example, cite their CEO's involvement in the company's first round of GHG reduction goals as critical to their success. Only Environmental Health & Safety groups were seen as greater advocates, with 90% of the respondents labelling them as fundamental to a company's sustainability efforts. Likewise, Hoffman found that educating the workforce and earning its buy-in was a key component of change. After all, it is employees who will be responsible for initiating and maintaining sustainable policies and processes across the company (A. J. Hoffman 2006b).

The literature suggests that the organizational context of a company is also important, since it plays "an important role in shaping managerial interpretations of environmental issues, particularly in framing of issues as opportunities as opposed to threats" (Sharma 2000, 684, Porter and van der Linde 1995, Hoffman and Bazerman 2006a). There is the belief that "when concern for the environment becomes an integral component of corporate identity, environmental issues become 'harder to disown'" (Sharma 2000, 684). This implies that if a company has become committed to environmental leadership, for example, organizational buy-in for sustainable environmental practices will be widespread. In addition, discretionary slack for managers is also deemed to be a contributing factor to environmental-related innovation within a company, given its potential to encourage employees to interpret environmental issues as opportunities and to take chances when tackling them. Finally, to channel this discretionary slack, the literature advocates for the integration of environmental performance criteria into employees' performance evaluation. A study that examined the links between managerial interpretations of environmental issues and corporate choice of environmental strategy among 99 firms in the Canadian oil and gas industry found empirical evidence that confirmed the first two theories – that is, that organizational commitment to sustainability and discretionary slack given to managers facilitate the buy-in and level of engagement across the corporation. However, there was no evidence that confirmed that employees' performance evaluations ought to be linked to environmental performance criteria (Sharma 2000).

2.3.2.2 A Systems-Based Vision of Sustainability

A clear vision of sustainability that the company is committed to is considered to be fundamental as well. According to the literature, the vision should send a strong signal across the organization for everyone to understand and embrace the firm's environmental goals. Such a sense of direction will facilitate discussions regarding what a company's policy and next steps should be, and will protect the firm from losing itself in the midst of potential resistance to change emanating from within and outside the company (McDonough and Braungart 2002).

The vision ought to inspire the corporation to set environmental goals and standards that are challenging but not daunting. There is general agreement that for firms to identify what these goals should be, they need to think about issues systemically, generally expanding the timeframes, payoffs, and boundaries under consideration (Esty and Winston 2006). Unfortunately, systems-thinking is difficult both for individuals and organizations given "our propensity for straight-line thinking" (Doppelt 2008, 38). Nevertheless, straight-line thinking, however pervasive, prevents us from taking into account the bigger picture and the long-term consequences of our actions. In the case of climate change, for example, a "poor understanding of accumulation [stocks and flows] leads to serious errors in reasoning about [the issue]," and consequently, to serious errors in policies that seek to mitigate the risks of changes in atmospheric greenhouse gas concentrations (Sterman 2008, 532).

A systems-based approach, on the other hand, enables organizations, first, to identify how their actions affect and how they are affected by "the rates of renewal, recycling, or regeneration of [natural] resources;" second, to account for the interrelationships between the organization and the various components of environmental sustainability; and third, to identify the "leverage points related to specific initiatives that facilitate systemic change" (Marshal and Brown 2003, 122-123). In the words of Senge et al., "seeing the present systemically is crucial to creating the future. Otherwise, people, get so drawn into fragmented views of the 'problem' that they often resort to superficial quick fixes... as opposed to a deep reflection on the interconnections between [] different issues" (Senge, et al. 2008, 51).

2.3.2.3 Performance Evaluation

There is also widespread agreement that environmentally sustainable firms need to evaluate their environmental performance continuously. Environmental tracking tools should enable firms to gather data on metrics that provide information on their environmental performance across the company and throughout time (see Table 3 for a list of key environmental metrics). As Esty and Winston explain, "environmental metrics show a company where it stands. Data and indicators are critical to fact-based decision-making and sound environmental management. They drive continuous improvement and allow managers to mark progress against pollution control and resource productivity goals." (Esty and Winston 2006, 179).

Environmental Outcome	Basic Metrics
Energy	- Energy used - Renewable energy used or bought
Water	- Total water used - Water pollution
Air	- Greenhouse gas emissions - Releases of heavy metals and toxic chemicals - Emissions of particulates, VOCs, SOx, and NOx
Waste	- Hazardous waste - Solid waste - Recycled materials
Compliance	- Notices of violations - Fines or penalties paid

Table 3: Key Environmental Metrics
(Esty and Winston 2006, 175)

2.3.2.4 Contending Boundaries: Supply Chain Social Responsibility & Natural Growth

Two remaining considerations that companies striving to become sustainable should think about are significantly controversial. First is a company's responsibility of the environmental impact across its supply chain. While there is little debate regarding whether firms should be accountable for the ecological footprint of their internal day-to-day operations, research and manufacturing processes, there is no general agreement on whether they should also be liable for their suppliers', carriers', and – with regards to product use – clients' performance pertaining to unregulated environmental impacts,

such as GHG emission levels. Nevertheless, the interdependency between firms and their suppliers and carriers means that, to be effective, they need to address environmental issues together – the actions of one will inevitably affect the other.

The second consideration regards the kind of growth that companies should be pursuing. There are authors who argue in favour of "good" or "natural" growth – that is, growth that is responsive to "real" societal demands and is considerate of the planet's resources and limitations – instead of economic growth (McDonough and Braungart 2002, Chouinard 2005). This, unsurprisingly, is a key point of contention. Those who favour conventional economic growth argue that it leads to competitive advantage gains and maximizes human well-being. Critics of what they call "growth for the sake of growth" suggest, instead, that "the limiting factor to future economic development is the availability and functionality of *natural capital*, in particular, life-supporting services that have no substitutes and currently have no market value" (Hawken, Lovins and Lovins 1999, 9).

2.4 The Balance between "Passion" and "Process"

As discussed in previous sections, the literature suggests that sustainable corporations rely on an individual and organizational emotional commitment to sustainability as much as they rely on a management process based on established standards and the methodical evaluation of the company's environmental performance. The implication is that, in implementing environmental programs, any company must deal with the classic tension between "passion" and "process" that has been documented for many years in the innovation literature, but needs further exploration in the sustainability literature. The following provides a brief overview of what are considered to be the roles of "passion" and "process" in environmental management.

2.4.1 Sustainability through Passion: Nourishing an Emotional Commitment

Much of the literature suggests that sustainability requires a personal and organizational commitment that is driven by what our aspirations are, and by what we believe to be "the right thing to do." Doppelt argues that "the negative emotions that are associated with seeing or imagining the effects of global warming, environmental degradation and related social distress or the sense of relief that comes from doing your part to resolve the issues provide a potent stimulus for change" (Doppelt 2008, 99). Paine adds that "a system of morality [...] enables individuals and societies to function more effectively than would otherwise be the case" (Paine 2003, 97). Indeed, companies that are considered to be exemplary sustainable corporations, such as Patagonia, The Body Shop, Ben & Jerry's, and Stonyfield Farm, are largely founded on a passionate and ethical commitment to protecting and improving our society and environment (Chouinard 2005, Hirshberg 2008, Makower 2009). As Chouinard, Founder & CEO of Patagonia, explains,

> "In every long-lasting business, the methods of conducting business may constantly change, but the values, the culture, and the philosophies remain constant... Living the values and knowing the philosophy of each part of the company align us all in a common direction, promote efficiency, and avoid the chaos that comes from poor communication." (Chouinard 2005, 83-84)

Previous sections in this chapter have discussed how the literature underscores the importance of individual commitment to the cause of sustainability across the corporation, and how it has identified

that an organizational dedication to environmental leadership is fundamental. The key, it is argued, is to find "instigators of change" and to rally the corporation to become sustainable by increasing awareness on the issue and by highlighting the value-creation opportunities inherent to embracing a more sustainable way of doing business.

Doppelt argues that five things must happen for people and organizations to actually shift their actions towards more sustainable behavioural patterns. First, they need to learn about the issues and understand the consequences of their behaviour. Second, they need to deliberate whether changing is worthwhile – this requires comparing the benefits of change with the related downsides. Third, Doppelt suggests that individuals and organizations must become convinced that the upsides of change are greater than the costs, and that once this happens, they will likely become more serious about committing to a different way of living. Fourth, they will begin to make significant changes in their thinking and behaviour. Finally, they need to focus on sustaining their new lifestyle and must do their best to avoid falling back to their previous patterns of behaviour (Doppelt 2008). He asserts that for these five things to occur, "sufficient tension must be established between some deeply held unmet values and aspirations and current conditions," and that, therefore, both individuals and organizations should seek to become "emotionally inspired by the tragedies or opportunities" related to issues of sustainability in order "to reconsider your current perspectives and adopt new ones."

2.4.2 Sustainability through Process: Environmental Management Systems

Some of the literature also underlines the importance of establishing standards and procedures, and of continuously monitoring and evaluating the firm's environmental performance. Environmental management systems (EMSs) are a widely-recognized tool for doing this.

An EMS is a formal scheme and database that establishes procedures and processes for "systematically identifying environmental aspects and impacts of [organizations'] operations" (Andrews, Darnall and Gallagher 1999, 3). Gallagher describes EMSs as a tool to "build a path to compliance and beyond" (Gallagher 2005, 60). At the most basic level, this management structure aids organizations with regulatory compliance, management of environmental risks and liabilities, and identification of potential improvements (Gallagher, Darnall and Andrews 1999). This entails articulating and following processes for goal setting, performance monitoring and evaluation, continuous improvement, and reporting to internal and external stakeholders (Andrews, Darnall and Gallagher 1999, Melnyk, Sroufe and Calantone 2003). As detailed by Melnyk et al, "the documentation of this 'environmental' information is primarily internally focused on design, pollution control and waste minimization, training, reporting to top management, and the setting of goals. The use of this information for external stakeholders is primarily found in annual reports, focuses on the outputs of the firm, and is used to enhance firm image" (Melnyk, Sroufe and Calantone 2003, 332).

The most extensively recognized EMS international standard is ISO 14001[9], which was established in 1996 with the goal of coordinating EMSs globally by offering businesses an option for "[environmental] governance without governments" (Andrews, Darnall and Gallagher 1999, 3, Gallagher, Darnall and

[9] The International Organization for Standardization (ISO) is a non-governmental organization (NGO) that helps the public and private sectors across 157 countries reach consensus on what international standards should exist to meet the needs of both business and society (ISO 2008).

Andrews 1999).[10] The criterion for any facility to obtain the ISO 14001 certification include (Clapp 2005a, 230-231, Andrews, Darnall and Gallagher 1999),

- adopting an environmental policy statement that includes a commitment to regulatory standards, continuous improvement, and pollution prevention;
- identifying all environmental impacts and aspects of its operations;
- adopting a management system that facilitates fulfilment of the environmental policy and goals; establishing goals that will move the firm's environmental efforts forward;
- assigning responsibility for the execution of the policy and the monitoring and evaluating of the firm's performance;
- participating in internal and external audits to ensure the management system is working as it should be;
- documenting procedures and results, making these as transparent as possible for all stakeholders, and using them for continuous improvement within the organization; and,
- encouraging suppliers and contractors to adopt a similar EMS

What an EMS does, in other words, is provide a framework for firms to manage their environmental impact and aspirations (see Figure 5).

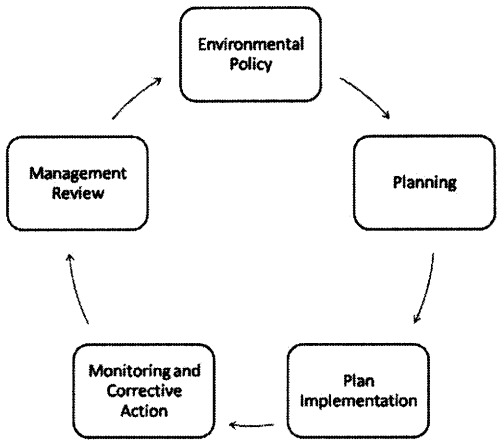

Figure 5: Environmental Management System Loop
(Gallagher, Darnall and Andrews 1999, 2)

Each firm has the freedom and responsibility of deciding what its goals and priorities will be – ISO 14001 "does not prescribe environmental performance standards, nor does it direct which of many possible environmental goals should be given priority" (Andrews, Darnall and Gallagher 1999, 4). In the words of Melnyk et al.,

> "[T]he ISO 14001 EMS standards are process, not performance standards. In other words, these standards do not mandate a particular organization's optimum environmental performance level but describe a system to help an organization achieve its own environmental objectives. Underlying this

[10] Similar procedural standards have also been established by the United Kingdom and the European Union (Andrews, Darnall and Gallagher 1999)

> approach is the assumption that by helping a firm focus on each stage of its manufacturing process, the firm will develop better environmental management practices and, ultimately improve its environmental performance." (Melnyk, Sroufe and Calantone 2003, 332)

This is very important given how dynamic our world is. By having guidelines instead of rules, organizations can have a sense of direction regardless of what context they find themselves in.

The freedom enjoyed by organizations when setting their goals and priorities also means, however, that adoption of an EMS does not necessarily indicate a serious commitment to environmental improvement and sustainability. Because of this, the detailed content of the EMS (the policy, goals, priorities, etc) is essential in determining whether the EMS will further an organisation's sustainability standing – one should not assume that sustainability will be achieved through EMS adoption alone. It is important to recognize that "EMSs by themselves are only limited procedural instruments for such purposes, and the goals themselves – sustainability or others – must and will be driven by more fundamental exogenous forces. All the substantive decisions that an EMS reflects are self-selected from within the enterprise, and often reflect only the perspectives and priorities even of particular facilities and business units" (Andrews, Darnall and Gallagher 1999, 14-15).

Nonetheless, preliminary studies have found that the introduction of an EMS can be at least somewhat beneficial to a firm's environmental performance, even if the company chooses not to provide detailed public information on any facility's actual environmental standing though the data exists and is readily available for those within the corporation (Andrews, et al. 2003). In addition, facilities that have adopted the ISO 14001 standard may be able to diminish environmental reporting burden and costs, which are significant. An EMS allows organizations to more easily redesign their operational structure, substitute standards, and introduce new regulated processes, and may even serve as signal to regulators of their commitment to environmental stewardship (Gallagher, Darnall and Andrews 1999).

2.4.3 Exploring the Balance between Passion and Process

This section illustrates that, on the one hand, some of the literature underscores the importance of an emotional and values-based (ethical) commitment to the "cause" of sustainability, while, on the other hand, a significant part of the literature underscores the importance of putting in place appropriate policies and procedures. The goal of this thesis is to explore the balance between the two by studying in detail the experience of one particular firm – IBM – with environmental sustainability. T

The following chapter presents the case study of IBM's experience in environmental management.

3 SUSTAINABILITY AT IBM

This chapter illustrates IBM's experience in environmental management. Following a brief history and description of IBM, the chapter describes the company's approach to corporate social responsibility and to environmental management. It provides information about the origins of environmental management at IBM, including the development of its corporate policy on environmental responsibility, and, later in the chapter, a description of how goals and standards are developed and integrated across IBM's different organizations. The case study also includes an overview of the challenges that IBM's Corporate Environmental Affairs team has identified, along with a discussion surrounding the team's views on "greening of the company." This is followed by a description of IBM's Environmental Management System (EMS), examples of how it works, and an explanation of how the company's environmental performance is monitored and evaluated. IBM's "green businesses" are introduced afterwards. As an example of how IBM's system works, I've included a detailed mini case-study of IBM's energy conservation and climate change initiatives. The chapter ends with a discussion of some of the challenges that emerged throughout the various interviews conducted for this study.

3.1 History & Description of IBM

> *"We acknowledge our obligation as a business institution to help improve the quality of the society we are part of. We want to be in the forefront of those companies which are working to make our world a better place."*
>
> *Thomas J. Watson, Jr., IBM Chairman, 1969*[11]

IBM's origins go back to 1911, when the Computing-Tabulating-Recording Company (CTRC) was created through a merger of smaller businesses. The company's initial offerings were a wide range of consumer products, including meat and cheese slicers, industrial time recorders, commercial scales, tabulators and punch cards. Thomas J. Watson, Sr., joined the company as general manager in 1914 and within months had become CTRC's president. Ten years later, the company had changed its name to International Business Machines, had expanded its manufacturing facilities to Europe, and had introduced computation to the public, private, and academic sectors (IBM Archives 2008, Gerstner 2002, 113). Watson Sr.'s philosophy and values – "hard work, decent working conditions, fairness, honesty, respect, impeccable customer service, jobs for life" – became core components of IBM's culture, significantly strengthening the company (Gerstner 2002, 114).

It was Thomas J. Watson, Jr., however, who recognized IBM's future in electronics (Gerstner 2002, 114, Chandler 2001, 88-89). By 1963, the company, which was also known as "Big Blue," had become the leader of the world's computer industry and generated $1.24 billion in revenue – more than twice the total earnings of $539 million made by its competitors. IBM had grown from a company with five hundred engineers and technicians to one with sixty thousand employees, and which increasingly focused on building new sets of capabilities in software and electronic technology development (Chandler 2001, 85-93). The introduction in 1964 of System/360 – the first family of fully compatible computers and peripherals – revolutionized not only IBM but the industry as a whole. IBM shaped its growth around this offering. To support System/360, the company invested in the semiconductor

[11] Quoted in (IBM CEA 1994)

industry, software, and research and development for new technologies. In Gerstner's words, "IBM was a *one-product company* – a mainframe company – with an array of multibillion-dollar businesses attached to that single franchise" (Gerstner 2002, 116-117).

System/360 proved to be one of the most successful product launches in history, and IBM remained a leader of the IT industry for the next thirty years. Company revenues grew at a compound rate of 14 percent between 1964 and 1985, gross profit margins averaged 60 percent, and IBM's market share was larger than 30 percent (Gerstner 2002, 117). In 1991, however, for the first time in 45 years, the company stopped growing, and by 1993 Big Blue's net losses reached a record $8 billion (Garvin and Levesque 2005, 2, IBM Archives 2008). Lou Gerstner was hired from outside IBM to turn the company around. He described the company's difficult time as closely related to its "decades-long run of uninterrupted success" (Gerstner 2002, 117). In his words,

> "When there's little competitive threat, when high profit margins and a commanding market position are assumed, then the economic and market forces that other companies have to live or die by simply don't apply. In that environment, what would you expect to happen? The company and its people lose touch with external realities, because what's happening in the marketplace is essentially irrelevant to the success of the company." (Gerstner 2002, 117)

IBM's market share success also attracted an antitrust suit filed in 1969. While the suit was later dropped and categorized as "without merit," Gerstner believes it had a negative impact on IBM's corporate culture and also contributed to the company's slow down (Gerstner 2002, 118).

With this in mind, Gerstner found himself nourishing a customer-oriented sensibility and fighting the pressure to respond to new competition – companies like Sun and HP that promoted UNIX[12] – by splitting IBM into separate independent businesses (Gerstner 2002, 119, IBM Archives 2008). He recognized the need for integrated solutions and envisioned IBM could have a clear advantage by staying together instead of breaking apart (IBM Archives 2008). To secure such advantage, Gerstner and his team transformed IBM from a vertically integrated computer hardware manufacturer to a company with a diverse business portfolio, including a strong focus on software and services, and that procures most of the components that go into its finished products. As a result, the company began to rely on its supply chain not only for product quality and environmental compliance, but for achieving its social responsibility and environmental stewardship objectives. Unfortunately, in addition to these changes, Gerstner was also forced to lay people off for the first time in IBM's history in 1993 – a tremendous shock for all IBMers.

Since then, Big Blue has grown to regain its status as a renowned global company that delivers IT hardware and solutions, and that offers a wide range of services. In 2003, Gerstner was succeeded by current CEO Sam Palmisano, who has continued to strengthen IBM, solidifying its position for the 21st Century. By 2008, the company had nearly 400,000 employees and generated over $103 billion in revenue: 21% software, 21% hardware and financing, 57% services, and 1% other (IBM 2009).[13] On November 2008 Palmisano launched IBM's "Smarter Planet" agenda, a call for the world to rethink the

[12] An open operating environment that offered an alternative to IBM's mainframe products, and that opened the marketplace to new producers of software and peripheral products.

[13] IBM's financial highlights for years 2005-2007 can be found in the Appendix.

way it works, and a vision of how IBM can contribute to making the necessary and substantive changes a reality – by enabling smarter and more efficient systems (Palmisano 2008).

3.2 Spare Change vs. Real Change: Corporate Social Responsibility at IBM

> *"From IBM's inception, nearly a century ago, our company has always been in the business of engaging with forward-thinkers across business, science and society to make the world work better. IBMers have always believed that when people think about how the world should work, they are inevitably driven to challenge the status quo, and to change it. And the resulting benefits flow not just to them and their organizations benefit, but to their communities and global society."*
>
> *Sam Palmisano, IBM Chairman & CEO*[14]

The legacy of IBM's founder, Thomas J. Watson, Sr., continues to be evident in IBM's commitment to corporate social responsibility (CSR). As explained earlier, Watson Sr.'s values had a significant influence on IBM's culture. While it became impossible for IBM to continue providing jobs for life, its commitment to conducting business in an ethical, safe, and constructive manner has remained central to the firm.

CSR at IBM includes seven functional areas, including Governance and Financial Accountability, Corporate Community Relations, Environmental Affairs and Product Safety, Employee Well-Being, Global Human Resources, Supply Chain, and Governmental Programs (see Figure 6). Each function has a representative on the Executive Steering Committee, which defines IBM's CSR Policy, and on the Working Group, which meets monthly to manage IBM's CSR reporting and stakeholder engagement, and to address cross-company citizenship issues, including IBM's relationship with socially-concerned investors.

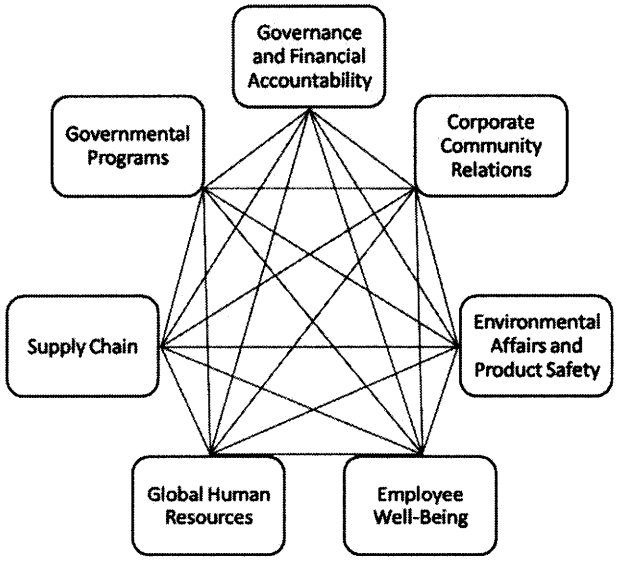

Figure 6: IBM Corporate Citizenship Executive Steering Committee and Management System
Each organization in the system has been in IBM for more than 15 years.

[14] Chairman's Letter in (IBM 2008)

The company's CSR report includes a wide variety of key performance indicators (KPIs) including metrics describing employees' satisfaction, workforce diversity, greenhouse gas emissions reduction, pollution prevention, and supply chain social responsibility (IBM Corporate Responsibility 2008).[15] The firm is also a founding member of the Global Leadership Network, a partnership of leading global companies committed to performance excellence in corporate citizenship, defined as the "alignment of corporate citizenship to core business strategy and operations" (Global Leadership Network 2008).

CSR at IBM is viewed very much as a partner to the business. Stan Litow, VP of Corporate Citizenship & Corporate Affairs (CCCA), and Chair of the Executive Steering Committee for Corporate Responsibility, suggested that "CSR is part of IBM's core values and directly related to our business strategy – we ensure that all investments are related to innovation that matters." Hence CCCA's focus on education and public health issues, among others. Litow added that IBM's efforts are "the difference between spare change and real change" and emphasized that the firm does not treat CSR as charity. In his view, "most companies approach corporate citizenship as a private foundation, while [IBM's] foundation is our arsenal of weapons – the key is to know your core capability and use it."

Paula Baker, VP for Global Community Initiatives within CCCA (now retired), referred to IBM's approach to CSR as "a continuum from regulation and compliance to value creation," and noted that the firm currently focuses on CSR mostly as a platform for growth (see Figure 7). She explained, "IBM doesn't do cash grants – we want to use our people, expertise and technology." Litow explained that this approach is intrinsic to treating CCCA as if it were yet another business unit. He believes that when it comes to the company's corporate citizenship activities, "you should always ask if you would do something similar with a customer – for instance, you wouldn't give a client a check-book for them to go hire someone else to do the job instead of you."

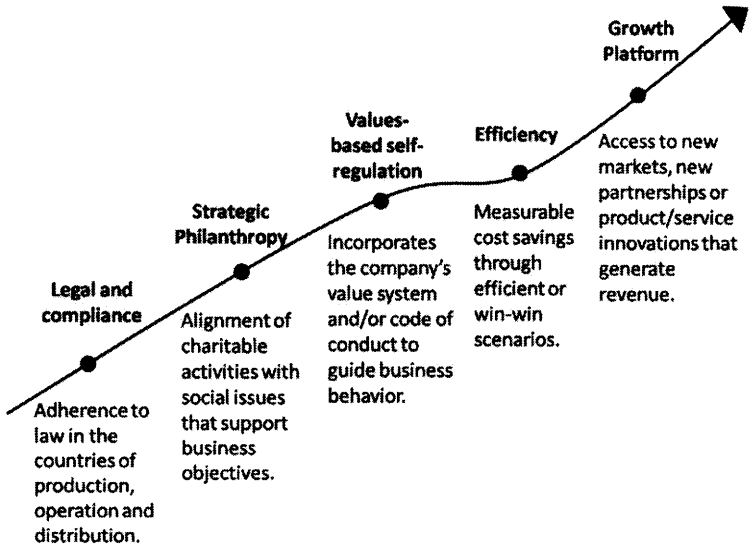

Figure 7: CSR Value Curve
Figure from (Pohle and Hittner 2008, 4)

[15] Some of these CSR KPIs for years 2005-2007 can be found in the Appendix, and at the following website: http://www.ibm.com/ibm/responsibility/index.shtml

Instead of making a financial donation to the Nature Conservancy's "Water for Tomorrow" Project, for example, IBM sought to become an active partner. The goal of the project is to build a modelling framework that simulates river basin behaviour to support policy decision-making. According to Baker, the partnership proved to be valuable to IBM on many fronts. First, the Nature Conservancy was an experienced global organization with an identified real need. It was also an organization that IBMers could relate to, being the NGO that received the most individual financial contributions from across the company. Second, the project addressed water issues, which ranked high on the agenda of IBM's Global Innovation Outlook (GIO) 2.0 and 3.0[16], as well as on the company's Innovation Jam[17], which may be described as a conversation across IBM about a healthy planet. Third, it gave IBM the opportunity to test its simulation technology, one of the developing business opportunities within the company. Finally, the project took place in Brazil and China – two countries with strategic importance for IBM.

Clearly, IBM treats CSR as a tool to push the company and its products forward. As the Water for Tomorrow example shows, the company strives to use CSR as an avenue for testing and proving its technology and as a way to open doors in emerging countries.

3.3 Managing the Environment

3.3.1 Origins of Environmental Management at IBM

Environmental management is a critical component to CSR within IBM. In Litow's words, "it is impossible to have high quality corporate citizenship without [environmental] sustainability." Indeed, the company has a long history of environmental commitment. It began instituting worldwide policies for safety, conservation, and the environment as early as 1967 (Grimm 1992). The company's first Corporate Policy on Environmental Responsibility was established in 1971; just a couple of months after the creation of the Environmental Protection Agency (EPA).[18] Written by then-CEO Thomas J. Watson, Jr., it stated:

> "Line management in IBM must be continuously on guard against adversely affecting the environment. This effort must include constant attention not only to the waste incident to producing a product but also to the consequences of the processes established during product development." (Watson 1971)

There are two remarkable aspects in Watson's policy. First, it placed the responsibility of protecting the environment firmly in the hands of line management, rather than in IBM's staff. Second, it emphasized

[16] IBM describes its GIO as "a worldwide conversation about innovation that matters" (IBM GIO 2008). The firm brings together its best researchers, consultants and business leaders to collaboratively address issues that call for innovative solutions. In 2008 the GIO focused on the implications of climate change and the increasing pressures on water supplies, among others.

[17] A "Jam" at IBM is a "massively parallel [online] conference... a group of interlinked bulletin boards and related Web pages on IBM's intranet, with systems for centrally managing everything and seeking substantive answers to important questions" in a short period of time. In 2006, the company used this tool to promote innovation by encouraging all IBM employees to brainstorm "to develop ideas better and more quickly commercialize them." A set of "Big Ideas" emerged out of these discussions, and these become the basis for new business propositions. Three examples of these new business units include IBM's Intelligent Utility Networks, Intelligent Transportation Systems, and "Big Green" Innovations (Bjelland and Chapman Wood 2008).

[18] The EPA was formed in 1970, under the administration of President Nixon, and officially opened on December 2, 1970 (Lewis 2007)

pollution prevention instead of pollution control as a primary activity – a shift that did not occur in the EPA until the eighties.[19] Watson's far-sightedness has generated significant pride across the firm, and has often led IBMers to refer to their former CEO as a true visionary and a man ahead of his time.

IBM continues to set internal standards that go above and beyond those set by law – which, in the words of Edan Dionne, Director of Corporate Environmental Affairs (CEA), helps "make regulations irrelevant [for the company] by keeping IBM ahead of the regulatory requirements." Tim Mann, Program Manager of Environmental Product & Process Stewardship for CEA, sees IBM's approach as being practical too. In his view, "it is easier [and more efficient] to [establish higher standards] voluntarily, on your schedule, than to wait for the regulation and be told you need to do it within six months."

IBM's environmental impact in the 1970s and 1980s largely flowed from the construction and infrastructure of its manufacturing sites, and in consequence the team responsible for the development of IBM's environmental goals and directives (the Environmental Engineering Team or EET) was housed under the Real Estate and Construction Division (RECD). The EET focused on defining and maintaining what years later would become the company's Environmental Management System (EMS). Among others, the EET developed policies to address the environmental impact of its processes and products. The company established the Process Environmental Impact Assessment (EIA) program in 1973 and the Product EIA in 1977. The Process EIA evaluated the resource and material (e.g., energy, water, chemicals) requirements of, and discharges from, manufacturing and facilities processes. It also assessed requirements for waste management, and control of air emissions and waste discharges. The Product EIA included an evaluation of what every product was made of, its energy use, the chemicals used for its maintenance, and whether there was a need for special disposal. IBM also established its supplier environmental evaluation program in 1972 and its corporate policy on energy conservation in 1974.[20]

As IBM's approach to environmental management continued to mature, a number of events gave its environmental efforts added momentum. In 1984 a chemical release at Union Carbide's plant in Bhopal, India, killed over 3,000 and injured more than 300,000 (A. J. Hoffman 1999, 363). That same year the semiconductor industry, which until then had enjoyed a public image of being "clean", began to be increasingly recognized as a major contributor of toxic wastes after the EPA published a list of high-technology companies whose leaking underground storage tanks had contaminated groundwater supplies. During that time, IBM's Manassas manufacturing plant was proposed to be added to the EPA's "national priority list" of hazardous waste sites for Superfund cleanup, despite the fact that IBM had already taken actions to solve the problem (Salisbury 1984, Hamilton 1984).

This issue did not take IBM by surprise. In fact, six years earlier, in 1978, the company had established a Groundwater Protection Plan to prevent groundwater contamination, to monitor facilities "to assure the integrity of all plant system against release of chemicals into groundwater," and in case of contamination, to undertake appropriate remedial measures "to limit the spread and eventually remove the contaminate" (Morris 1978).

IBM's environmental efforts were further energized when in 1987, two years after the discovery of the Ozone Hole, routine, permitted emissions by the company placed three of its manufacturing facilities as the first, second and third largest emitters of CFC-113 in the US (IBM CEA 1992, 7). Tim Mann

[19] The EPA's Pollution Prevention Act was established in 1990 (Browner 2007)
[20] A detailed timeline of IBM's other environmental highlights can be found in the Appendix.

remembers this information listed on the front page of a major newspaper as something that was, in his words, "a big slap on the face [and] not something IBM wanted to be associated with."

In addition, the Exxon Valdez oil spill in Prince William Sound, Alaska, occurred in 1989. These events furthered "the right to know" by increasing social and regulatory pressure for companies to disclose information on their environmental footprint and on their ability to respond to any accident, should they be faced with one.

IBM recognized the subject of environmental responsibility "was getting hotter," recalled Wayne Balta, VP of Environmental Affairs and Product Safety. To reflect the company's recognition and commitment to manage environmental affairs as a strategic imperative, IBM decided to institute a separate environmental entity within IBM. In 1990 IBM pulled together professionals from RECD's EET and other areas across IBM including environmental, energy and legal experts to form Corporate Environmental Affairs (CEA) – a corporate staff function (Deutsch 1991). Arthur J. Hedge Jr., a corporate officer formerly responsible for running RECD and who was appointed as vice president of environmental affairs at the time, later explained the change responded to the feeling that IBM "needed one high-level group to focus [the company's] environmental efforts, and to send a clear signal that management cares about the environment" (Deutsch 1991, PR Newswire Association, Inc. 1990). When the announcement was made, IBM's senior vice-president at the time, C. Michael Armstrong, said,

> "IBM has long been committed to conducting business in the safest way possible for our employees, the communities where we operate and for the world at large. Bringing environment, energy and safety programs together under this new position will enable us to further coordinate our work in these interrelated areas." (PR Newswire Association, Inc. 1990)

CEA was founded at a difficult time for IBM – the company's profits were decreasing, it was being attacked by all sorts of new competitors, and there was talk of splitting IBM into various companies. Nonetheless, when IBM was about to lay people off for the first time in history a couple of years later, it kept CEA as a staff function. The message was clear remember Balta and Dionne – IBM's commitment to the environment was for the long run. In fact, CEA was one of the few groups within IBM that Gerstner left untouched amid his long list of changes. In his 1994 environmental report letter, he stated,

> "In the past two years, we in IBM have had to rethink much about the way we do business. In the process, it has become clear that there are certain things that should *not* change. One of them is our responsibility to run a business mindful of the world in which that business operates. When it comes to the environmental well-being of that world, this responsibility takes on added weight for a company such as ours: a multinational organization whose technology represents a powerful engine of change." (IBM CEA 1994)

The staff of the newly formed group focused on three tasks: continuing the work of the EET, raising the stature of the EMS across IBM, and strengthening IBM's environmental strategy.[21] To do the latter, Balta

[21] IBM's Corporate Policy 139 on Environmental Affairs, the company's corporate policy on environmental protection set in 1990, begins with the words: "IBM is committed to environmental affairs leadership in all of its business activities." This sentence continues to be the opening of the two follow-on policy updates – policy 139A

recalled the group asked itself, "what do we aspire to be?" and "what stands the test of time?" IBM's policy of commitment to environmental leadership emerged from these conversations, and with it, explained Balta, "an obligation to have a demonstrable record of performance." Six major challenges were identified:

- **"Consumerism."** IBM recognized that consumers were increasing their focus on the environmental, energy, and safety attributes of products. It identified "a growing awareness of environmentally friendly products and a growing trend for companies to develop them" (IBM CEA 1990, 32). Consequently, it underscored the importance of designing its own products with this growing consumer interest in mind, and of communicating their products' environmental attributes in manner that was credible, transparent and easy-to-understand.
- **"Credibility."** This was about earning people's trust, given that industry is generally cast "in the role of wrongdoer and as the major contributor to environmental problems." IBM felt there was "a lack of sufficient trust between environmental organizations, business and regulators." The company knew "it will no longer suffice for IBM to simply say that it has existing policies and practices, that those policies meet the law, that IBM is in compliance and that IBM, therefore, performs well. IBM will instead be challenged to prove these things" (IBM CEA 1990, 33).
- **"Communications."** Events such as the Union Carbide's chemical accident in Bhopal, India, and Exxon Mobil's oil spill in Prince William Sound, Alaska, had a significant negative impact on the public's perception of companies. As a result, there was an increase in public and regulatory demand for corporate disclosure. The challenge identified was for IBM to communicate its environmental policy, programs, objectives, and stewardship activities' results, in addition to its environmental impact, in a way that anticipated and satisfied such demand (IBM CEA 1990, 34).
- **"Issue Coordination."** The complexity of the world's environmental issues and the increasing demand that business become involved with each presented yet another challenge since not all of the issues related to IBM's activities. The company believed it faced an important challenge "to have a coordinated, worldwide posture on the issues – from actions and communications to support and contributions" (IBM CEA 1990, 34-35)
- **"Public Policy and Regulation."** Environmental policy and regulations are constantly evolving and changing. CEA's challenge was to continuously provide intelligence on these requirements and changes across IBM, to make sure that none come as a surprise and that all are well understood across the board. In addition, as a global company, IBM faces the challenge of dealing with levels of regulation that varied according to geography. It also sought to speak with one voice on policy matters internationally (IBM CEA 1990, 35-36).
- **"The Need to Build Upon a Record of Success."** By 1990, IBM already had a series of environmental accomplishments under its belt, which the firm believed "placed [IBM] ahead of industry." CEA staff felt they had already picked a significant amount of the low-hanging fruit – such as easy-to-implement real estate operations changes to reduce energy consumption. The challenge identified was being able to *continue* to build on that record of success to demonstrate environmental leadership. As an internal document explained, "given increasing attention and worldwide concern over environmental affairs issues, it is clear that companies today must not rest on their past success. People concerned with environmental affairs issues will not accept past achievements as an indicator of present or future performance. Companies must make demonstrated progress today and tomorrow, regardless of whether they have already come 99 percent of the way toward tackling environmental affairs problems... Without a

(set in 1995) and policy 139B (1997), IBM's current environmental corporate policy. A complete copy of Corporate Policy 139B can be found in the Appendix.

continued record of success, IBM will not be able to speak with the same credibility it has had in the past on its programs and public policy positions" (IBM CEA 1990, 36-37).

3.3.2 Corporate Environmental Affairs Today

Since 1990, IBM's environmental strategy has been reviewed approximately every 5 years. The company has relied on CEA's situational analysis to address internal business changes, IBM's present environmental impact, the global environmental talk of the day, and even the environmental performance of competitors and other businesses. According to Balta, today's challenges are not very different from those identified at the beginning of the 1990s, though changes in the business have inevitably had an impact and introduced new challenges, including:

- **"Improve supply chain environmental performance."** In addition to being concerned with the quality of the products obtained from suppliers, IBM must now also pay attention to *how* such products are manufactured. In other words, IBM must pay attention to suppliers' environmental performance, and ensure it is up to IBM's standards.
- **"Ensure IBM's environmental management system (EMS) remains appropriate, adequate and effective for current IBM business."** IBM's business model continues to change – and keeping up with that change is another challenge faced by CEA.
- **"Help IBM colleagues develop innovative solutions for IBM's clients."**

For Balta and Dionne, however, what is most important is what is done as a consequence of the chosen strategy for IBM – which for them means executing the Environmental Management System (EMS) and making sure it remains appropriate, adequate and effective for the firm's current business (the EMS is described in section 3.3.3). After all, Balta explained, "the common thread [behind IBM's environmental work] is the EMS, [which CEA has integrated] into the fabric of the business, making [its execution] a routine job."

As it stands today, CEA is a staff function of approximately 35 people located across the globe complemented by 400 full-time equivalent employees across the rest of the firm that execute compliance activities, required programs, goals and objectives. These include, for example, product design activities, the management of permits and waste discharge, and regulatory reporting, amongst other key environmental functions. CEA's responsibilities are twofold. First and foremost, it focuses on setting IBM's strategy for environmental affairs, overseeing internal execution and driving operational results. In addition, it communicates IBM's efforts and their results to the public.[22] Second, CEA uses its expertise and results to provide support and advice to IBM's client-facing teams that are working with companies on improving their environmental performance.

How can such a small group effectively keep track of all environmental issues in a company that has close to 400,000 employees? The answer, according to CEA staff, goes back to Watson's Corporate Policy on Environmental Responsibility, which placed the responsibility with IBM's line management rather than with its staff. While CEA staff provides advice and counsel regarding what environmental issues matter and why, it is employees within the business organizations, anchored in the company's global environmental management system, who ensure that all applicable environmental requirements are met.

[22] IBM has published an environmental report every year since 1990.

CEA is funded solely as a corporate staff function. IBM's other organizations – such as Real Estate Site Operations (RESO) or the Systems & Technology Group (STG) – are accountable for their own environmental impact and are therefore responsible for procuring the capital and expense requirements to meet the companies' environmental policies. Environmental projects are given the same rigorous review for budget allocations than any other project is given. Greg Peterson, Global Energy Manager within RESO, explained, for example, that "energy conservation is competing with everything else IBM spends money on, including research and other projects." The case must always be made that any initiative will be good for business in addition to being good for the environment.

3.3.3 Greening the Company?

Clearly, IBM has a rich history of environmental commitment, and it strives to identify its environmental attributes rather than to merely say it is green. Referring to IBM's careful approach, Edan Dionne, CEA Director, said, "'Green' is so over used yet undefined – it is a word that resonates with people in a general sense; however, it does not provide any specific meaning when used to describe programs or products." This approach goes hand in hand with IBM's goal of maintaining a continuous, stable, and demonstrable commitment to environmental responsibility.

CEA is focused on having a long-term understanding of what IBM does and how what it does intersects with the environment. What this means is that the company must look at environmental issues in a "holistic" and process-based way, rather than only focus on particular environmental concerns – such as reducing carbon emissions, for example. In Balta's words, the goal is "not to get too high when everyone is talking environment, but to not get discouraged either or less aggressive when [the environment] is not as fashionable... [The commitment needs to be for the] long-term, not a fad...We want this integrated into our core business and be steady as a rock."

IBM has embraced the definition of sustainability found in the Brundtland Report, which places emphasis on preserving resources for the future, and on the importance of having viable businesses and economies. It agrees with the report's statement that "the concept of sustainable development does imply limits – not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities" (WCED 1987, 25). Nevertheless, CEA is concerned that society's recent (mid 2000s) "green" rhetoric is vague and a little too self-promotional. While Balta recognizes that "the [green] frenzy is good," his concern lies on the "need to keep our eyes on where the benefit is." He believes that "green conversations need to shift towards specific, long term, sustainable practices that deliver measurable value to both business and the environment, and away from shorter term initiatives that look good on the surface, but offer less opportunity for substantive impact and may have less staying power." In brief, the goal is to implement policies that make both business and environmental sense.

The sustainable environmental management policies or practices that Balta referred to are essential to IBM's environmental work because they provide a process-based framework – the Environmental Management System (EMS). For him, "it is easy to do environmental work when it is on the news, but different skills are needed to sustain this [type of work] when you have to reduce headcount and budgets are contracting." This is possible thanks to IBM's EMS, which Dionne described as "a map to objectively rather than subjectively make decisions." "Unless you have a blueprint of what you have and

what you can do," she explained, "you don't know how to optimize your resources to make the most difference regarding the company's intersections with the environment."

For Dionne, part of the challenge consists in "applying good judgement as you provide direction [to the company and its employees] without stifling passion and innovation." For this, she said, "it needs to be as clear as possible where we're heading." Anytime someone approaches CEA with a concern or suggestion regarding an environmental matter, Dionne and her colleagues make every effort to "take the emotion away from the discussion and talk about the facts." The goal, she explained, is "to make fact-based decisions that make sense for the environment, business, and the company's shareholders."

Business sense does not mean, however, that every single project must have a financial payback. As Patrick Aurrichio, Program Director of the EMS, explained, the objective is, in addition to protecting the environment, "not just to protect [the site], but to protect the corporation... if [a project] is potentially painful financially for a site, but good for the corporation [and its environmental goals], then it has to get done." In the words of former CEO John Akers,

> "Even in the midst of far-reaching changes to its business, the IBM company kept its worldwide environmental programs front and centre. We have sustained our efforts, and indeed, added important new initiatives. Continuing a long tradition, the IBM environmental record gives cause for pride – but not complacency. Too much is at stake not to keep our sights fixed firmly on future challenges, rather than on progress we've made in our past.
>
> High technology multinational companies like ours can do much to improve the quality of life on this planet. In our own operations, we can set an example by complying fully with laws and regulations and taking actions even before they are mandated. We can also encourage the efforts of others by making our technology available for them to tackle problems that might otherwise remain unsolved." (IBM CEA 1992)

IBM's spending on environmental efforts has remained remarkably stable since 1992 (see Figure 8), and since 1997 IBM's environmental expenses[23] have on average yielded savings[24] of more than double the expense (see Table 4) – an estimate that CEA considers to be conservative since it doesn't include intangibles, such as the value of IBM's brand.

[23] Environmental expenses include: Personnel, consultant fees, laboratory fees, permit fees, waste treatment & disposal, water and wastewater management, air emission control operations, groundwater protection operations, other environmental systems operations, waste & materials recycling, superfund & former IBM site (i.e. environmental) remediation, and other miscellaneous expenses.

[24] Environmental savings include savings and cost avoidance related to: Site pollution prevention and operations, on-site recycling, corporate operations, packaging, recycled materials usage and savings, energy conservation & cost avoidance, superfund & site remediation efficiencies, insurance savings, spill remediation cost avoidance, and compliance cost avoidance.

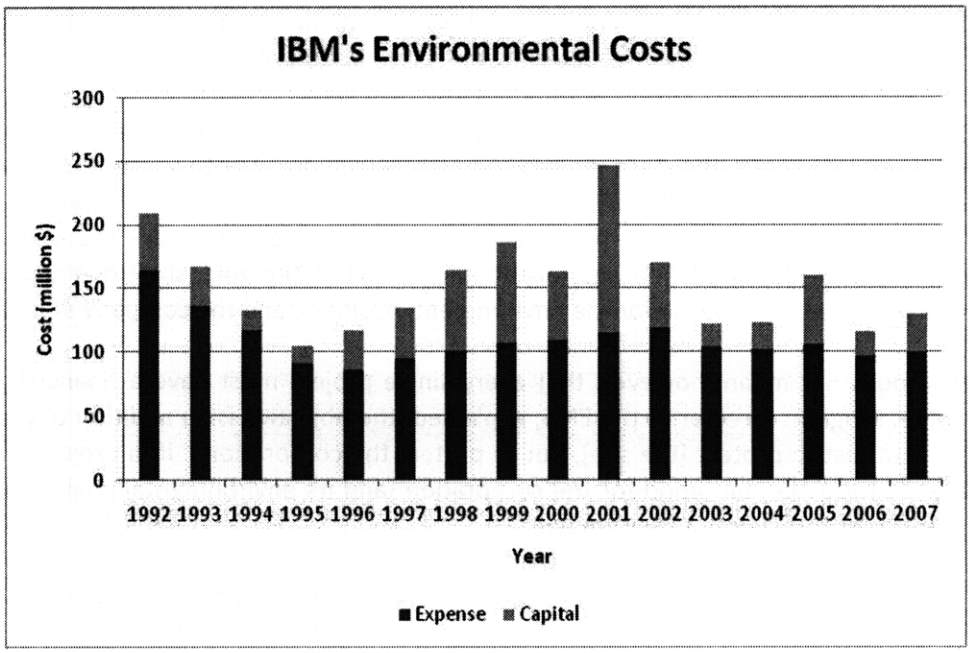

Figure 8: IBM's Environmental Costs

Please note that this does not include research and product development expenses, among others. The cost of making products RoHS compliant, for example, are not included (Source: IBM Environmental Reports).

YEAR	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
SAVINGS / EXPENSES	2.06	2.11	1.77	1.76	2.11	2.01	2.20	2.04	2.42	2.04	2.00

Table 4: Annual Average Environmental Savings to Expense Ratio

Please note that this does not include research and product development expenses, among others. The cost of making products RoHS compliant, for example, are not included (Source: IBM Environmental Reports).

3.3.4 Improving Internal Operations: IBM's Environmental Management System

> *"The global EMS is IBM's foundation to what IBM has or has not done [in the environmental arena] – it is like a building's concrete blocks, they may not be exciting but are absolutely necessary for everything else."*
>
> *Wayne Balta, VP of Environmental Affairs & Product Safety, IBM, 2008*

IBM relies on its global Environmental Management System (EMS) to "identify and manage the potential environmental impact of IBM's operations" (IBM Environment 2008). It does so by defining policy, programs and requirements, by setting standards and goals, and by allocating responsibility for meeting these, but also – most critically – by monitoring progress. This is all done through an online system that is easily updated and can be accessed by any authorized employee within IBM.

The EMS grows from IBM's environmental policy, which states that "IBM is committed to environmental affairs leadership in all of its business activities."[25] As Figure 9 illustrates, the EMS is a two-tiered approach that places responsibility both at the corporate and at a local or business function level. CEA is responsible for developing IBM's worldwide EMS, including its environmental policy, environmental corporate instructions, and corporate-wide environmental practices and standards. CEA is also responsible for establishing IBM's environmental strategy and goals, and monitoring the company's progress towards them. At the execution level, IBM's locations and/or operating units are responsible for implementing the company's policy by managing environmental programs and meeting the established requirements and goals (IBM CEA 2008).

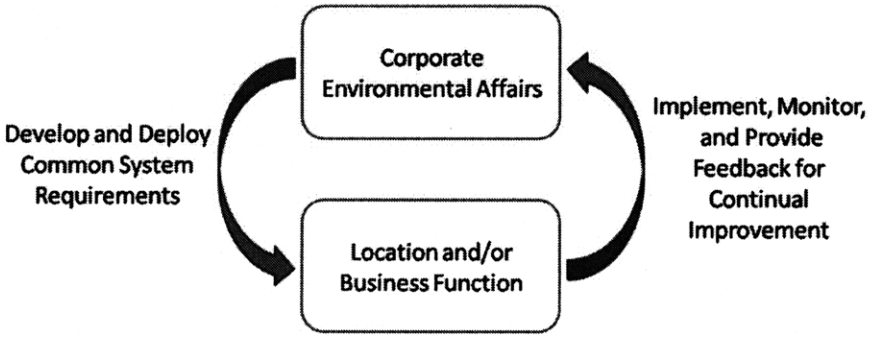

Figure 9: EMS Approach
Source: IBM CEA

[25] IBM's Environmental Affairs Policy is in the Appendix.

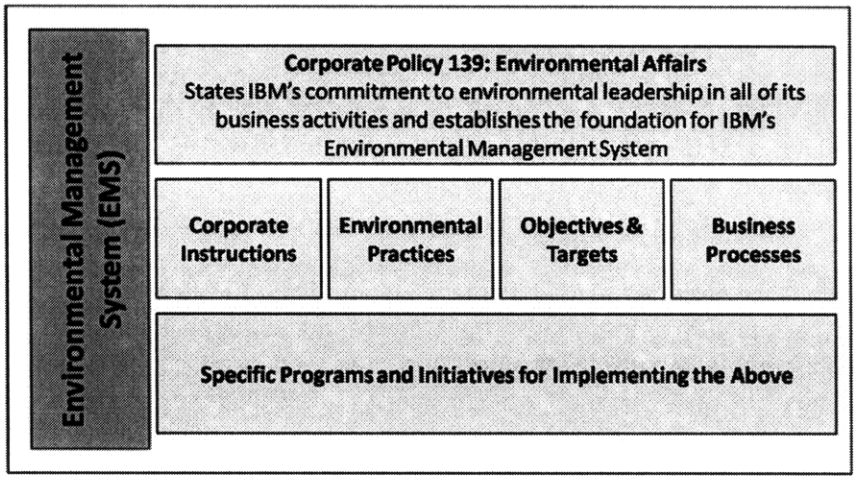

Figure 10: Environmental Management System Structure
Source: IBM CEA

Within the EMS, Corporate Instructions and Environmental Practices identify the elements critical to the successful implementation of IBM's environmental policy, including energy management programs, environmental incident prevention and reporting, environmental due diligence for acquisitions and divestures, chemical management programs, product stewardship, and documentation of products' environmental profiles. They also identify the management practices that are considered important. Corporate Instruction ENV119 on Product Stewardship and Design for Environment, for example, states that:

> "Those IBM Organizations with responsibility for design, development, and/or release of IBM Logo hardware and chemical products shall:
> A. Develop and maintain an EMS in line with IBM's worldwide EMS.
> B. Establish Product Stewardship programs [which] must be integrated into the Organization's EMS and at a minimum include [elements detailed in ENV119]
> C. Designate an individual to be its Product Stewardship Executive Leader
> D. Conduct annual reviews of the Organization's EMS and Product Stewardship programs with the Product Stewardship Executive Leader to ensure the EMS' appropriateness, adequacy, and effectiveness in implementing IBM's environmental policy and objectives, and consistency with the Organization missions
> E. Report performance against Corporate Product Stewardship objectives and targets and other EMS information as requested by CEA in the Corporate Environmental Performance Database, consistent with report content and timing requirements." (IBM CEA 2008)

Balta believes the EMS is what makes IBM's environmental work sustainable – in his view the EMS is representative of IBM's long-term commitment to environmental work. He explains that by having an EMS with a global focus, good judgement and good decisions are nourished within IBM by "optimizing the global interests of the enterprise over what one particular entity's interests are." For Dionne, this fosters uniform environmental management across the company, thus increasing the effectiveness of IBM's efforts. Among others, the EMS sets baseline requirements and drives consistent execution across

all IBM facilities and business functions, including those that are located in places with weaker environmental laws and regulations. Lyon explained that, "history has helped us [IBM] understand the business benefits of not degrading the environment; we are not going to wait for someone to pass a law on this. It's a philosophy based on logic – it is better to avoid damaging the environment than to try to restore it after."

For example, IBM's Environmental Practice 4 (EP4) requires the installation of secondary containment for all liquid storage and handling systems located at facilities owned, operated and/or managed by IBM.[26] While there are no specific regulations governing secondary containment of liquids in India, IBM's EP4 is written so that "in case of conflict [between IBM standards and practices and government regulations] the more stringent requirements shall apply" (IBM CEA 1979, 1). Therefore, any IBM facilities located in India must meet the secondary containment requirements set in EP4.

In 2004, IBM acquired Daksh, a business process and transformation outsourcing service provider, as a wholly owned subsidiary. Like any other IBM facility in India, Daksh is equipped with 100% backup power in the form of diesel generators. This precaution has been taken against any power failures of main government grids. During IBM's environmental due diligence process, 3 Daksh locations were identified by IBM RESO India to be non-compliant with EP4 requirements. Therefore, following the acquisition, a program was outlined and initiated to ensure these sites meet all of IBM's environmental requirements, including the installation of secondary containment.

The EMS also emphasizes the importance of relying on a systematic process, as opposed to having an approach that is people-dependent. This implies that "the company's environmental program wellbeing is not tied to a person being around [and] will thus outlast each generation of leaders and employees," suggested Dionne. Diana Lyon adds that during an economic downturn like the one we are presently experiencing, "even if we at IBM have to take a headcount cut, the system, the goals, the objectives remain."

IBM's EMS dates back to the 1970s and has been continuously improved since then. Today, it is aligned with ISO 14001, which provides the internationally-accepted standard requirements for any environmental management system.[27] ISO 14001 is recognized as a management tool that helps any organization to "identify and control the environmental impact of its activities, products or services; and to improve its environmental performance continually; and to implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved" (ISO 2008). Another way of stating this is that IBM's EMS helps the company identify what is environmentally relevant – from what goals to set and the metrics that matter, to who will be responsible for executing such goals, and for managing and monitoring IBM's environmental impact. Patrick Aurrichio, the EMS Program Manager, actively participated in the development of the standard and IBM was the first company in the world to attain ISO 14001 certification at a global level – something that was achieved within a year of the standard's publication. According to Aurrichio, the ISO

[26] This covers all liquids except: Steam and high temperature water, de-mineralized/de-ionized water, air conditioning (cooling coil) condensate, chiller condenser water, cooling tower blow-down, sanitary sewage, storm water, treated groundwater and industrial wastewater, fire suppression system water, drinking and potable water, other liquids similar in nature or hazard as those listed above and approved by CEA.

[27] The International Organization for Standardization (ISO) is a non-governmental organization (NGO) that helps the public and private sectors across 157 countries reach consensus on what international standards should exist to meet the needs of both business and society (ISO 2008).

14001 certification has encouraged IBM to become more disciplined towards the structure of its EMS instructions, goals and plans. In addition, the required audits are deemed to be important both by CEA and groups responsible for the execution of environmental programs across the firm. They open the door to self-assessment and thus self-correction, and provide an opportunity to learn about what and how others are doing.

3.3.4.1 Establishing Goals

> *IBM is committed to environmental leadership in all of its business activities – from its operations, research and technology to its products and services. IBM will help its clients and the world develop new approaches and innovative solutions to critical environmental problems.*
>
> *IBM Goals Statement (IBM CEA 2007)*

In order to fulfil its commitment to environmental leadership, IBM has established a set of goals for its environmental management system, for conservation, climate protection, pollution prevention, and product stewardship (see Table 6). Each of IBM's goals targets a particular "intersection" between IBM and the environment (see Table 5), and reflects IBM's confidence in its ability to have a positive impact on that particular issue.

Product Development	•Energy Efficiency •Environmentally Preferable Materials •Information for Users & Recyclers
Research and Manufacturing	•Chemical & Waste Management •Discharges to the Environment •Regulatory Permits & Reporting
Procurement	•Materials Content Prohibition & Restrictions •Supply Chain Compliance Verification
Logistics	•Packaging •Carriers' Conduct
Product End-Of-Life Management	•Collection & Treatment •Regulatory Reporting •Financing

Table 5: Examples of IBM's Environmental "Intersections"

CEA leads the company's goal setting, which includes a process of extensive discussion with those line managers who will be affected by them. As Tim Mann explained, "IBM doesn't establish goals without knowing them to be technically feasible... goals may be stretch but should be achievable." Brad Brech, Distinguished Engineer of the Systems & Technology Group, agreed. He explained his role in the goal-

development process is to "provide realism to stretch goals" with information. In his mind, he has "accountability for meeting goals because it is my job to help the corporation to do the right thing and because the tools I develop should help meet the goals." Jay Dietrich, CEA's Program Manager for Energy & Climate Stewardship, expressed that any tension during these discussions is "in good spirit." Engineers involved in product development, for example, understand that the goals being discussed will be "what they will be measured on in the future."

Dionne said that IBMers agree with the need to have meaningful goals. It is CEA's responsibility to propose goals that are thoughtful and make sense – both environmentally and business-wise. As a consequence, discussions between CEA and affected line units typically do not involve challenges to the concept behind the proposed goals, but focus on what the particular numerical target should be. "People don't like to fail," she explained, which is why the buy-in process is essential, giving everyone responsible for meeting the goal an opportunity to participate in its development. Once the process comes to an end, "the time of debate is over," she said.

EMS	•IBM's global environmental management system will cover all aspects of its business activities, including its operations, products, services and supply chain. •Responsible IBM Organizations: CEA, ISC Procurement
Conservation	•IBM will maximize its opportunities to conserve materials and natural resources and to use recycled materials when feasible in its operations •Responsible IBM Organizations: RESO, STG, ITD, ISC Procurement
Climate Protection	•IBM will be a leader in climate protection across its operations and in the energy efficiency of its products •Responsible IBM Organizations: CEA. ISC Procurement, ISC Logistics, STG, SWG, GTS, RESO, ITD, HR, Operating Units
Pollution Prevention	•IBM will prevent pollution and minize the environmetnal footprint of its manufacturing operations •Responsible IBM Organizations: STG, ISC Manufacturing, ISC Logistics
Product Stewardship	•IBM will be a leader in product design for the environment and product recovery, reuse and recycling •Responsible IBM Organizations: STG, ISC Procurement, Research, GARS, ISC Logistics

Table 6: IBM Goal Statements & Responsible Organizations

The acronyms refer to the following IBM organisations: CEA, Corporate Environmental Affairs; ISC, Integrated Supply Chain; RESO, Real Estate & Site Operations; STG, Systems & Technology Group; ITD, Integrated Technology Delivery; SWG, Software Group; GTS, Global Technology Services; HR, Human Resources; GARS, Global Assets Recovery Services (IBM CEA 2007).

In the case of energy, for example, CEA staff had a discussion with the Real Estate Group's Global Energy team to explain what they wanted to achieve, and most importantly, to ask how it could be done. Greg Peterson, Global Energy Manager, explained that discussions surrounding goals usually focus on what the particular target should be – a 3, 4, or 5% conservation in the case of energy use, for example – and how IBM can measure progress. He describes the conversation as "an open dialogue regarding the investment – in assets, expense moneys for lights and new technologies, for example – needed to

achieve a particular goal." Peterson feels that while there is little tension regarding the topic of the discussion (i.e. whether there should be an energy conservation goal) since "nobody forces things, and CEA is very good at asking questions", there is some tension regarding where the money will come from. As explained earlier, any environmental initiative – including energy conservation – is competing with any other project carried out by IBM. This conversation for setting goals is very important – as Peterson explains, he "need[s] to understand very well [what the goal] is because it is [him] who will achieve it." Currently, RESO, STG, and ITD have been responsible for IBM's goal to:

> "Achieve annual energy conservation savings equal to 3.5% of IBM's total energy use. This goal applies to spaces owned, operated or leased by IBM in support of IBM's operations." (IBM CEA 2007)

Another example is how IBM determined its goal for paper procurement. The initial suggestion had been to require the use of recycled paper across IBM. However, the responsible organization, ISC Procurement, expressed concern about those facilities located in places where purchasing recycled paper was not an option. After some consideration, CEA and ISC Procurement decided the goal would be to use paper originating from sustainable sourcing. In addition to addressing the underlying issue, CEA felt the impact of a sustainable sourcing goal would be far greater. The goal is:

> "For paper and paper/wood-based packaging directly acquired by IBM, procure them from suppliers who source from sustainably managed forests where such sources exist." (IBM CEA 2007)

There are cases in which the "right thing to do" is evident, as when in 1987, in response to the discovery of the ozone hole, IBM chose to voluntarily eliminate the use of Class 1 ozone-depleting substances by the end of 1993. That the company knows what the right thing to do is does not mean it knows how to do it. In the case of CFCs, for example, nobody knew how to completely eradicate their use. IBM invested $100 million during that period to find solutions that would eliminate the use of CFCs – everyone, from the company's President to engineers in research and manufacturing facilities, understood the gravity of the issue – "the science was indisputable," said Dionne.

There are other situations, however, in which the approach is less obvious. At times, the company has little control over the solution. In the case of global warming, for example, CO2 cannot be eliminated in the same way CFCs were. "The issue is about our whole infrastructure," said Lyon. While IBM can pursue energy conservation and emissions reductions, the company has little control over the system as a whole. In addition, there are other times when situations call for harder balancing acts to "make good scientific decisions," explained Dionne. Such is the case with the use of brominated fire retardants.[28]

IBM prohibited polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) from use in packaging in 1990, and then extended the prohibition to its products in 1993, 14 years ahead of the first law in the area. Beginning in 2006, IBM prohibited the use of nonreacted tetrabromobisphenol-A (TBBP-A) from use in IT systems enclosures for newly released products. However, IBM is permitting the use of reacted TBBP-A in its products. This is because when TBBP-A is reacted it is a very different substance from the non-reacted substance and does not possess the same properties.[29]

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[28] There are some health concerns related to these compounds, including their potential to be carcinogenous.

[29] TBBP-A is the most commonly used flame retardant in printed wiring boards (PWBs), where it is reacted into the polymer backbone of epoxy resins used in the manufacturing of PWBs. There are no current regulatory restrictions

Nevertheless, IBM is collaborating with industry consortia to identify and qualify non-brominated flame retardants for use in printed wiring boards (PWBs). The pivotal issue in this endeavor is not whether halogen-free flame retardants exist and are available on the market today, but whether such halogen-free flame retardants can suitably replace TBBP-A in PWBs, especially in PWBs used in high-end electronic products such as servers and mainframes. Such non-halogenated flame retardants must absolutely satisfy three essential criteria when incorporated into PWBs: 1) they must provide effective flame retardancy under normal PWB use and product failure conditions; 2) they must maintain the electrical and mechanical properties of TBBPA-based PWBs; and 3) they must be preferable from an environmental and human health standpoint.

At this point, it is not known if proposed non-halogen replacement materials will provide the functional properties required for use in PWBs in high-end electronic products. In addition, there are scant environmental, health and safety data available for the proposed non-halogen replacement materials. Specifically, there are no available data that demonstrate these replacement materials are environmentally preferable to the current use of TBBP-A. The company therefore has chosen not to ban all brominated flame retardants, though it continues to actively participate in industry and government efforts to identify alternatives for halogenated flame retardants in PWBs that meet the above required criteria. Should practical, reliable and more environmentally sound alternatives to this use of TBBP-A be identified, IBM will move to those preferred materials.

IBM's environmental goals continuously evolve – they need to adapt to the changes in the business, and to keep pushing the company's environmental efforts beyond what has already been achieved. For example, IBM's current recycling goal for non-hazardous waste (NHW) is an 8th generation goal (see Figure 11). In 1988, IBM set out to achieve 50% recycling of all wood, metal, paper glass and plastic from manufacturing and research operations by 1992 (region A in Figure 11). The company achieved this target earlier than planned, and in 1992 it added non-hazardous chemicals, end-of-life IT and manufacturing equipment, and industrial trash to the recycling goal (region B). In 1994 CEA expanded the goal to include administrative sites (region C). By 1996 CEA began targeting sites according to their individual performance. Those sites that had already achieved the 50% recycling goal were expected to achieve a 67% recycling rate (region D), while those that hadn't yet reached 50% had to continue striving for that target (region C). In 1999 CEA divided NHW into two categories: solid waste and industrial waste, with specific recycling goals of 67% (region F) and 35% (region E) respectively. The latter had changed to 67% for all types of non-hazardous waste by 2004. In 2007, IBM raised the target to a 75% recycling rate applicable to all manufacturing, research and administrative sites (region G). Starting in 2008, the goal also became applicable to leased locations as identified by IBM.

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on the use of TBBP-A in IT products and no human health hazard or concerns have been identified in the EU risk assessment of TBBP-A.

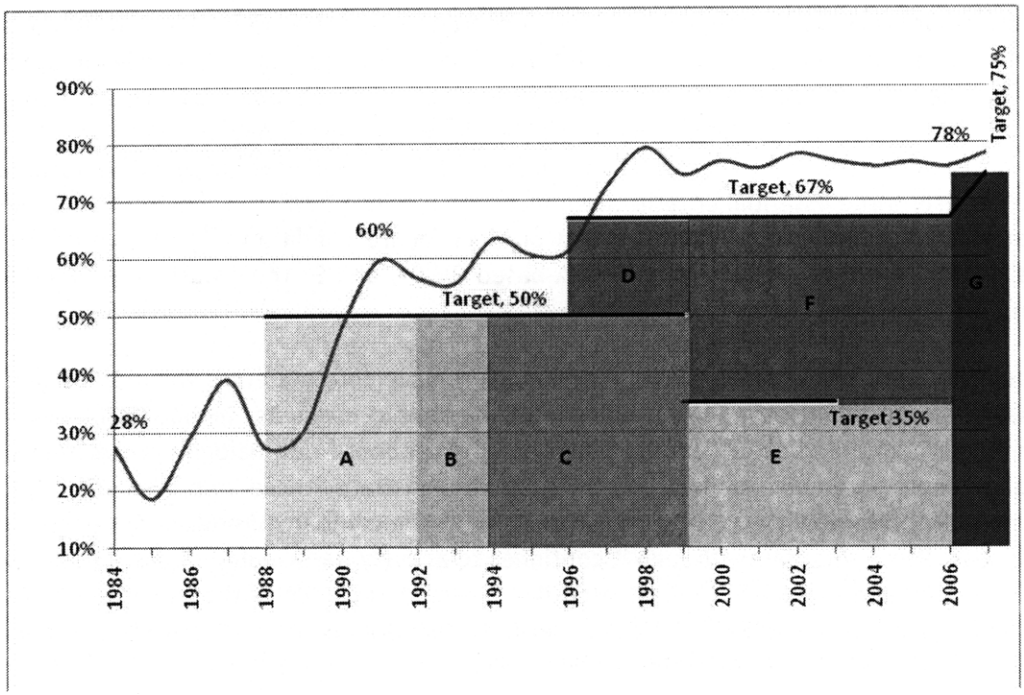

Figure 11: Evolution of Non-Hazardous Waste Recycling Goal & Performance
See previous paragraph for explanation. Source: IBM CEA.

Because goals are aggregate goals, IBM operates with the understanding that some sites will overachieve while others may underachieve. The EMS Project Manager, Patrick Aurrichio, explained, however, that anytime a business unit expresses an inability to meet a requirement or goal, it needs to provide a thorough evaluation and explanation of the reasons why it cannot or did not do so. Diana Lyon, Program Director of External Relations for CEA, expressed that CEA's objective is to have a constructive and collaborative environment, not a police state.

How does IBM decide what "enough" is, or, in other words, what the breaking point is? How far does IBM choose to stretch its goals? There isn't one single method used by the company to evaluate this decision. At the most basic level, IBM will comply with the law. However, IBM's requirements remain ahead of laws and regulations because, as Diana Lyon, Program Director of External Relations for CEA, explained, "IBM is driven by science, in addition to regulatory measures." Dionne added that the company can do this because it "continuously monitors environmental issues, seeks to increase its understanding, and, when dealing with a new emerging issue, studies the situation to make decisions based on science." "We understand," expressed Dionne. "We have the same common objective [as the government and NGOs]; we want to take the bad stuff out of people's lives – the question is how to go about it."

At the other end of the spectrum the question is always whether a goal "is of a leadership nature," expressed Dionne. For Balta, what makes IBM's environmental efforts sustainable is that they make good sense both for business and the environment. He believes a lot of experience and good judgment is behind such sustainable decisions. The necessary question is "why something matters, and if it is something that will matter in the long-run."

Dionne explained that when there are requirements to meet certain standards, whether these are internal or regulatory in nature, "there are no questions asked" across IBM. Wayne Balta believes that this behaviour "is part of the IBM culture of compliance," and he recognizes that CEA is fortunate to be able to take this attitude for granted. Diana Lyon takes the commitment towards IBM's environmental goals and standards across the firm a step further. She explains that "most IBMers like to have a challenge," that there is a reason why they work for an innovation company, and that therefore, they embrace IBM's commitment to environmental leadership regardless of the difficulties inherent to the goals set by CEA.

It is apparent that IBMers are personally very much committed to improving the company's environmental performance. Sharon Nunes, VP of Big Green Innovations in the Systems & Technology Group (STG), said that there is "no lack of ideas" and that "we have people knocking on our door to see how they can get involved." She was referring to IBM's "green community" – a group of approximately 1000 volunteers within IBM who communicate on a continuous basis regarding projects they may get involved in, and who have become an essential resource to many of IBM's efforts. Greg Peterson, Manager of IBM's Global Energy Program, described this green team as "an extra pair of eyes and ears in our facilities" – a group of people that can identify if there is a gap in IBM's environmental programs, or that can help achieve the company's goals by, for example, making sure the lights are out every night.

"Many IBM's employees have a strong personal interest in environmental protection even though their day-to-day job responsibilities in IBM do not involve environmental management," explained Dionne. According to her, "the key is to balance this passion by applying some discipline to it." IBM has a number of avenues through which employees are made aware of IBM's long history of environmental commitment and results – something all employees can be and are very proud of. The company also educates its employees about IBM's global environmental management system which defines our programs, and drives actions that are consistent with the company's policy and positions. "Having equipped employees with this information," she said, "we are able to harness their enthusiasm and channel it toward helping IBM achieve its environmental goals and objectives such as materials and energy conservation and waste recycling."

3.3.5 The EMS in Action

One of the key characteristics of IBM's EMS is that it is fully integrated across the corporation. As has been discussed earlier, each IBM function is responsible for their chain of activities and impact. While they enjoy certain freedom – such as determining whether their goals will go above and beyond the goals and standards set by CEA – other aspects of the EMS, such as its practices and instructions, restrict that liberty with more detailed directions on how to execute the company's environmental policy.

The EMS has been embedded as much as possible into other units' responsibilities – from placing all training responsibility on IBM's functions, to the point where those not directly involved with CEA may not be aware of certain activities already taking place. For example, the Integrated Supply Chain Green Team, a group of part time volunteers within IBM that help with corporate citizenship activities, gave CEA a set of recommendations to improve supply chain environmental performance, only to find, to their surprise, that many were already in place. Dionne explained that "the environment has been so engrained into IBM that we don't talk about it – people focus on their work, which is great."

One of the best ways to gain insight into the EMS – what it is, how it works, and how it has become integrated across IBM – is through examples. Here we focus on three: real estate site operations, product development and manufacturing, and global procurement.

3.3.5.1 Real Estate Site Operations

The IBM Real Estate Site Operations (RESO) organization has "responsibility for the company's owned and leased real estate portfolio and for providing a safe, efficient and effective workplace" (IBM Archives 2008). In addition to basic compliance to environmental health and safety regulations, this also entails responsibility for energy conservation, emissions reduction, data centre energy efficiency, and nonhazardous waste recycling. RESO has environmental management representatives covering each IBM site who are responsible for the local implementation of the EMS and for the minimization of the company's environmental impact, whether the site is devoted to research, manufacturing, or services. They collaborate with other organizations present at the site, and report their performance to CEA through the Environmental Performance Database (EPD), a part of the EMS, on a regularly scheduled basis.

3.3.5.2 Product Development and Manufacturing

IBM's efforts to detail the environmental attributes of its products can be traced back to the early 1970s, when IBM established requirements for completion of environmental assessments of all new products. In 1991, the firm established the Engineering Centre of Environmentally Conscious Products (ECECP) in Research Triangle Park, NC, to provide greater focus to its Design for Environment (DFE) efforts. The first task of the ECECP was to define what an environmentally conscious product was – to IBM, this meant a product designed to reduce its environmental impact as much as was practical. Included in this consideration was whether better and/or more recyclable materials could be used for products, and how best to eliminate hazardous materials. As a result, IBM began working with suppliers to create sources of recycled materials.

The ECECP provided early guidance to IBM's design community regarding design features and attributes to increase the recyclability of IBM's products. In 1992, the ECECP established standards for coding of plastic parts to facilitate sorting and recycling. In 1994, they published standards for design of plastic parts to facilitate recycling. In 1997, IBM published its first general environmental standard documenting and/or establishing baseline requirements for design of IBM products, including an extensive list of potentially hazardous materials that were prohibited or restricted in IBM's products.

As soon as the product DFE standards were established, they were integrated into the IPD – the integrated product design process, which is IBM's product development process – so that a product is evaluated with respect to its environmental objectives throughout the design process. Tim Mann believes this is one of the reasons IBM's product stewardship program has been successful, since it integrated DFE procedures and processes into the firm's habitual way of doing business. The Product Environmental Profile (PEP) process begins in the early stages of product design, and is completed prior to the first shipment of products. As part of this process, environmental experts review each product to ensure that it not only meets all legal and regulatory requirements, but that it also complies with IBM's more stringent internal design requirements. The metrics monitored within the PEP include: environmental characteristics of products (e.g., materials content, energy efficiency, reportable materials), evaluation of IBM products' compliance with applicable environmental, materials and

chemical management requirements (legally required and those voluntarily established by IBM), and identification of components, parts, and assemblies which may require special handling or disposal at product end-of-life. By doing so, environmental stewardship leaders can also evaluate the efforts of design teams to enhance the environmental attributes of a product.

In 1996, IBM established its first corporate instruction detailing requirements for development of product stewardship programs within development organizations. In addition to establishing product stewardship leaders within each IBM brand, this corporate instruction established design objectives for all IBM products, and required that each IBM brand not only support IBM's corporate-wide product stewardship objectives (see Table 7), but establish their own product stewardship design goals and complete an annual report to document their performance.

Priority Objectives for IBM Organizations with responsibility for the design, development and/or release of IBM Logo Products
• Develop products with consideration of their reuse and recyclability at the end of the product's life • Develop products with consideration of their upgradeability to extend the product's life • Develop products that can be disposed of safely at the end of the product's life • Develop and manufacture products that use recycled materials where economically and technically justifiable • Develop products that will provide improvements in energy efficiency and/or reduced energy consumption • Develop products which minimize resource use and environmental impacts through selection of environmentally preferred chemicals, materials and finishes

Table 7: Environmental Priority Objectives for Products
(IBM CEA 2008)

One of IBM's priority objectives established in that first Product Stewardship Corporate Instruction was the development of products with improved energy efficiency and / or reduced energy consumption. Today, IBM's Systems & Technology Group (STG) is responsible for developing an annual strategy that outlines how this objective will be met and it is then up to the design engineers to make it happen. As Dionne explained, this is "specific but not so decentralized that it will drive designers crazy."

IBM has not focused on flagship green products to drive innovation, Tim Mann explained, because it believes that if something "is good for one product, it is good for all." He recalled that in 1998 IBM nevertheless tried to establish an internal environmental rating system for products in order to drive additional improvements in design. However, after piloting the system, it was judged to be ineffective and "too subjective." It was difficult to come up with a definitive methodology for rating products when the company had such a wide range of products and opportunities. "The purpose of the rating system was really to demonstrate improvements as the design process progressed, not to compare different products against one another," said Mann. Every product got a score, but designers – "competitive as they come" – soon began focusing much more on the numerical score as opposed to the environmental improvement achieved from their own initial design. Dionne explained that because of this, IBM had to

get rid of this internal environmental rating system for products. "Scores can be good," she said, "but they need to be meaningful – you need to make sure you are comparing apples to apples."

She questioned, for example, that one could have compared the efforts of different IBM organizations to eliminate CFCs. The objective for IBM is to ensure people move at the right pace, and she believes this can be achieved by having a specific goal with a deadline, and by making organizations responsible for reporting their progress towards this goal on an annual basis. As Mann explained, "IBM works off standards, and if you want something done you write a standard." This is the language developers understand, and what IBM chose as tool to improve the environmental standing of its products. The product DFE standards identify IBM's high level environmental product objectives, which become the basis for the firm's environmental goals and targets. The PEP contains the significant environmental aspects of products considered by IBM – it is a compilation of attributes, a tool for education rather than one used to drive innovation. Corporate Policy is what drives innovation at IBM.

3.3.5.3 Global Procurement

Global Procurement's mission is to "deliver competitive advantage in the form of cost, quality, delivery and technology, to [its] clients and [shareholders]" (Ferreti 2008). This involves, among other key tasks, being accountable for IBM's environmental and social impact across its supply chain: something that involves both compliance and voluntary activities at an international level. "These will be the next barriers to entry for companies that want to be in business," expressed Lou Ferretti, Director of Global Procurement's Centre of Excellence (CoE) & Supply Chain Social Responsibility (SCRS).

Global Procurement focuses on developing long-term, mutually beneficial relationships with suppliers. This approach underlies all discussions and sets the stage for IBM to be able to make requests to suppliers, who are only willing to make environmental and social responsibility investments because they know IBM will continue to be in a relationship with them, explained John Gabriel, Technical Lead for Global Procurement's SCSR and Environmental Initiatives (SCEI), and Chair of the Electronics Industry Citizenship Coalition (EICC).[30] To achieve this, IBM helps suppliers think about their own growth by sharing its strategy with them so that both businesses can align to become as effective and efficient as possible.

The Centre of Excellence for Environmental Compliance (CoE) has worldwide responsibility for meeting environmental compliance regulations affecting the Global Procurement organization. This includes, among others, understanding new and future environmental regulation, designing compliance strategies and processes, educating both IBM Global Procurement employees and its suppliers about the requirements, and evaluating suppliers' environmental performance. IBM has long had worldwide environmental requirements for suppliers providing hazardous waste management services (1972) to the company, production-related suppliers (1980), and product recycling and disposal (product end-of-life management, PELM) suppliers (1991). To assess whether suppliers have a strong focus on environmental management and the capability to meet IBM's environmental requirements, EMS' Corporate Instruction EA 109 establishes requirements that "prevent the transfer of responsibility for environmentally sensitive operations to any company lacking the commitment or capability to manage

[30] The Electronics Industry Citizenship Coalition (EICC) is "a group of companies working together to create a comprehensive set of tools and methods that support credible implementation of the Code of Conduct throughout the Electronics and Information and Communications Technology (ICT) supply chain." For more information visit http://www.eicc.info/

them properly, reduce environmental risk, [and] protect IBM's brand" (Dionne 2008). Implementing these requirements entails collaboration between the Global Procurement organisation and CEA. CEA is responsible for evaluating and approving suppliers providing hazardous waste management and PELM services for the company globally. Procurement ensures that IBM only contracts with CEA approved suppliers for these services.

In addition, the CoE is responsible for conveying the firm's environmental specifications for products, which cover both legal and internal requirements, to suppliers, and ensuring suppliers comply with these. It therefore supports STG product development to ensure hardware products, parts, and components acquired from suppliers meet IBM's materials prohibition and restriction requirements without sacrificing their functionality, quality and safety. At the same time, Global Procurement representatives participate in different industry consortia, such as IPC (Association Connecting Electronics Industries) and JEDEC, which help establish standards for environmental compliance, and provide a forum to discuss alternative technologies with other companies in the electronics and solid state industries.

On the other hand, Global Procurement's SCSR and SCEI groups are responsible for the implementation of supplier conduct principles and voluntary environmental initiatives, and work very closely with the EICC, which "is a group of companies working together to create a comprehensive set of tools and methods that support credible implementation of the Code of Conduct throughout the Electronics and Information and Communications Technology (ICT) supply chain" (EICC 2008). In the electronics sector, Gabriel explained, CSR had its "coming of age" in 2004, with the publication of the report "Clean Up Your Computer" by the Catholic Agency for Overseas Development (CAFOD).[31] The report brought to light labour issues across the industry, highlighting worries related to safety, overtime, and wages. While the focus was originally solely on labour concerns, pressure quickly branched into environmental and other issues.

Gabriel explained that the EICC started as a way for companies in the industry to address social responsibility issues as a team – after all, their value chain is, in a way, held in common. Tier 1 manufacturers cried out for standard codes of conduct after receiving a different code from each brand company trying to respond to the CAFOD report. By coordinating with each other and standardizing their requirements, companies could optimize their investments by ensuring such issues could be addressed more effectively. Being part of EICC is a significant help for Gabriel and his 3-person team, since it helps them address social responsibility and voluntary environmental issues "as part of a larger team."

IBM's and EICC's work in corporate citizenship has evolved simultaneously, and thus IBM's requirements have been coordinated to those of the EICC (IBM's Supplier Conduct Standards can be found in the Appendix). The EICC has set standards on labour, health and safety, environment, management systems, and ethics (see Table 8). IBM has raised awareness on these supply chain issues across sourcing teams and executives by conducting audits of its suppliers (500 between 2004 and 2008, results are shown the Appendix), engaging major growth markets, and introducing SCSR into pre-sourcing activities that evaluate potential future suppliers, regardless of the country of operations. Gabriel believes that audits help educate buyers about the corporate citizenship commitment of IBM. Also, he believes that social

[31] CAFOD is "the official overseas development and relief agency of the Catholic Church in England and Wales." Its mission is "to promote human development and social justice in witness to Christian faith and Gospel values." For more information visit http://www.cafod.org.uk/vision.

responsibility needs to evolve to the stage where CSR issues influence the company's decision making, which is why it is essential that pre-sourcing / pre-auditing activities address them.

EICC Environmental Standards	
Environmental permits and reporting	Required environmental permits and registrations must be obtained, maintained and kept current. Their operational and reporting requirements must be followed.
Pollution prevention and resource reduction	Waste of all types (including water and energy) must be reduced or eliminated at the source or by practices such as modifying production, maintenance and facility processes, materials substitution, conservation, recycling and re-using materials.
Hazardous substances	All hazardous substances must be identified and managed to ensure safe handling and disposal
Wastewater and solid waste	Must be monitored, controlled and treated prior to discharge or disposal
Air emissions	VOCs, aerosols, corrosives, particulates, ozone depleting chemicals and combustion by-products are to be characterized, monitored, controlled, and treated as required prior to discharge
Product content restrictions	Adhere to all applicable laws and regulations regarding prohibition or restriction of specific substances including labelling laws and regulations for recycling and disposal.

Table 8: Electronic Industry Citizenship Coalition Environmental Standards
(EICC 2005)

3.3.6 Monitoring IBM's Environmental Performance

"No results come easy... many $10,000 dollar projects are needed to achieve a goal for a 100 billion dollar company... Hard work is the bottom line – there is no magic."
Edan Dionne, Director, CEA, 2008

Wayne Balta, VP of Environmental Affairs & Product Safety, leads CEA. He reports to a Senior VP who in turn reports to the CEO.[32] In addition, he gives an annual presentation on the company's environmental affairs to the Governance Committee of IBM's Board of Directors. This gives CEA and its activities a considerable amount of visibility within IBM. The CEO places full trust and responsibility of any environmental matters on CEA – a liberty it has earned, in Dionne's words, due to its "maturity, comprehensiveness, and proven ability."

[32] As of 2008, Wayne Balta reports to Robert Weber, Senior VP, Legal & Regulatory Affairs, and General Counsel. Before then, he reported to Nick Donofrio, Executive VP of Innovation & Technology. The change was caused by Donofrio's retirement.

Monitoring and measurement activities are a key component of IBM's EMS. These include annual site and organization self assessment programs, reporting on IBM's Environmental Performance Database (EPD), and internal and external EMS (for ISO 14001) audits. These activities are designed to help identify opportunities for improvement and to provide space for practice sharing and learning across the firm. Nicolette Visalli, RESO's Environmental Manager in IBM's Thomas J. Watson Research Centre, talked about self-assessments as an opportunity to identify "if any deviation from [policy] happens, [and if so] to self-correct." In the case of internal audits, she explained that "they are a great way to learn about what others are doing" since different groups get to visit and evaluate each other.

3.3.6.1 Tracking IBM's Environmental Performance Data

The Environmental Performance Database (EPD) collects environmental performance data on a quarterly or annual basis. It is extremely detailed (see Appendix for a "screen shot" of the EPD). It enables anyone within CEA to easily access information on a particular site's environmental expenses and savings, as well as on its performance against all of IBM's environmental goals, across time. In a similar database, the Environmental Incident Reporting System (EIRS), IBM tracks environmental incidents that meet IBM's reporting criteria. Under these criteria, reportable environmental incidents include those that must be reported to a government entity and those that meet IBM's own requirements. For example, an incident involving a government's notification to IBM regarding the improper disposal of a cardboard box with IBM's logo was recorded in the EIRS even though the box was not related to IBM's operations. In addition, CEA performs environmental due diligence involving all business and real estate transactions, and tracks and/or monitors the integration of IBM's EMS requirements across acquired businesses.

The following charts and tables illustrate the level of data monitored by IBM.

Hazardous Waste Generation

IBM has the goal to achieve year-to-year reduction in hazardous waste generation from IBM's manufacturing processes indexed to output (IBM CEA 2007). The bar chart depicts IBM's performance against this goal, which covers approximately 90% of IBM's manufacturing- and hardware development-related hazardous waste. IBM's total hazardous waste has decreased by 94.7% since 1987. The responsible organization for meeting this goal is STG.

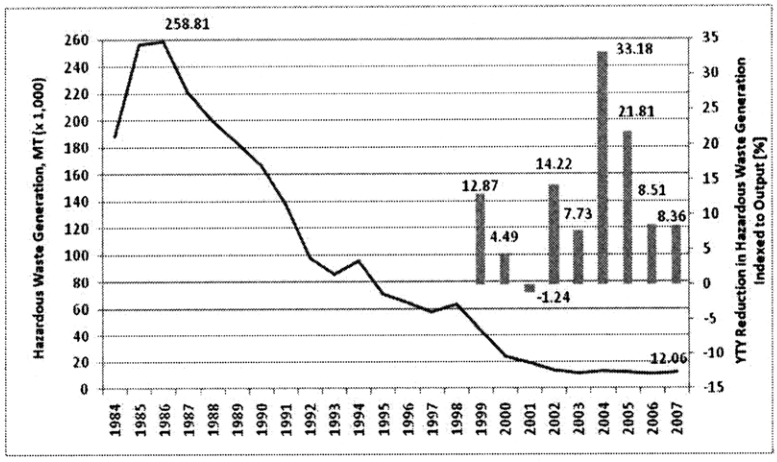

Figure 12: IBM Hazardous Waste Generation (1984-2007) & HW Indexed to Output (1999-2007)
Source: IBM CEA.

Water Conservation

IBM's goal is to achieve average annual conservation savings equal to 2% of IBM's annual water use at microelectronics manufacturing facilities over a rolling 5 year period. The organization responsible for meeting this goal is STG (IBM CEA 2007).

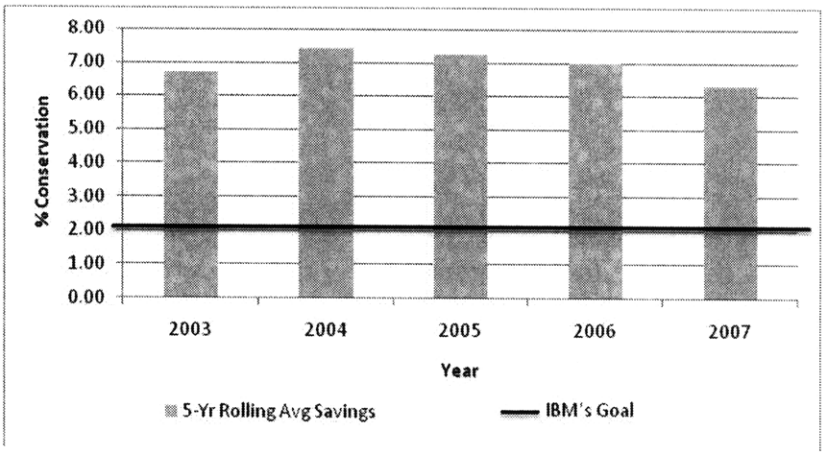

Figure 13: Annual Data for IBM's Water Conservation Goal (2003-2007)
Source: IBM CEA.

Use of Recycled Plastics in IBM Hardware Products

Metrics tracked are recycled resin usage, type of resin, and total amount of plastics procured by IBM for application in hardware products. IBM increased its recycled content plastics goal from 2% in 1997 to 10% in 2001. After significant early progress, the ability to meet this 10% goal was impacted largely by the decrease in applications for recycled plastics with the company's products went through a major change in material use, from using plastic enclosures to metal enclosures. Availability for source material was also a factor in the early 2000s. As a consequence, IBM adjusted this goal in 2003 to 5% or greater (IBM CEA 2007). Since then, the increased involvement of the Retail Store Solutions division has had a positive contribution to recycled resin use. Retail Store Solutions products provide greater opportunities for recycled resin applications, as reflected in the current numbers. The responsible organizations are STG and Global Procurement.

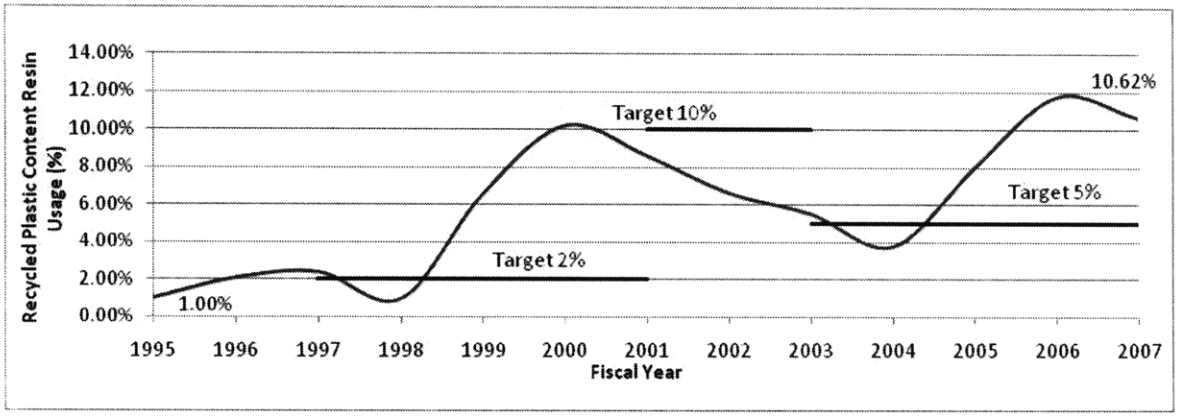

Figure 14: IBM Recycled Plastic Content Resin Usage Metric Performance (1995-2008)
Source: IBM CEA.

Use of Powder Coatings & Resulting Volatile Organic Compounds Avoidance

IBM's goal is to "use powder coatings in lieu of liquid paints for at least 90% of the decorative finishing on IBM products" (IBM CEA 2007). The responsible organizations are STG and Global Procurement.

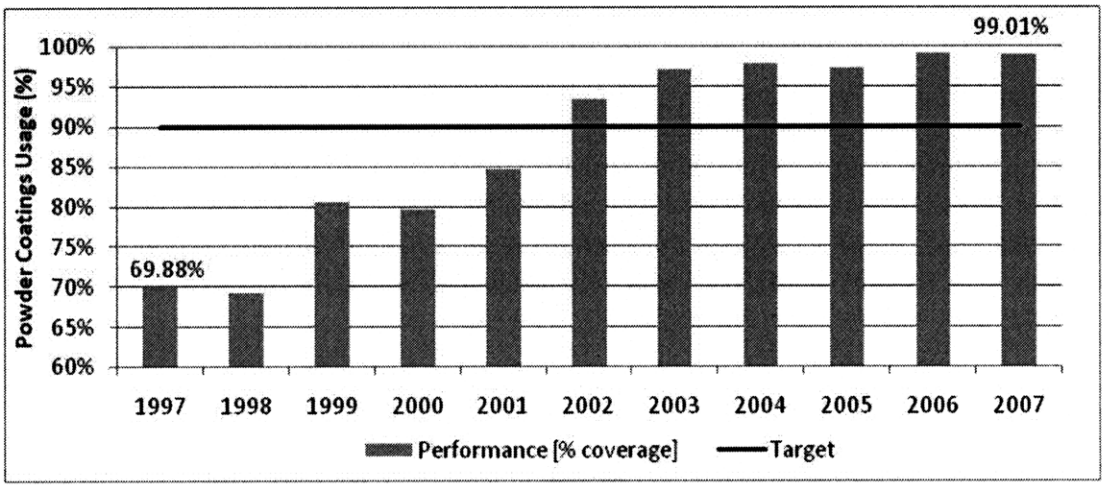

Figure 15: IBM Powder Coatings Usage Metric Performance (1997-2007)
Source: IBM CEA.

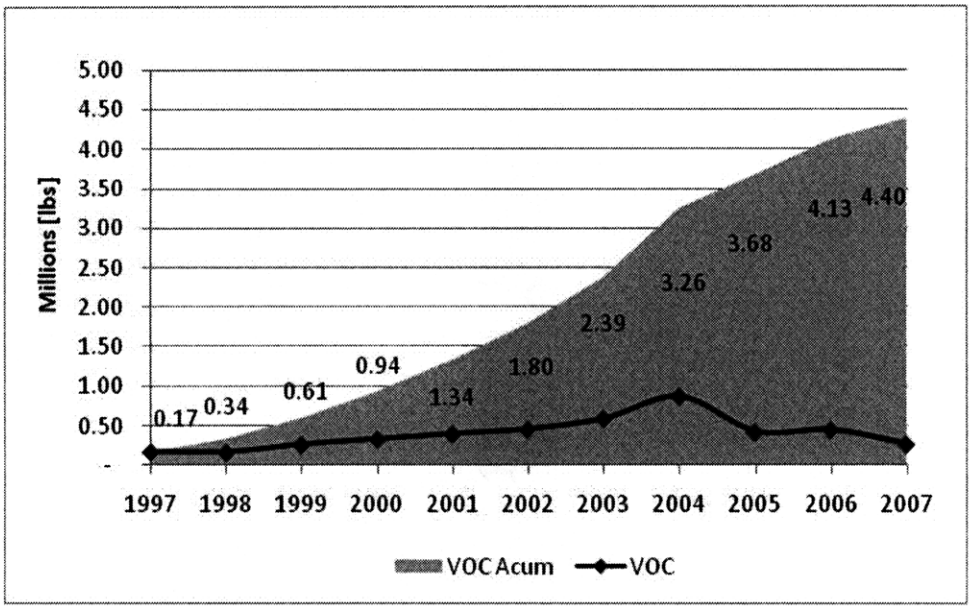

Figure 16: Annual and Cumulative Avoidance in VOC Emissions from the Use of Powder Coating for Product Decorative Finishing (1997-2007)
Source: IBM CEA.

Minimize the environmental impact of end-of-life (EOL) IT products and IT product waste

Metrics currently tracked include, first, the total amount of IT EOL products and IT product waste processed by IBM globally and, second, avoidance of the use of landfills and incineration for disposition of IT EOL products and IT product waste. IBM began offering EOL IT product take-back programs in Europe in 1989 and has extended and enhanced them over the years. Today, IBM's Global Asset Recovery Services organization offers asset recovery solutions to commercial customers in 57 countries. Since 1995, when IBM first began disclosing the volumes of EOL IT products and IT product waste collected and recovered in the company's annual corporate environmental report, IBM has documented the collection and recovery of more than 1.5 billion pounds (686,877 metric tons) of EOL IT products and IT product waste worldwide through year-end 2007. In 2003, IBM became the first IT company to reach the 1 billion pounds threshold of EOL IT products and IT product waste processed for reuse and recycling. In 2000, IBM established a goal to avoid sending more than 3 percent of the total amount of EOL IT products and IT product waste it processed to landfills. In 2007, this goal way modified to include incineration as a treatment method along with landfilling within the not-to-exceed 3% limit. The responsible organization is Global Asset Recovery Services.

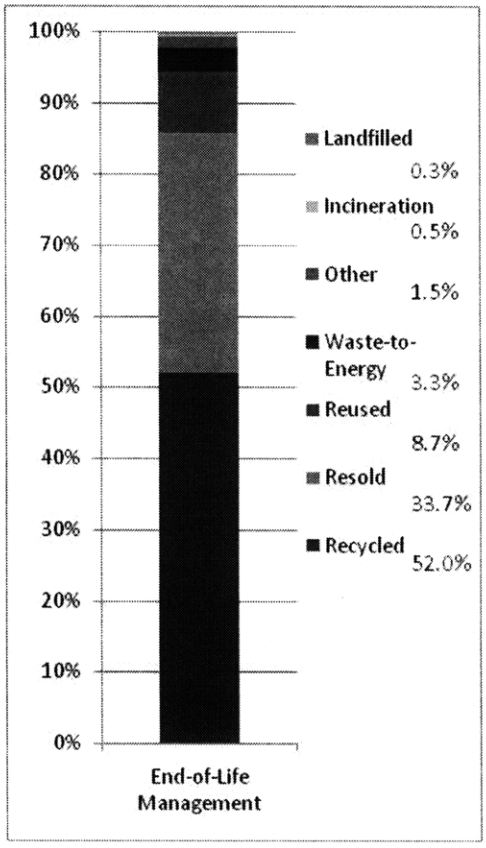

Figure 17: IBM Product EOL Management Results for 2007
% by Weight, Total Weight Processed: 44, 332 metric tons

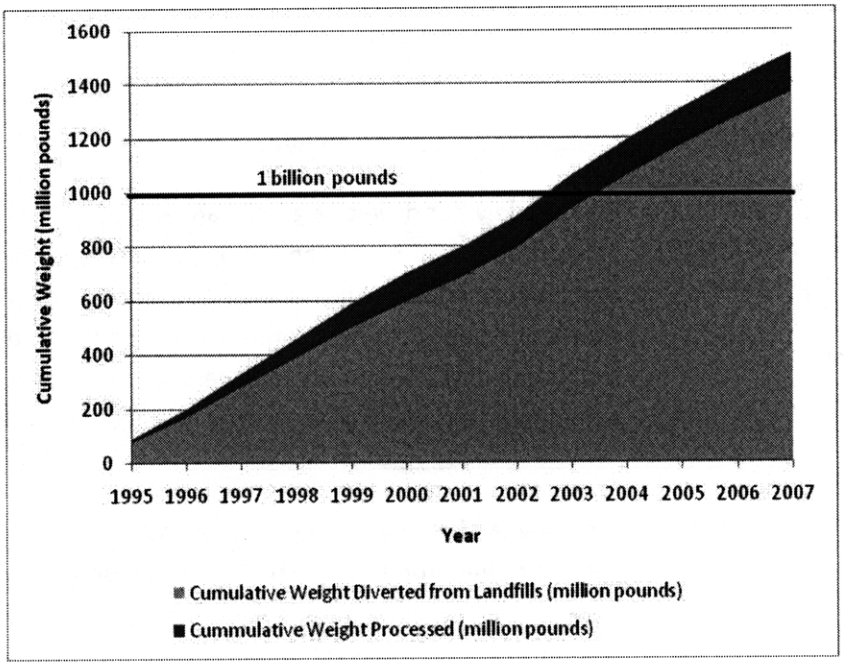

Figure 18: IBM Product End-of-Life Management Results 1995-2007
Weight processed and weight diverted from landfills.

Fines and Penalties Worldwide

IBM received 111 agency visits worldwide in 2007, and during the year was assessed one Administrative Enforcement Order, which included a $1,000 fine. The Order was issued in response to IBM's failure to provide copies of a completed Hazardous Materials Business Plan at one of its office locations. As can be seen in the table, this is the only fine IBM has paid over the past five years.

Year	2003	2004	2005	2006	2007
Number	0	0	0	0	1
Fines ($K)	$0.0	$0.0	$0.0	$0.0	$1.0

Table 9: Fines and Penalties Worldwide
Source: IBM CEA.

3.3.6.2 IBM Chairman's Environmental Award

To recognize and foster environmental leadership across IBM's organizations, an annual Chairman's Environmental Award was established in 1991. This award – one of only two Chairman's awards given at IBM – is highly coveted within the company. Some recipients are listed in Table 10.

Year	Organization	Recognized Achievement
2007	Systems & Technology Group	Developing innovative technologies and products to reduce energy use for clients and IBM.
2006	Research and Global Real Estate Site Operations	Respectively, for developing innovative solutions to improve product energy efficiency and to optimize clients' operations and processes to improve their energy efficiency; and for achieving excellent results in energy conservation and cost reduction, facilitating IBM's procurement of renewable energy, and using its experience to provide client energy management solutions.
2005	Global Asset Recovery Services	Extending the useful life of products and parts, increasing product recycling, and providing an environmentally responsible solution for end-of-life products. Establishing a comprehensive audit and assessment process to ensure IBM uses environmentally responsible product recycling and disposal suppliers.
2004	IBM Europe / Middle East / Africa	Effective health and safety programs for both housed and mobile employees. Strong waste recycling and product end-of-life management programs that have consistently exceeded IBM's goals. Energy conservation efforts that include the largest procurement of cost-competitive renewable energy in IBM. Extensive use of conferences and presentations to share IBM's environmental accomplishments, expertise and solutions. Fostering the standardization of product content reporting on product stewardship issues internationally.
2003	IBM Software Group – Canada	Strong, proactive approach to workplace safety and employee well-being, achieving zero workplace injuries or illnesses. Employees are active in site and community environmental and health programs, including commutation reduction programs and certification of the Toronto lab as a wildlife habitat. Toronto lab was designed to be more energy efficient than the government's model national building standard. Increased its waste recycling rate from 55 percent in 2000 to 80 percent in mid-2003. Comprehensive focus on the reduction of product packaging.

Table 10: Recipients of IBM Chairman's Environmental Award
Source: IBM Environment News Website[33]

[33] http://www.ibm.com/ibm/environment/news/chairmanaward2007.shtml, with the year changing accordingly.

3.4 Profiting by Doing Good for the Environment: "Green" Businesses for a "Smarter Planet"

"Our world is becoming smarter... [it] is becoming instrumented, interconnected, [and] all things are becoming intelligent... Computational power is being put into things we wouldn't recognize as computers. Indeed, almost anything – any person, any object, any process or any service, for any organization, large or small – can become digitally aware and networked.

With so much technology and networking abundantly available at such low cost, what wouldn't you enhance? What service wouldn't you provide a customer, citizen, student or patient? What wouldn't you connect? What information wouldn't you mine for insight? The answer is, you or your competitor, will do all of that. You will do it because you can – the technology is available and affordable.

But there is another reason we will make our companies, institutions and industries smarter. Because we must. Not just at moments of widespread shock, but integrated into our day-to-day operations. These mundane processes of business, government and life – which are ultimately the source of those 'surprising' crises – are not smart enough to be sustainable."

Sam Palmisano, IBM Chairman & CEO, 2008[34]

"We're not in this [only] for its direct social benefit, we're in this to help our clients respond to [environmental and energy concerns] and innovate in response to government actions... We focus on innovation that matters."

Martin Fleming, VP Corporate Strategy, IBM, 2008

"We can be effective because we have the credibility of having done the environment work ourselves."

Edan Dionne, CEA Director, IBM, 2008

The focus of IBM's client-facing activities is to help clients address environmental issues as effectively and efficiently as possible. To do this, CEA supports the rest of IBM in developing innovative solutions for customers. CEA's task is to share IBM's internal experience and know-how, to provide environmental training to those interacting with potential clients, and to participate in strategic discussions as IBM's environmental experts.

Information technology (IT)'s potential to address environmental issues has only recently begun to be recognized. According to Martin Fleming, VP of Corporate Strategy at IBM, for example, IBM's opportunities in this space have grown dramatically as governments have begun to take action to respond to the threat of climate change. As IBM's clients seek to innovate to respond to higher prices resulting from increasing regulation and energy prices, IBM's green businesses can give the company an opportunity to grow.

[34] Remarks (as prepared) by Sam Palmisano to the Council on Foreign Relations on November 6, 2008 (Palmisano 2008)

Within IBM, business opportunities in the environmental arena have been largely nourished by the Emerging Business Opportunity (EBO) group, a corporate strategy team that identifies, funds, and develops new businesses within IBM (Garvin and Levesque 2005, 1). To identify green business opportunities, Fleming and his team considered what the major energy consumers are and how IBM's capabilities could be best used to reduce their demand. They identified transportation, buildings, and industrial processes as major energy consumers. By surveying undergoing activities within IBM, the EBO group identified 280+ projects that could be grouped into four distinct "green" initiatives, three of which directly addressed energy efficiency in transportation and buildings:

1. Energy Efficient or Green Data Centres (GDC), to reduce energy consumption in data centres.
2. Intelligent Utility Network (IUN), to improve grid network planning and electricity management, and to provide a platform for managing renewable sources of energy.
3. Intelligent Transportation Systems (ITS), to reduce congestion and transportation emissions in cities, and to encourage greater use of public transportation.
4. Strategic Water Information Management (SWIM), to improve water management and foster better conservation practices.

Each of these initiatives was considered to be large and immediate enough for IBM to be able to have an impact. A statistic commonly-cited across IBM is that 2% of the world's total energy use originates from IT energy use – hence the focus on energy efficient data centres.[35] The vision, however, is that the company should work not only to minimize that 2%, but to ensure full use of its capabilities to address the remaining 98% of energy consumption – hence IBM's interest in new businesses such as the IUN and ITS. For Fleming, the key is that these cases are all network management issues, thus directly building on IBM's ability to manage an IT network and systems.

In each case IBM hopes to build an appropriate software infrastructure or Service Oriented Architecture (SOA) that can serve as a platform for innovation. Therefore, these initiatives will capture value for the company by using IBM's middleware foundation to carry out their implementation and achieve the desired results for customers. IBM drove the development of the Energy & Environment (E&E) Framework (see Figure 19) to help its clients address energy, climate change, and other environmental issues. Rich Lechner, VP, Energy and Environment (Business Opportunities), explained that the framework "is a very holistic approach, based on our own experience in managing environmental issues, managing Data Centres, and being leading members in partnerships such as the Chicago Climate Exchange and the Green Grid." Lechner explained that "green is becoming a parameter of business effectiveness, with savings going into innovations and IT business opportunities, not only to the bottom line."

The "house" inside the E&E Framework represents all areas that need to be considered by clients on these issues, while the circle encompassing it represents IBM's expertise. The Framework covers all areas IBM has offerings in, including its Global Business Services, Software Group, Global Technology

[35] Eurosif, the European Social Investment Forum, published an ICT Hardware Sector Report. In it, it states that, "The ICT sector causes around 2% of global CO2 emissions – as much as air transport. This estimate includes the in-use phase of PCs, servers, cooling, fixed and mobile phones, local area networks (LANs), office telecommunications and printers... The USEPA found that data centers consumed about 61 billion kWh in 2006 (1.5% of total US electricity consumption) for a total electricity cost of about $4.5 billion. Consumption is expected to double by 2011." (Eurosif, WestLB 2008)

Services (e.g., Data centers), Systems & Technology Group (servers, storage products), and Industry expertise (e.g., Intelligent Utility Network, Intelligent Transportation System, Financial Services Sector, etc.)

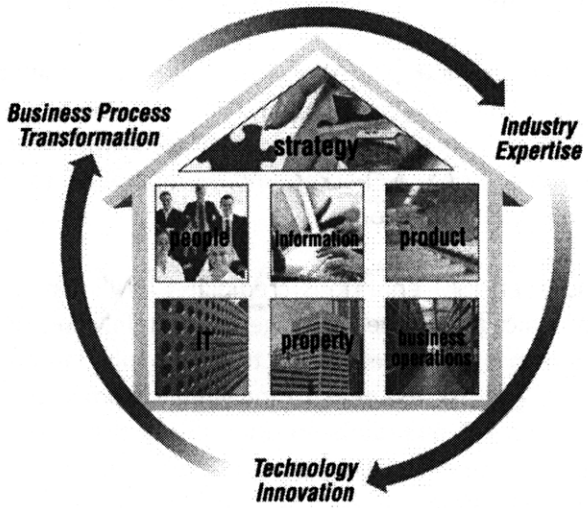

Figure 19: IBM Energy & Environment Framework
The Framework is IBM's holistic view of the challenges that organizations face in responding to energy, climate change, and environmental challenges (Source: IBM). A more detailed version is found in the Appendix.

In addition, IBM has deployed its Big Green Innovations (BGI) team – described by Sharon Nunes, VP of BGI for STG, as "a seed organization that would figure out if projects are viable as businesses" – to apply "advanced materials science, physics, modeling tools, materials science, physics, and integration expertise to address emerging environmental management opportunities" (Semiconductor Solutions IBM 2008). This is the organization that has moved IBM into photovoltaics by capitalizing on the company's semiconductor know-how, and is now focusing on water modeling and management

For the long term, Fleming envisions IBM becoming involved in energy and climate change issues as a developer and manager of the selected networks and business processes, rather than being only an IT supplier. For example, a utility company could be looking to invest billions of dollars over a three- to five-year period to build a smart grid, with tens of millions of dollars of that total to be spent on traditional IT. By further engaging in these issues, IBM could create more value for its clients and, by doing so, take advantage of this larger opportunity. Fleming believes that due to the complexity involved in grid issues over time, this will be a long-term and profitable opportunity for IBM. Equally, he anticipates there will be significant business opportunities springing up from future emissions cap and trade schemes, from the need to address how to manage the charging and fueling of plug-in hybrids, and even maybe from carbon capture and sequestration. "Clients will be faced with new needs and requirements," he said, "and IBM can help address them – these are all spaces where IBM could participate in the future."

Beyond the breadth of IBM's capabilities in research, hardware, data centre management and services, consulting services and industry solutions, Martin Fleming identifies 3 differentiators for IBM in this area:

1. The ability to help clients address matters in a systemic fashion. The management of large network infrastructure-related projects needs a long-term systemic view, something that IBM can offer.
2. IBM's software infrastructure and platform, which creates significant value for clients by bringing together and coordinating diverse elements of operation.
3. IBM's internal experience and expertise. This is a significant differentiator for IBM, since the list of organizations that can bring a background comparable to IBM's in environmental management to the table is very short one.

Fleming believes that CEA has given IBM enormous credibility. IBM's leadership and participation in voluntary programs such as the Chicago Climate Exchange has certainly contributed to this, but perhaps even more important is IBM's own experience. Clients trying to solve an environmental problem ask constantly "what does IBM do?" and ask to speak to individuals from CEA. IBM can often show that what it is recommending to clients has already been done inside the company, thus providing a live example as answer to the question, "can you really do that?", which many customers ask. For example, IBM has been able to emerge as a leader in addressing climate change. This is illustrated in greater detail in the following section, a "mini case study" on IBM's energy conservation and climate stewardship efforts.

3.5 Case Study: Energy Conservation & Climate Change

In 1974, IBM's Corporate Policy on Conservation was established by then CEO F.T. Cary. The policy, based on lessons from the oil crisis of 1974 – basically, that responding to a crisis is not enough –, gave IBM the responsibility to follow an ongoing practice of conservation:

> "It is the policy of IBM to conduct all activities in such a manner that conservation of energy, raw materials and commodities remains a permanent way of life for the Company... The 1973-74 oil crisis forcefully demonstrated that with planning and imagination we were able to reduce our fuel and power consumption significantly. This, in turn, led us to develop ways to make a more efficient use of raw materials and commodities which were in short supply. It is not enough, however, to react to a crisis situation. Conservation must be a deliberate and continuing policy of management." (Cary 1974)

Since then, there has been a focus on energy conservation within IBM – or, in the words of Jay Dietrich, CEA's Program Manager for Energy & Climate Stewardship, "a constant drumbeat [reminding everyone] that this is something important for IBM."

3.5.1 Goals

The company's energy conservation and climate protection goals have evolved continuously, incorporating changes deemed necessary to enhance IBM's efforts and to stay attune with deepening scientific findings and understanding. IBM has placed so much emphasis on energy conservation

because, in addition to its commitment to environmental leadership, the company has identified its largest potential impact on climate change is through emissions from utilities supplying IBM's electricity.

In 1992, IBM announced a 4% annual conservation goal and expressed its intention to use internal audits to monitor progress (Grimm 1992). In 1996, the corporate goal changed "from a cost- to a consumption-based goal with the objective of achieving energy conservation savings each year equivalent to 4 percent of IBM's annual electricity and fuel use" (IBM CEA 1996, 19). This change shifted the focus from savings achieved in dollars to savings achieved in kWh and CO2 emission reductions. Dietrich explained that this change made sense to IBM since energy use and GHG emissions go hand in hand, and "the only way to deal with one issue is to deal with the other as well." In 2001, IBM's goal grew to include "improving energy efficiency and giving credit to renewable energy use" (IBM CEA 2002, 31), thus including the contribution of any renewable energy purchases into IBM's performance. In 2006, the goal was split to make sure that the use of renewable energy did not distort the perception of progress in energy efficiency projects. Also in 2006 the target changed from 4% to 3.5% as leased buildings began to be included in the computation. When calculating energy conservation results IBM does not include energy use reductions resulting from consolidations, downsizings, or cost avoidance actions. Excluding these when calculating energy conservations results has been a practice since IBM began tracking this metric because those actions, while producing reductions in energy use and cost, are not driven by the motive of conservation.

IBM also participates in various voluntary energy conservation and climate protection programs. Dietrich believes this gives IBM the opportunity to further its leadership role by publicly committing against its own conservation goal, preparing itself for future regulation, participating in policy development, and opening itself to the scrutiny of external audits. In 1992, IBM became a charter member of the USEPA's Energy Star Computer Program, whose criteria it helped develop. In 1995, IBM was one of three industrial companies to begin voluntary reporting its greenhouse gas (GHG) emissions under the US Department of Energy (US DOE) Voluntary Greenhouse Gas Emissions Reporting program in its inception year, and has continued to do so annually ever since – something that has only been possible thanks to the company's EMS. The following year, IBM took this commitment a step further by signing a Memorandum of Understanding (MOU) with the EPA to voluntarily report and reduce emissions of perfluorocompounds (PFCs), a class of chemicals that are stable in the atmosphere and have global warming potential that is several thousand times that of CO2, if not more. In 2000, IBM became a charter member of the World Wildlife Fund (WWF) Climate Savers program, committing to achieve CO2 emissions reductions equivalent to 4% of IBM's global CO2 emissions each year between 1998 and 2004. That same year, it joined the World Resources Institute's (WRI) Green Power Market Development Group, which seeks to build corporate markets for green power. In 2002, IBM became a charter member of the EPA's Climate Leaders Program, committing to average annual CO2 emissions reductions equivalent to 4% of the emissions associated with IBM's annual fuel and electricity use between 2000 and 2005, and an absolute 10% reduction in PFC emissions from the company's semiconductor manufacturing processes by 2005 against the base year of 2000. In 2003, it became a charter member of the Chicago Climate Exchange (CCX), the world's first and North America's only active voluntary, legally binding integrated trading system to reduce emissions of all six baskets[36] of GHGs. That same year, IBM began disclosing its GHG emissions under the Carbon Disclosure Project (CDP) from the start of the program. In 2006, the company joined the EPA's SmartWay™ Transportation Partnership Program, which encourages shippers and carriers to improve energy efficiency and reduce GHG and air pollutant emissions. In 2008, IBM joined the Climate Group, a coalition of governments and

[36] The six baskets of GHGs are carbon dioxide, methane, nitrous oxide, HFCs, PFCs, and SF_6.

influential businesses committed to tackling climate change. In addition, IBM also pioneered programs to reduce employee commuting and has sustained them for nearly two decades – key aspects are its work-at-home program and its mobile employees program. Today, more than 100,000 employees globally participate in one of these programs.

This is but a sample of the many different initiatives any company has the opportunity to join. As Diana Lyon, CEA's Program Director of External Relations, explained, IBM is committed to participating in voluntary committees and partnerships with organizations which are devoted to issues of strategic importance to IBM, and to which "IBM can contribute its expertise to make a difference." The goal is both to participate in "meaningful partnerships" and to be recognized for the company's leadership in addressing environmental issues.

3.5.2 Implementation

IBM's energy and climate stewardship program spans over the areas illustrated by Figure 20. The Real Estate & Sites Operations (RESO) organisation, in charge of operations, is responsible for managing IBM's energy, from procurement to consumption. The Systems & Technology Group (STG) is responsible for product development, and focuses on improving the energy efficiency hardware products including servers, storage products, and microprocessors. Integrated Technology Delivery (ITD) and Global Technological Services (GTS) are responsible for IBM's services, and in this case are largely focused on the energy management of data centres – the so called "green" or energy efficient data centres. Finally, IBM's Global Procurement drives collaboration with suppliers. CEA's role is to bridge each of these areas to each other, thus facilitating joint efforts, in addition to being responsible for the strategy and monitoring of IBM's energy conservation and climate stewardship programs.

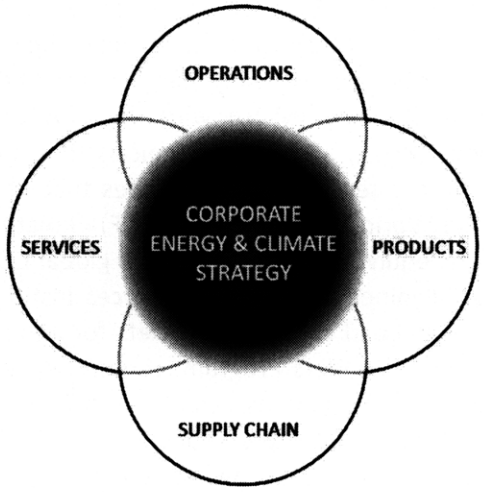

Figure 20: Span of Energy & Climate Stewardship Program

IBM's approach to reducing GHG emissions is two-fold. First, it seeks to reduce direct and indirect emissions associated with its own operations – Scope 1 and Scope 2 emissions, which fall under the

responsibility of RESO, STG, and ITD.[37] Second, IBM encourages its carriers and suppliers to do the same through participation in programs such as the Carbon Disclosure Project (CDP) and SmartWay™. In addition, IBM also has a suite of collaborative IT tools that enable the reduction of business travel (e.g., e-meeting, "sametime" web conferencing, messaging, voice suite, broadcast suite, etc). These IT capabilities are widely used throughout the company and have enabled reduction in business travel. For example, in 2006, the daily average of use of IBM's "sametime" web conferencing capabilities was of 1042 meetings involving a daily average of approximately 4,687 participants. Nevertheless, the company has so far shone away from specifically accounting for Scope 3 emissions since it is nearly impossible to do so in a completely analytical way and the benefit of this investment is unclear.

3.5.2.1 Operations

Greg Peterson, Manager of IBM's Global Energy Program, explained that RESO is responsible for managing IBM's energy demand and supply. The energy conservation programs he is in charge of therefore seek to decrease the company's demand and to increase the use of energy from renewable sources. While execution of IBM's energy management program is centralized within RESO today, it wasn't always so. When Peterson joined RESO in 1998, each site across the corporation was responsible for meeting the energy conservation goal, and as he explained, "efforts were much decentralized." There was a reason behind this – until the late 1990s, IBM was largely a vertically integrated hardware manufacturer with many large plant sites around the world. These sites were large energy users, and each had a commensurate energy management team. As the company transformed away from a vertically integrated hardware manufacturer and divested sites, it made sense to centralize energy management under RESO.

Peterson therefore sought to centralize the execution immediately. As he explained, "to do something so big, to manage energy end-to-end, matching supply and demand, the program needs to be globalised, and you need to have a large group [that has sole accountability] working on this." Bringing execution under one organization required getting over some inertia given IBM's business model, organizational structure, and having hundreds of sites around the world – it was something that involved taking power away from people. He first targeted IBM's energy supply, taking over buying decisions and bringing more energy industry experts into IBM. With greater control over IBM's energy supply, he began to focus on the company's demand, and moved the site and regional employees working on energy management under his management. He describes this as "an evolutionary process that took time." Having RESO as the organization responsible for energy management enables the company to leverage expertise at larger plant sites, share best practices, and include smaller locations in the program, thus enabling significantly greater efficiency and effectiveness. It is, in Peterson's words, "one of the main reasons we are able to make continual improvements" in energy management.

[37] The GHG Protocol (http://www.ghgprotocol.org/) has defined three scopes for GHG accounting and reporting purposes. Scope 1 emissions are "direct GHG emissions [that] occur from sources that are owned or controlled by the company." GHG emissions not covered by the Kyoto protocol (for example CFCs and NOx) are not included in Scope 1. Scope 2 emissions are "GHG emissions from the generation of purchased electricity consumed by the company." These are considered indirect emissions since they originate from where electricity is generated rather than consumed. The GHG Protocol Initiative defines Scope 1 and Scope 2 emissions in a way that prevents different companies from accounting for a particular set of emissions under the same Scope. The minimum accounting and reporting level for companies participating in the GHG Protocol includes both Scope 1 and Scope 2 emissions. Scope 3 emissions are also indirect, and are "a consequence of the activities of the company, but occur from sources not owned or controlled by the company." Reporting of Scope 3 emissions is optional (WRI, WBCSD 2004, 25).

Though IBM's corporate energy conservation goal is set at 3.5%, RESO has set an internal goal to reduce energy consumption site-by-site by 7% to further reduce costs and drive energy conservation. The challenge, Peterson explained, is that RESO cannot control how colleagues from other IBM organizations operate equipment such as data centres, which consume a significant amount of energy. By monitoring progress towards the internal goal, RESO can encourage tenants at individual locations to continue working to reduce energy consumption through more efficient machinery use by showing them their actions make a difference, even if sites are experiencing growth. Peterson's view is that since data centres are "inherent to IBM's business," he cannot really control this kind of growth but "can only try to minimize [the impact]."

Because IBM has been focusing on energy conservation for a long time and is "continuously pushing the envelope", it is very difficult for Peterson and his energy management team to meet IBM's conservation goal. For Peterson, IBM's goals are a challenge in and of themselves. "The goals keep me up at night," he said, "I am looking at what we can do in the next 2 years to meet them – energy conservation requires constant attention and action." As he explained, the key is to understand the issues, analyze the situation, assess the options, and take action (see Figure 21).

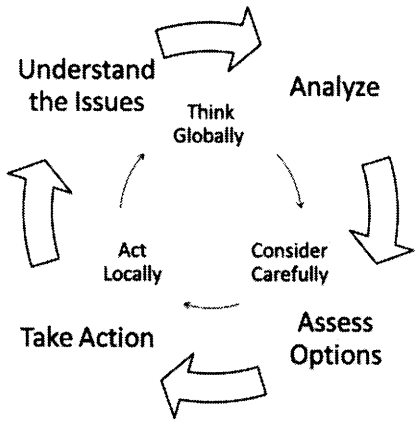

Figure 21: IBM's Energy Conservation Process
Figure adapted from a presentation by Greg Peterson, Manager of IBM's Global Energy Program.

RESO has devoted resources to identify where and how energy is being used across IBM. Peterson's team can now track and analyze energy use on a real-time basis using the Enterprise Energy Management System (EEMS), a series of meters located across IBM's largest facilities connected to a central data collection and display system (WBCSD 2008). The data (see Figure 22 and Table 11) that has been collected has helped Peterson identify that out of over 1600 sites worldwide:

- The top 20 sites for energy use accounted for 51% of IBM's total electricity consumption.
- The top 100 accounted for 76% of IBM's total electricity use.
- The energy drivers by function cluster (i.e. manufacturing, data centres, offices, lab & research, etc) were: heating, ventilating & air conditioning (HVAC), data centre equipment, the central utility plant, lighting, manufacturing processes and tools, lighting, and plug load.

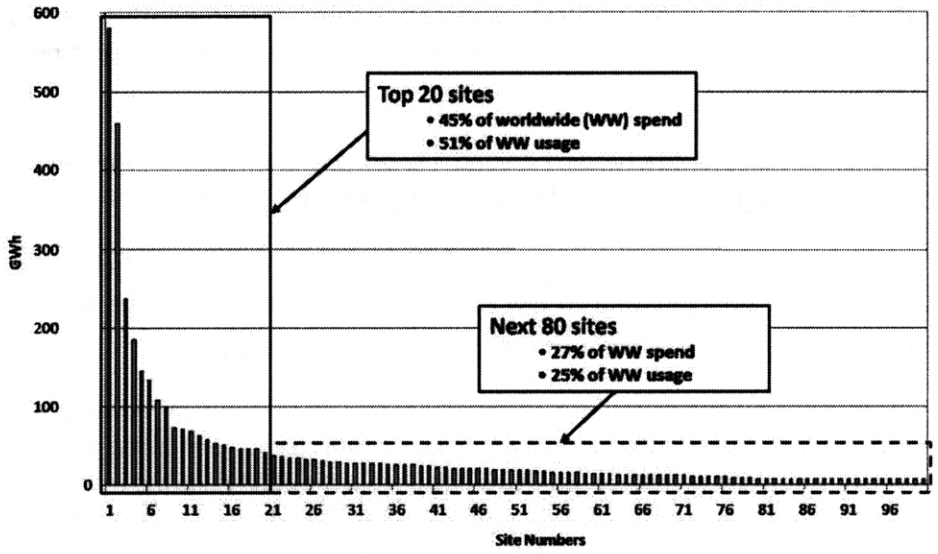

Figure 22: Top 100 IBM Sites by Electrical Usage

Out of over 1600 sites worldwide, IBM's top 20 sites in electrical usage represent half of the company's worldwide electrical usage, and the top 100 sites represent three quarters of IBM's total electrical usage. Note that over 500 IBM locations report their energy use and spend. Data is from September 2005 to August 2006.

Energy Drivers \ Clusters	Manufacturing	Data Centres	Office Spaces	Labs & Research	**Total Spend**
HVAC	20%	10%	50%	30%	**27%**
Data Centre Equipment	---	65%	---	25%	**22%**
Central Utility Plant (CUP)	25%	20%	---	20%	**16%**
Manufacturing Processes & Tools	45%	---	---	---	**14%**
Lighting	10%	5%	25%	10%	**13%**
Plug Load	---	---	25%	15%	**8%**
Total Spend	**30%**	**28%**	**28%**	**13%**	**100%**

Table 11: Energy Drivers by Cluster

Drawing on this information, the Global Energy group put together teams of experts – including non-IBMers, from outside experts to suppliers – that could address energy issues related to HVAC, data centres, central utility plants, and lighting. The team leads became responsible for carrying out a gap analysis, for building a comprehensive checklist of energy conservation activities for all sites to follow through by a particular date, and for creating standards. Each team lead's performance was evaluated based on these set of activities – these responsibilities were integrated in to their personal business commitment (PBC).

RESO is responsible for securing the funding behind any project managed by Peterson's Global Energy team. The general process Peterson goes through to get funding is to generate a list of projects and a description for each, and then outline what the total costs, savings and payback time will be. Recently, for example, Peterson approached RESO Finance with a list for 150 different projects, with a total cost of $10 million, and a payback time of 2 years. He was able to get 135 projects accepted, with a total cost of $8 million and a payback time of 1.5 years.

The key, says Peterson, is to be able to build a business case, aggregating the various projects for energy conservation together. He notes that while he's seen other companies disaggregate projects, the packaging together of these initiatives provides invaluable flexibility, including the ability to push through certain projects that have a payback time of more than 3 years – when usually the payback needs to be of 3 years or less, and most of the time it is of 2. To build the business case, he highlights all the positive potential outcomes of the project. In the case of purchasing a particular light bulb, for example, he focuses on the fact that it uses half the energy than traditional light bulbs, that it will improve comfort for users, and will reduce maintenance costs because of its longer lifetime. He will also highlight how such a light bulb will further IBM's energy conservation goals, thus providing an additional benefit to the company. He will try to make the case that "it's the right thing to do [for] IBM as a green company," asking, "how much better is it if you don't have to generate an extra 1 kWh?," and, if "IBM prides itself in being a driver of efficiency [and] we sell those services, why not be the best example?"

Peterson acknowledges, however, that in the end it is "money that gets people." Nonetheless, there are certain projects with considerably long payback times that he's been able to push through by finding creative financing approaches. For example, he was able to secure approval for a small solar project with a longer payback time by utilizing incentive funding from the local utility company.

Renewable energy projects have a longer payback time than other projects, which, as Peterson explains, pushes you to be more creative. For example, one approach may be through the so-called power purchase agreements, where the energy provider (e.g., a solar energy company) would be responsible for the capital investment associated with producing energy, and would recover that investment over the years by selling the power to the customer.

For other projects that also have a long payback time, such as replacing an AC chiller (from an old one which consumes 75 kW/ton, for a new one that uses 55 kW/ton[38]), which has a payback of 10 years, Peterson finds that there needs to be a set of reasons other than those related to energy conservation to gain support for it. These could include, for example, its reliability, maintenance cost, and age, among others.

[38] Chiller efficiency may be specified in kilowatts per refrigeration ton, the latter which is the cooling power of one ton (907 kgs) of ice melting in a 24 hour period.

In addition to securing sufficient funding, one of the biggest challenges for Peterson's group is that it doesn't always have access to "sub-sites" such as research labs and data centres, even though it is responsible for the operations within each site. "If [RESO] is paying the bill," said Peterson, "we manage it." In spaces owned by someone else, however, as is the case with the tightly-controlled data centres, the RESO energy management team needs to ask for access. The key, Peterson explained, is to build good relationships with the owners of that space, and part of this is to ensure you can talk to them. Jean-Michel Rodriguez, Program Office Manager of Montpellier's Products & Solutions Support Centre (PSSC) and worldwide leader of the Energy Efficient Data Centre for STG, agrees – "It can always be challenging to get two groups to talk to each other," he said, "While IT is not RESO's core area of expertise, [we need to understand that] RESO is not just about cabling and IT is not just about PCs." While RESO may not fully understand the machines used, or what the manufacturing process is, Peterson says the energy teams should be able to draw in enough expertise to address problems in each specific setting. While it was difficult to integrate all the right people around energy conservation projects, today's energy costs and IBM's "drive to be greener" have encouraged people to collaborate more readily. Another reason, as Peterson explains, is that he's been "knocking on the door long enough."

RESO's efforts were recognized in 2006, when it won the IBM Chairman's Environmental Award.

3.5.2.2 Services & Product Use

"Green is as much about the economics as it is about the environment," said Chris Molloy, Distinguished Engineer in the Integrated Technology Delivery (ITD) group of IBM's Global Technology Services (GTS), "It is our responsibility to have a low cost solution to our customers; we have to be innovative to bring cost down and deliver more application workload in less space." Molloy was referring to the increasing cost of running data centres and the need to provide companies with some "tactical breathing room" – that is, to offer quick, inexpensive, easy-to-implement solutions to optimize resources in existing facilities while the client company develops and implements a longer range data centre strategy using virtualization techniques and more efficient cooling approaches. "Use of data centre best practices, more efficient hardware, and better energy utilization offer us an environmentally preferable way to deliver business value," he said. Molloy feels that the "focus on 'green' data centres [...] didn't pick up just because of the environment, it didn't pick up because of [Al Gore's] Oscar, it picked up because of the [increasing] demand for IT and the cost associated with it – [companies are] using conservation of the environment as a way to enhance business value."

In 2007, IBM announced Project Big Green – an annual investment commitment of $1 billion to increase energy efficiency in IT, and in particular, to introduce products and services that will significantly reduce energy consumption in data centres (IBM 2007). This announcement was followed by a disconcerting EPA report on Server and Data Centre Energy Efficiency which found that energy demand for power and cooling resources had approximately doubled from 2001 to 2006, making data centre energy consumption approximately 1.2% of total electricity consumption in the US (WBCSD 2008), and that 50% of the energy used didn't even reach IT equipment and is lost as heat.

IBM has "responsibility beyond following rules," explained Brad Brech, Distinguished Engineer in STG Software Strategy & Architecture, "[because it needs to keep] trying to come up with ways to do things better." In Molloy's view, green is synonymous with sustainability – it is about "playing in an environment with limited resources, and since IBM wants to be in business for the long term, [it] needs

to provide products [and services] in a sustainable way." IBM is helping customers and companies around the world to address this [green] issue – for Molloy, "IBM's reputation is at stake."

3.5.2.3 Supply Chain

IBM is encouraging suppliers to participate in the Carbon Disclosure Project's Supply Chain Leadership Collaboration.[39] In addition, IBM is involved in the EICC's Environmental Workgroup, which is working on a methodology for data collection or disclosure of supply chain GHG emissions. Its goal is to have EICC members agree on, first, how suppliers will know and show IBM and their other clients what their emissions impact is, and second, how the EICC will ask suppliers to set goals to manage their energy use and emissions.

IBM has also become an active participant in the USEPA SmartWay™ program that seeks to identify "products and services that reduce transportation-related emissions" (USEPA 2008). Eric Amand, Manager of Global Logistics Operations for the Americas, explained, "SmartWay™ is part of our life now – we want suppliers to be environmentally savvy... my hope is that two years from now you won't be able to sit at the table with IBM if you're not a SmartWay™ carrier and have a certain score."

3.5.3 Results

The drivers of IBM's energy management and climate protection programs are various. First and foremost is the rate of return involved. In an example provided by Dietrich, every dollar of energy savings achieved in a data centre through virtualization and consolidation projects leads to $6 to $7 dollars of savings in operation costs – a significant figure given that 20% of RESO's spend is related to energy, and a third of that supports data centre operations. In addition, investing in renewable energy gives the company, the opportunity to gain experience using it on the one hand, and, on the other, helps IBM contribute to reducing the cost of that particular technology for the future. At the same time, IBM's efforts generate energy efficiency credits, for example, or credits that can be used in programs such as the Chicago Climate Exchange. The final driver is the belief that energy concerns are not going away. Customers' needs will be largely driven by energy conservation and an increase in energy prices. IBM also expects the legislative environment to incorporate measures that address climate change. Finally, IBM seeks to uphold its longstanding desire to be an environmental leader, and therefore wants to begin addressing today the issues that will be important tomorrow.

IBM's results (see Table 12 and Table 14) have earned the company various awards and international recognition for its environmental efforts. These include, among others, the USEPA Climate Protection Award in 1998 – the Award's inception year – and again in 2006 thus making IBM the first company to win this award twice, praise by CERES for achieving one of the greatest reported GHG emissions reductions, recognition by the WWF and the WRI in 2005, and the USEPA SmartWay™ Excellence Award in 2007, among others. Most recently, in 2008, CERES ranked IBM as #1 in climate change governance practices among 63 of the world's largest consumer products and IT companies in 11 industry sectors (CERES, RiskMetrics Group 2008). As Fleming explained, IBM's disclosed results and recognition have increased its credibility as a service provider in this area.

[39] The Carbon Disclosure Project encourages private and public sector organizations to measure, manage and reduce emissions and climate change impacts (http://www.cdproject.net/index.asp)

Year	Electricity Use *(Million kWhrs)*	CO2 Emissions from Operational Energy Use *(est, Thousand tons)*
1988	8,563	---
1989	8,916	7,331
1990	9,370	7,650
1991	9,130	7,538
1992	8,948	7,059
1993	7,871	6,137
1994	7,067	5,475
1995	6,412	4,437
1996	6,187	4,280
1997	5,820	4,031
1998	5,898	4,085
1999	5,800	3,951
2000	5,325	3,412
2001	5,228	3,247
2002	5,031	2,902
2003	4,446	2,573
2004	4,390	2,416
2005	4,952	2,744
2006	5,061	2,667
2007	5,343	2,801

Table 12: IBM Electricity Use and CO2 Emission from Operational Energy Use (1988-2007)

Year	Electricity and Fuel Use *(Thousand MMBTU)*	CO2 Emissions from Operational Energy Use *(est, Thousand tons)*
2001	26,190	3,247
2002	25,044	2,902
2003	21,695	2,573
2004	21,360	2,416
2005	22,630	2,744
2006	22,426	2,667
2007	23,649	2,801

Table 13: IBM Electricity and Fuel Use and Related CO2 Emissions (2001-2007)

Year	Cumulative Electric Savings *(Million kWhrs)*	Cumulative Avoided CO2 *(est, Thousand tons)*
2000	609	296
2001	944	442
2002	1,139	505
2003	1,290	560
2004	1,412	603
2005	1,294	609
2006	1,249	750
2007	1,116	685

Table 14: IBM Energy Conservation and Avoided CO2 Emissions (2000-2007)
The above annual figures represent results from each year's new conservation programs, plus results from programs of previous years (which are discounted by 25% per year). Savings prior to 1999 are not included. Sources: IBM Report on Innovations in Corporate Responsibility 2004-2005, and IBM CEA.

3.6 Review of Sustainability Challenges faced by IBM

Like any other company, IBM faces various challenges as it works to improve its environmental performance and to communicate its commitment and achievements to the world. While certain challenges have already been described throughout the case study, there are some that have yet to be mentioned, and others that continuously surfaced during interviews – these obstacles are briefly reviewed in this section.

First, there is the tension surrounding the availability of resources within IBM. As the case study shows, environmental projects need to compete for funding against any other project within the company. While this helps ensure environmental initiatives will make business sense, it represents a challenge for those responsible of securing sufficient funding to execute IBM's environmental policy. Particularly when different IBM organizations are working together, a key point of contention is which one will pay for the implementation of the environmental project. Closely related to the difficulty of "making the case" for environmental projects, is that the time for their implementation may be long. It is important to recognize, however, that regardless of these limitations, environmental affairs are considered to be equally important as any other issue within IBM. There is widespread agreement amongst IBMers that environmental management at IBM is not side-shifted to give priority to other business activities.

A second challenge is that of coordinating issues to prevent conflicting goals. The way in which IBM chooses to address a particular issue may conflict with progress made towards another established environmental goal. For example, an IBMer who at some point during his career had been responsible for recycling waste at his site recalled that he would often find himself "competing" for scrap against the person accountable for the site's goal towards reusing materials. While IBM is committed to long-term analytical thinking of the impacts and side-effects of the environmental goals and programs it establishes, preventing this type of situations may not always possible. In the end, however, the outcome may be equally favourable for the environment.

Another set of challenges is related to regulatory standards and public policy. One of these challenges is the proliferation of un-harmonized laws and regulations affecting the design and sale of products around the world. At issue often are not the substantive requirements but the inefficiencies caused by the varying approaches different governments take in executing them. In addition, solution offerings such as the Intelligent Utility Network and Intelligent Transportation Systems, which are already being implemented and succeeding, could be further optimized if government policy is supportive of them.

Related to IBM's emerging business opportunities is the challenge of finding enough people with the necessary skills to help IBM grow its new green businesses in a way that has a significant financial impact on the company. Unless these new ventures can grow and show strong financial returns, it will be difficult for IBM to continue investing in the identified emerging opportunities.

Finally, there is a communications challenge related to the proliferation of environmental rankings and ratings. It is not uncommon for a rating organization to fail to make a distinction on companies' business models, or to put companies' situations in the proper context, giving consideration to, for example, firms' environmental history and prior accomplishments. Sometimes, the methodology of these rankings may be questionable. Unfortunately, mistakes like this have the potential to negatively impact the public perception of IBM's environmental performance.

4 ANALYSIS & REFLECTION

The goal of this thesis is to gain a better understanding of how a firm's response to sustainability can itself be sustainable. As discussed in Chapter 2, this inevitably entails dealing with the classic tension between "passion" and "process" that has been largely documented in the innovation literature. The sustainability literature argues both in favour of an emotional and ethical commitment to sustainability, and in favour of the implementation of policies and procedures that can help a company monitor and improve its environmental performance. The question is how these can be balanced. By examining IBM's extensive and long-sustained environmental management experience, we sought to explore how a company may reach an effective equilibrium between passion and process that helps ensure its sustainability efforts will be commendable and sustainable.

First, this chapter relates IBM's experience to the sustainability literature. In particular, it explores whether IBM's environmental management efforts match what the literature says a sustainable corporation ought to be doing. Second, it offers some thoughts about how and why IBM has been so successful, which naturally lead to a discussion of how the firm has managed to strike a balance between the its passion towards sustainability and its commitment to a structured and methodical approach. Finally, it discusses some of the questions raised by IBM's experience.

4.1 Is IBM's Environmental Sustainability Program "Best Practice"?

IBM's story confirms much of what the literature says – indeed, the company has an impressive environmental sustainability program, and its commitment to corporate responsibility, a continuum from legal and compliance activities to engagements that help the company tap into new value-creation opportunities, is clearly strategic (see Figure 23). As a result, IBM's environmental sustainability efforts can be easily mapped across the Sustainable Value Framework developed by Hart and Milstein, which was introduced in Chapter 2 (see Figure 24).

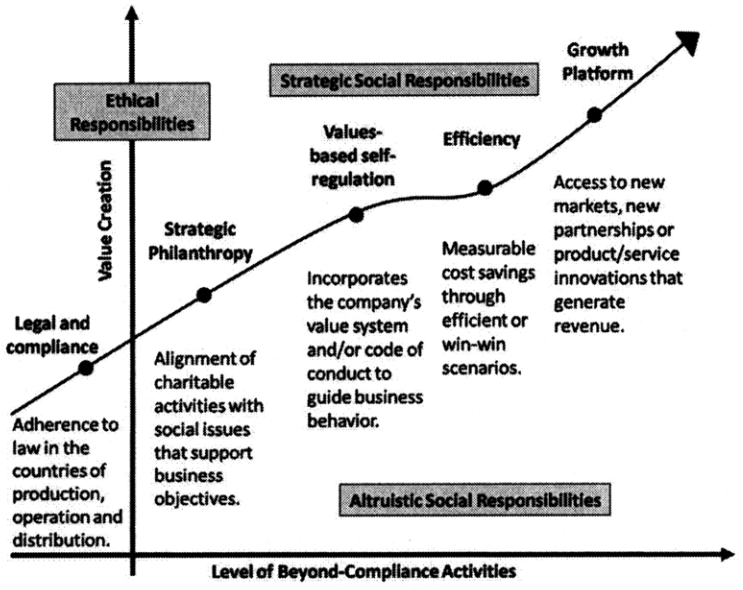

Figure 23: Levels of Corporate Responsibility at IBM

As shown in the lower left and right quadrants in Figure 24, IBM has focused on activities that have an immediate impact on IBM's business, and that address the pressures the company must deal with on a daily basis. IBM is generating value through resource efficiency and pollution prevention. The programs it has established for groundwater protection, energy conservation, climate stewardship, recycling, and CFC elimination, among others, have helped the company strengthen its environmental standing in a way that has also been financially beneficial for the company (see Table 4, for example). IBM's efforts in product stewardship and commitment to having a demonstrable record of performance have also gone a long way in building the company's reputation and legitimacy among governmental and non-governmental organizations, its clients, and the general public (see Table 1 and Table 2 for examples). Equally important is the company's commitment to working with its suppliers and carriers to help them improve their own social and environmental performance (see KPIs for Supply Chain Audits in the Appendix, for example).

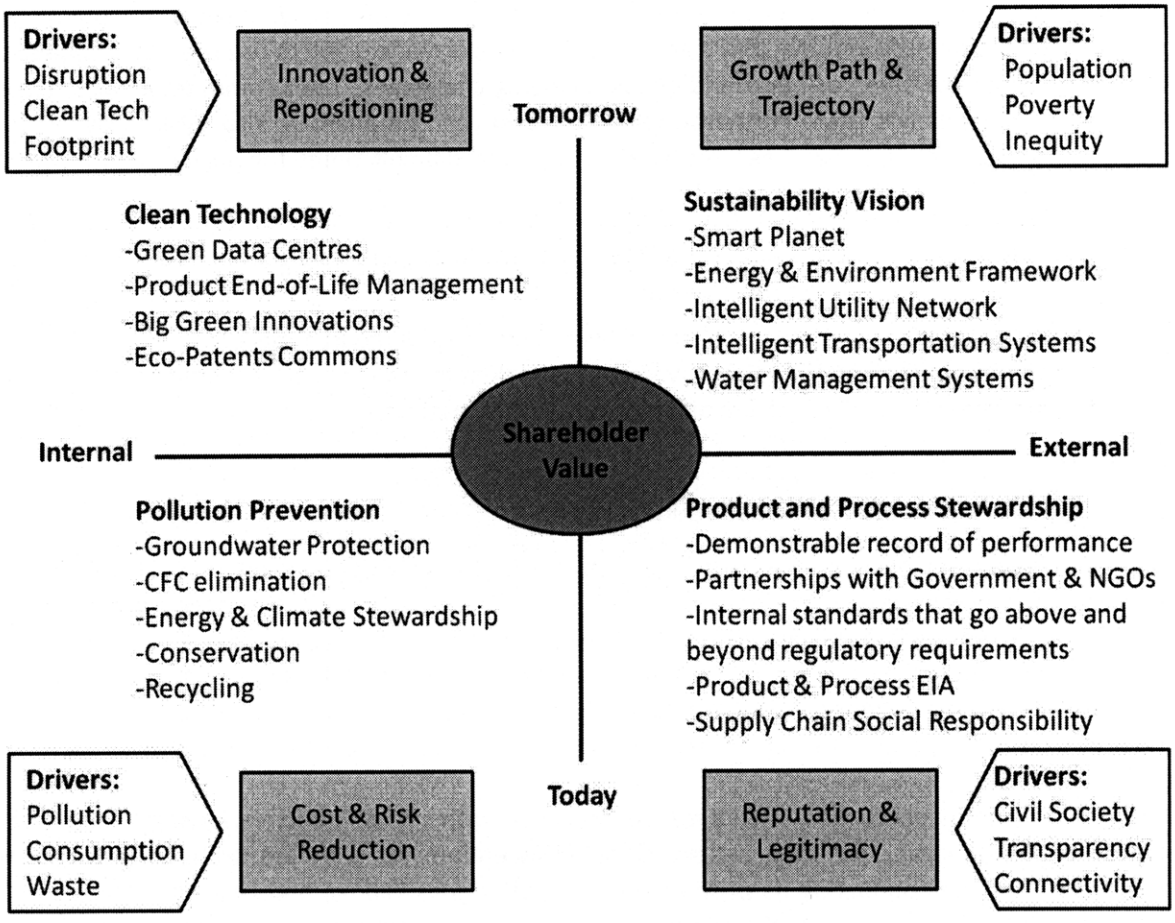

Figure 24: Sustainable Value Framework for IBM

IBM has also placed emphasis on preparing for tomorrow's business demands. As shown in the upper left quadrant in Figure 24, the company is developing cleaner technologies and processes, such as energy-efficient data centres and product-end-of-life management, among others. This has helped the

company to innovate and reposition itself according to the environmental attributes of its products. In certain cases, in fact, IBM has seen its clients' commitment increase as a response to this type of product improvements, as has been the case with the company's more energy efficient "green" data centres. Finally, as illustrated in the upper right quadrant in Figure 24, IBM has found inspiration in the world's challenges to develop a vision for growth – it seeks to use its IT and network capabilities to make our world "smarter," by, for example, helping design intelligent utility and transportation networks, and by doing so, it strives to help address issues of congestion, health, air pollution, water scarcity, and climate change, to name just a few.

4.2 Thoughts on IBM's Approach to Environmental Sustainability

IBM's approach to environmental sustainability is more than strategic in nature; it is based on deep-rooted values and on a commitment to analytical and methodical decision-making. IBM's historical dedication to environmental stewardship is humble, effective, and above all, sustainable – it has lasted for nearly 40 years, surviving periods of great difficulty for the company. IBMers are emotionally committed to continuously improve IBM's environmental performance, and to use the firm's capabilities to design solutions for some of our world's most pressing challenges. Their commitment has become integral to the company's DNA. Furthermore, it has been institutionalized into IBM's way of doing business, and in so doing, it has been protected both from difficult times for business and from the troughs inherent to the fashionable green wave.

The following is a brief discussion of the key characteristics of IBM's approach:

1. A commitment to environmental leadership and fact-based decision-making
2. A commitment to continuous improvement and a demonstrable record of performance
3. A commitment to value-creation and innovation that matters

4.2.1 Values and Science: A Proactive Strategy

Thomas J. Watson, Jr., believed that a firm with the right values would always be on the right path, regardless of any changes experienced by the business (Watson 2003). Indeed, IBM's ethical commitment to environmental leadership has given the firm a strong bearing since 1971, when Watson's Environmental Corporate Policy was established. In addition to shaping the firm's strategy across time, IBM's commitment makes its employees proud of their company and its origins. People are outwardly passionate about IBM's environmental legacy and its dedication to "do the right thing."

IBM's environmental policy has strived to be proactive rather than reactive, giving preference to pollution prevention over pollution control since its inception, years before such an approach was mandated by law. By conducting its business in a way that goes "above and beyond" environmental, health and safety law, IBM has nourished the skills necessary to sustain an anticipatory approach and to keep the firm, its processes and products, "ahead of the game." As many authors have noted, and as shown in the lower quadrant of Figure 24, this attitude allows companies to manage regulatory risk and, in some cases, capture value for the firm – which seems to be the case for IBM. In addition, IBM has also been able to gain experience that is valuable not only for the company, but for regulatory agencies alike. Its hard-earned credibility has given IBM a seat at the policy-makers table, and with it, the power to shape future environmental policy, from product standards to emissions and reporting requirements.

An essential characteristic of IBM's approach to environmental sustainability is that the firm is committed to a holistic and fact-based methodology. Its efforts focus on every single possible environmental aspect the company has an impact on, rather than only on those mandated by law or demanded by the public sentiment. Its climate stewardship program, for example, goes back to the 1980s, years before climate change became as recognized a challenge as it is today. To do this, it has cultivated a thorough understanding of where its business "intersects" with the environment, and what its impact is. It has also emphasized the importance of conducting an analytical and scientific evaluation of any environmental issue and policy decision, and of continuously re-evaluating and improving the firms' understanding and performance in environmental matters. As a result, in the case of climate change, for example, IBM has preferred to focus on emission reductions and energy efficiency initiatives with tangible results, rather than on emissions offset and carbon labelling ventures designed with what seems to be a lack of understanding of the underlying issues.

Again, this confirms what is suggested by the literature – an organizational commitment to sustainability and a systemic evaluation of the firm's relationship with the environment is an essential component to corporate environmental sustainability.

4.2.2 Managing by Measuring: A Process of Continuous Improvement

Most important, however, has been how IBM has chosen to execute its commitment – through an environmental management system that underscores the importance of process and measurement above all.

IBM has integrated its environmental requirements across the corporation, assigning specific responsibilities to different entities within the firm. While CEA is responsible for defining the company's environmental policy, strategy and goals, and monitoring progress towards these, other groups across IBM are responsible for executing them and for reporting their performance. This separation of responsibilities is an important organizational characteristic.

It has enabled the firm to separate those who set environmental policy from those who finance the execution of the policy – the philosophy is, "if you manage it, you pay for it," which likely reduces the risk of having decisions be subject to conflicting interests that could arise between environmental and economical concerns. While this minimizes any potential financial bias, it does not mean that the goal-development process is blind to monetary – or technical – considerations. On the contrary, the process is careful and inclusive to ensure that any entity affected by an environmental goal or standard will have the opportunity to provide input and commentary to help shape the requirement before it is finalized. This long-term process is essential for the firm's buy-in of any environmental goal. It engages stakeholders by creating a space for conversation: What does IBM want to achieve? What is the most effective way to go about it? What is technically feasible for IBM? How much will it cost? What are the implications of this goal? It provides IBM with the opportunity to balance stretch goals with realistic expectations, guided both by the zenith of environmental leadership, and the knowledge and experience of its scientists and engineers.

The EMS is designed to be flexible, and can therefore easily incorporate new knowledge and regulatory requirements. There is a sense across IBM's CEA staff that they are always learning, always growing. There is also a strong commitment towards continuous improvement of the EMS. IBM is a firm believer that "one can't manage what can't be measured" and has therefore given great attention to tracking its

performance. Whether it is through the EMS' Environmental Performance Database, self-assessments, or audits, the company constantly measures how it is doing. Surprisingly, IBMers across different organizations refer to these tools as learning opportunities rather than a burden to be dealt with. This is likely due to the constructive environment in which they are used. If an organization does not meet IBM's corporate environmental goals, for example, CEA's focus is to make sure everyone understands what went wrong and how to prevent this from happening again. Likewise, people refer to internal audits as an opportunity to learn from their mistakes and from each other.

Despite its flexibility, the EMS has very well defined processes for environmental management, which drive consistency across issues, geographies, and time. While the challenges of eliminating CFCs and reducing greenhouse gas emissions are very different, for example, the approach IBM followed to identify what the company should do and how to carry out its plan of action was the same in both cases. Goals and standards were based on scientific knowledge and technical feasibility, discussed across the corporation with the relevant organizations, and, once determined, they were integrated across the various business processes that have an impact on the company's performance in these issues. Equally, while meeting an internal requirement may be more expensive for a site located in a developing country, whether it is because it puts it at a disadvantage compared with other companies in the area or because of a lack of facilities in the country, the EMS ensures that requirements are met globally across the corporation. Finally, IBM's process for environmental responsibility is designed to outlast generations of IBMers, with its specifics tied to the EMS corporate instructions and practices, rather than to any particular person.

4.2.3 Agent of Change: A Process for Value Creation

In addition to implementing policies to minimize whatever negative impact the company may have on the environment, IBM searches for and takes advantage of opportunities to have a positive influence – whether it is by improving the environmental attributes of its products and processes, sharing best-practices across the firm and with other companies, participating in partnerships with governmental and non-governmental organizations, or creating product offerings that help tackle global environmental issues.

IBM is selective towards the partnerships it engages in. Rather than joining any possible group, IBM evaluates each engagement based on the issue addressed, the partnering organization, and its own ability to have a positive impact. Given the infinite number of initiatives IBM could join, this is a way for the company to allocate its resources to what it identifies as the most meaningful partnerships. First, it narrows down the list by solely considering issues that are intimately related to its business. While there is much IBM has to offer and gain from a partnership with the EPA on the energy efficiency of products, or corporate climate change initiatives, for example, the relevance of a potential partnership to safeguard endangered species is not as apparent unless it would involve the use of IBM's people, expertise, and technology.[40] Second, IBM chooses to work with organizations and institutions that are well known, credible, and respected. It also makes a point of stirring away from lobbying groups, since its interests lie on best-practice sharing and building a common understanding. Third, IBM joins partnerships to which it can contribute based on its internal expertise and business capabilities. This is as much about creating value as anything else.

[40] See 3.2 Spare Change vs. Real Change: Corporate Social Responsibility at IBM

As discussed earlier, IBM's commitment to "innovation that matters" has also helped the company channel its resources so that they have a fundamental impact on the challenges we are facing. As shown in the upper right quadrant of Figure 24, this vision of sustainability will likely solidify IBM's future standing.

4.3 IBM's Balance of "Passion" and "Process"

IBM's experience confirms both the importance of nourishing an emotional commitment to sustainability and of establishing an environmental management system that enables the company to systematically identify and manage the environmental impacts of its operations. It also shows that combining both is realistic and desirable. On the one hand, its long-sustained record of environmental commitment, combined with its dedication to being a recognized environmental leader, has instilled a strong passion for sustainability across the company's organizations and employees. On the other hand, IBM's pursuit of a demonstrable record of performance, combined with a commitment to continuous improvement, has led to the development of a carefully designed and continuously improved environmental management system.

IBM seems to have optimized the balance between passion and process (see Figure 25) through a commitment to scientific decision-making, which has allowed the company to design and implement goals and procedures that will have the most impact given its resources and footprint, and which has helped educate the firm about the different environmental challenges it faces. As is evident from the case study, IBM devotes great care to fully understanding environmental issues and using scientific facts as a guide for how to respond. This does not mean that there is little passion involved. On the contrary – every single IBMer I spoke to was clearly proud of and committed to the company's goal of environmental leadership. This passion has been heightened by IBM's historical commitment to such leadership, by environmental educational programs, by environmental activities that seek to be inclusive of everyone within IBM (such as environmental discussions during IBM's Innovation Jam or ThinkPlace), and by a strong and visible commitment from the company's top senior executives. What it means, alternatively, is that science is used to channel and enhance the energy and interest of IBMers across the company so that the company's carefully defined environmental goals are met.

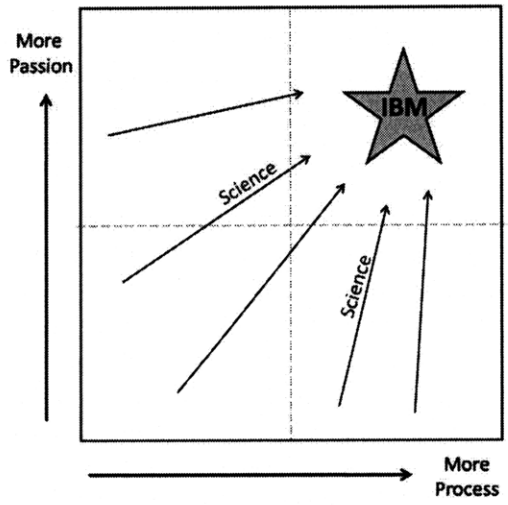

Figure 25: Balancing Passion & Process for Environmental Sustainability

4.4 Questions Raised by IBM's Experience

Among others, IBM's experience suggests that a historical commitment to environmental sustainability is a considerable asset to companies striving to improve their environmental performance. It also implies that the goal-setting process is particularly important to a company' ability to establish goals that are both ambitious and realistic, and that key characteristics of this process include a separation of responsibilities and power between those entities who establish the policy and those who execute it. Finally, IBM's story underlines the need to be committed to a science-based decision-making process.

What does this mean for other companies? In particular, what can young companies or organizations that are just realizing the business imperative of environmental responsibility do to generate an organizational level of commitment to sustainability comparable to that pervasive across IBM? How can other companies establish goal-setting processes that enable conversations that will push the company's environmental efforts further without burdening its organizations? And, what can companies do to nourish a science-based approach, particularly if their day-to-day business is not as closely related to science and technology as IBM's? How else can companies pursue an optimal balance between passion and process in their management of environmental affairs? Does the size of the company matter? Can a small company follow the example of a $103 billion dollar company?

Another important – perhaps fundamental – question relates to IBM's growth strategy. As discussed in Chapter 2, some of the literature suggests that companies should be slowing down their growth to the rate of what they refer to as "natural growth." This is not a goal that is being pursued by IBM – nor indeed by any major company, so far as I am aware – although it is clear that the firm's "Smarter Planet" initiative has the potential to play a major role in supporting sustainable economic development. This issue raises a number of questions for future research: is it indeed appropriate for any commercial entity to pursue only a "natural growth" rate? Why or why not? If so, how would a for-profit company – subject to all the constraints of the capital market and the fiduciary duty to maximize returns for shareholders – grapple with such a concept? Perhaps the concept of "natural growth" is better applied to the economy as a whole, rather than to any particular company? These are questions that I could potentially explore in future work.

5 CONCLUSIONS

The overall goal of this thesis was to build our understanding of how business can respond to sustainability, and how its response can be both effective and sustainable. To achieve this, we explored the balance between passion and process by investigating in detail how IBM has responded to environmental issues.

IBM's example is valuable given its impressive record of environmental performance and the fact that the company has been deeply committed to environmental leadership for close to 40 years, withstanding periods of great difficulty for the firm. We found that IBM's experience is easily relatable to what the literature considers to be "best practice" in corporate environmental sustainability. Its range of activities – including pollution prevention, product stewardship, and the development of clean technologies – have positioned IBM as a sustainable corporation and have generated considerable value for the firm, through cost and risk reduction, increased reputation and legitimacy, and innovation opportunities, among others. Furthermore, IBM has had the vision to use our world's most pressing challenges as inspiration for determining its future growth strategy.

In addition to a deep historical commitment to environmental sustainability, IBM's approach is characterized by:

1. A commitment to environmental leadership and fact-based decision-making
2. A commitment to continuous improvement and a demonstrable record of performance
3. A commitment to value-creation and innovation that matters

This approach entails the balancing of both passion and process, something that IBM seems to have achieved by relying on science-based decision-making to identify how the company ought to interact with the environment. IBM strives to make environmental efforts as inclusive as possible – engaging employees across the corporation in environmental goal development, seeking to educate them on sustainability matters, and relying on some of them as volunteers who facilitate the execution of IBM's environmental programs. To optimize employees' passionate commitment and interest in these issues, and to provide guidance to the company as a whole, IBM heavily relies on a thoroughly designed environmental management system, which has enabled the company to integrate environmental processes and standards across the firm, and which has allowed its sustainability program to become sustainable itself.

IBM's experience is inspiring. It has shown that sustainability can be made sustainable by finding an optimal balance between passion and process. This entails, as mentioned earlier, a commitment to fact-based decision making, continuous improvement, and a demonstrable record of performance. It also requires a commitment to creating value and to having a positive impact in the surrounding communities and environment. As encouraging as it is, IBM's experience also shows that sustainability involves very hard work – there is no magic.

The future seems promising to IBM. The question surrounding the type of growth sustainable corporations should pursue remains, however, and must be addressed in the future.

6 APPENDIX

6.1 IBM Financial Highlights for 2005-2007

($ in millions except per share amounts)

FOR THE YEAR	2007	2006	2005
Revenue:			
Services	54,057	48,328	47,509
Sales	42,202	40,716	41,218
Financing	2,526	2,379	2,407
Total Revenue	**98,786**	**91,424**	**91,134**
Cost:			
Services	39,160	35,065	35,151
Sales	16,552	16,882	18,360
Financing	1,345	1,182	1,091
Total Cost	**57,057**	**53,129**	**54,602**
Gross Profit	**41,729**	**38,295**	**36,532**
Expense and Other Income:			
Selling, general and administrative	22,060	20,259	21,314
Research, development and engineering	6,153	6,107	5,842
Intellectual property and custom development income	(958)	(900)	(948)
Other (income) and expense	(626)	(766)	(2,122)
Interest expense	611	278	220
Total Expense and Other Income	**27,240**	**24,978**	**24,306**
Net Income	**10,418**	**9,492**	**7,934**
Total Assets	**120,431**	**103,234**	**105,748**
Net investment in plant, rental machines and other property	15,081	14,440	13,756
Working capital	8,867	4,569	10,509
Total debt	35,274	22,682	22,641
Stockholders' Equity	28,470	28,506	33,098
Market capitalization	**$149,744**	**$146,355**	**$129,381**
Stock price per common share	**$108.10**	**$97.15**	**$82.20**
Number of employees in IBM/wholly owned subsidiaries	**386,558**	**355,766**	**329,373**

Table 15: IBM Financial Highlights (2005-2007)
Source: IBM Annual Reports

IBM's 2008 Annual Report has not been published yet, but the company's fourth-quarter and full-year results for 2008 are available at http://www.ibm/com/investor/4q08/press.phtml.

6.2 IBM Environmental Affairs Policy

IBM is committed to environmental affairs leadership in all of its business activities. IBM has had longstanding corporate policies of providing a safe and healthful work place, protecting the environment, and conserving energy and natural resources, which were initiated in 1967, 1971 and 1974 respectively. They have served the environment and our business well over the years and provide the foundation for the following corporate policy objectives:

- Provide a safe and healthful workplace, including avoiding or correcting hazards and ensuring that personnel are properly trained and have appropriate safety and emergency equipment.
- Be an environmentally responsible neighbour in the communities where we operate and act promptly and responsibly to correct incidents or conditions that endanger health, safety, or the environment, report them to authorities promptly, and inform everyone who may be affected by them.
- Maintain respect for natural resources by practicing conservation and striving to recycle materials, purchase recycled materials, and use recyclable packaging and other materials.
- Develop, manufacture, and market products that are safe for their intended use, efficient in their use of energy, protective of the environment, and that can be recycled or disposed of safely.
- Use development and manufacturing processes that do not adversely affect the environment, including developing and improving operations and technologies to minimize waste, prevent air, water, and other pollution, minimize health and safety risks, and dispose of waste safely and responsibly.
- Ensure the responsible use of energy throughout our business, including conserving energy, improving energy efficiency, looking for safer energy sources, and giving preference to renewable over non-renewable energy sources when feasible.
- Participate in efforts to improve environmental protection and understanding around the world and share appropriate pollution prevention technology, knowledge and methods.
- Utilize IBM products, services and expertise around the world to assist in the development of solutions to environmental problems.
- Meet or exceed all applicable government requirements and voluntary requirements. Where non exist, set and adhere to stringent standards of our own and continually improve these standards in light of technological advances and new environmental data.
- Strive to continually improve IBM's Environmental management system and performance, and periodically issue progress reports to the general public.
- Conduct rigorous audits and self-assessments of IBM's compliance with this policy, measure progress of IBM's environmental affairs performance, and report periodically to the Board of Directors.

Every employee and every contractor on IBM premises is expected to follow the company's policies and to report any environmental, health, or safety concern to IBM management. Managers are expected to take prompt action.

Corporate Policy Number 139A, signed by Louis V. Gerstner, Jr., on July 14, 1995 (Gerstner 1995)

6.3 Timeline of Highlights in IBM's Environmental Activity

The following information was provided by IBM CEA.

6.3.1 Energy Conservation & Climate Protection

Year	Highlight
1974	Corporate Policy on Energy Conservation
1976	Think, the company magazine, devoted an entire issue to IBM's energy conservation and environmental programs.
1990	Pioneered employee commute program. By 2007, nearly 1/3 of IBM's global workforce participated in this program. IBM estimates that it has conserved approximate 7.75M gallons of fuel, and avoided 64,000 tons of CO2 emissions in the U.S.
1995	Began to voluntarily report its greenhouse gas emissions.
1996	Established energy conservation goal. In 2007, conservation projects saved energy equivalent to 3.8% of IBM's actual global energy use.
1998	1st semiconductor company to set a specific numeral perfluorocompounds (PFCs) emissions reduction target.
2000-2001	Contributed to the publication of the World Resources Institute GHG Protocol, a corporate accounting and reporting standard
2005	Met goals under USEPA Climate Leaders Program
2006	Set 2nd generation CO2 reduction goal: To reduce CO2 emissions associated with IBM's energy use by 12% between 2005 and 2012 through energy conservation and the use of renewable energy or procurement of Renewable Energy Credits or comparable instruments
2007	Using a baseline of 2000, IBM achieved a 51% reduction in PFC Emissions between 2000 and 2007
2007	Using a baseline of 2001, IBM increased its use of renewable energy from less than 50MWh in 2001, to more than 400MWH in 2007
2007	Using a baseline of 1990, IBM's global energy conservation actions had, by 2007, saved 4.6B kWh, avoided 3.1M tons of CO2 emissions (equal to 45% of its 1990 emissions), and saved $310M.

Table 16: Highlights in IBM's Energy Conservation & Climate Protection Efforts

6.3.2 Product and Process Stewardship (Design for Environment)

Year	Highlight
1973	Established Process Environmental Impact Assessment Program
1978	Eliminated polychlorinated biphenyls (PCBs) in products
1990	Prohibited the use of the following in packaging: Ozone Depleting Compounds as expansion agents, polybrominated pibhenyls (PBBs) and polybrominated diphenyl ethers (PBDEs), and heavy metals (including lead, hexavalent chromium, and mercury).
1991	Formalized IBM's Product Stewardship Program. It included considerations for: reuse and reclability, upgradablity, energy efficiency, use of recycled materials, use of environmentally preferred materials, and safe disposition.
1992	Became a Charter member of the Energy Star program.
1993	Eliminated Class I Ozone Depleting Compounds from products and processes
1993	Prohibited PBBs and PBDEs in products
1993	Prohibited Asbestos from use in products
1993	Prohibited lead from use in plastic housing and paints. Prohibited use of hexavalent chromium in inks, dyes, pigments and paints used for IBM products. Prohibited mercury from use in IBM parts of assemblies (exceptions, i.e., in lamps, were added in 1999)
1995	Eliminated Class II Ozone Depleting Compounds from products and processes
1995	Established a goal for recycled plastic resins use in products. In 2007, 36% by weight of resins procured through IBM's corporate contracts contained recycled resin
2004	Contributed to EXMA-341, the international standard on Design for Environment
2005	Project partner with the USEPA's Design for Environment Program on Life-Cycle Analysis of lead-free solders
2006	Prohibited nonreacted tetrabromobisphenol-A (TBBP-A) and polyvinyl chloride (PVC) from use in IBM-designed IT system enclosures.
2007	Prohibited certain perfluorinated compounds from research, development and manufacturing processes. Prohibited nonreacted TBBP-A and PVC from use in IT system enclosures.

Table 17: Highlights in IBM's Product & Process Stewardship Efforts

6.3.3 Resource Conservation & Pollution Prevention

Year	Highlight
1988	Established nonhazardous waste recycling goal, which has been met annually
1989	Offered IBM's first product take back program
1994	Established Global Materials Recovery Centre network for product re-use and recycling
1995	Achieved a reduction of 95% in hazardous waste generation since 1987
1995	Established goal to achieve year-to-year reduction in hazardous waste generation from IBM's manufacturing processes indexed to output, which has been met annually
1997	Established goal for use of powder coating for product decorative finishes. By 2007, IBM had avoided 4.4 million pounds of volatile organic compounds since establishing this goal
2000	Established a water conservation goal for semiconductor manufacturing operations. By 2007, IBM had achieved an average of annual water savings of 7%
2003	IBM documented its recycling of over 1 billion pounds of end-of-life product waste. It was the first company to reach the 1-billion-pound threshold in the IT industry
2007	IBM sent less than 1% of end-of-life product waste to landfill or incineration

Table 18: Highlights in IBM's Resource Conservation & Pollution Prevention Efforts

6.3.4 Supply Chain Management and Collaboration

Year	Highlight
1972	Established Supplier Environmental Evaluation Program
1979	Introduced 1st reusable ARBO crate for servers throughout logistics supply chain
1980	Expanded Supplier Evaluation Program to cover certain production-related suppliers
1990	Published Corporate Packaging guide and shared with suppliers
1991	Further expanded Supplier Evaluation Program to include product recycling and disposal suppliers
1997	Published Engineering Specification on Baseline Environmental Requirements for supplier deliverables
2004-2005	Initiated and led the Joint Industry Group on the development of uniform product content reporting requirements
2004	Established IBM Supplier Conduct Principles and supporting audits. IBM is one of the leading companies that supported the Electronic Industry Citizenship Coalition
2006	Joined USEPA's SmartWay™ Transport Partnership. Within a year, by 2007, over 80% of US-based transport spending by IBM was with SmartWay™ carriers. The company is voluntarily expanding its SmartWay™ commitments outside of the US
2008	Participating in the Carbon Disclosure Project's Supply Chain Leadership Collaboration
2008	IBM commits to ship 100% of products from System Z and Supercomputer families to customers in North America exclusively using a SmartWay™ carrier

Table 19: Highlights in IBM's Supply Chain Management & Collaboration Efforts

6.3.5 History of Collaboration and Partnerships

Year	Partnership
1990	International Cooperative for Ozone Layer Protection (ICOLP)
1991	USEPA 33/50 Toxics Reduction Program, charter member
1992	USEPA Energy Star, charter member
1993	IBM Environmental Research Program. By 1997 IBM had provided more than $16 million in equipment and cash to 14 rigorously selected universities and research institutions worldwide.
1994	SWICO Electronic Recycling System
1995	Climate Vision – DOE 1605(b) Voluntary Greenhouse Gas Reporting Program, since inception
1996	1st PFC Emissions Reduction MOU with the USEPA
1996	UNESCO Biosphere Reserve at Menorca, Spain and Portugal
2000	WWF (charter member), Pew Centre on Global Climate Change - Business Environmental Leadership Council (first IT company invited to join this group), USEPA National Environmental Achievement Track, WRI Green Power Market Development Group (charter member)
2002	USEPA Climate Leaders (charter member), National Greenhouse Challenge Plus Program in Australia
2002	2nd PF Emissions Reduction MOU with USEPA
2003	Chicago Climate Exchange (charter member), Carbon Disclosure Project (since inception)
2006	USEPA SmartWay™ Transport Partnership
2008	The Climate Group
2008	Launched Eco-Patent Commons

Table 20: A Sampling of IBM's History of Collaboration and Partnership

6.4 Examples of IBM's CSR Key Performance Indicators

Employees	2005	2006	2007	Future goals
Employee satisfaction	65%	65%	66%	Management will continue to work with employees to improve job satisfaction
Workforce diversity *(Percentage of Women Global Executives)*	19.4%	19.7%	20.3%	Maintain or grow percentage of women in IBM's employee base
Training *(Learning investment, Learning hours)*	$648M, 18M learning hrs which equals 55 hours per employee	$682M, 19.6M learning hrs which equals 55 hours per employee	$622M, 22.3M learning hrs which equals 58 hours per employee	Increase employee participation in learning

Table 21: IBM CSR Key Performance Indicators Related to Employees
Source: IBM Corporate Responsibility Website[41]

Company	2005	2006	2007	Future goals
Global contributions	148.5M	152.1M	166.6M	Equal or higher contributions
US vs. International	US: $103M (69%) Intl.: $45.5M (31%)	US: $95.7M (63%) Intl.: $56.4M (37%)	US: $91.8M (55%) Intl.: $74.8M (45%)	Increase percentage of international giving
Distribution by type	Cash 26%, Technology 43%, Services 31%	Cash 32%, Technology 39%, Services 29%	Cash 26%, Technology 34%, Services 40%	Maintain or increase technology and services
Global employee volunteerism[42]	56,708 employees, 2.75M hours logged	70,207 employees, 4.45M hours logged	94,974 employees, 4.41M hours logged[43]	+10% for employees and hours logged

Table 22: IBM CSR Key Performance Indicators related to Company Contributions
Source: IBM Corporate Responsibility Website

[41] For more information see: http://www.ibm.com/responsibility/key_perform.shtml, and http://www.ibm.com/ibm/responsibility/index.shtml.

[42] Note that the program also involves IBM retirees. In 2007, for example, there were 11,555 retiree registrations, and 1.88M retiree hours logged.

[43] In 2007, the number of registrants in the program increased but the hours logged decreased. As explained by CCCA: "The program began with the incentive that, if you logged 40 hours over 5 months, you could get a cash award for the non profit you volunteered with ($1,000) or a technology grant ($2,500 value). The number of cash awards has not increased (in fact, I think they've declined some), so this may have impacted the incentive to "log" one's hours even though the volunteerism has actually taken place. Also, some of the non-profits with whom our employees our working may have received all the technology they need and no longer need a technology grant. In fact, [one of our employees] noted that he sometimes forgets to log his hours because he knows the non-profit with whom he works doesn't need a technology grant, so he doesn't have the same incentive he used to have for making sure he logged his hours."

6.5 IBM's CSR Key Performance Indicators for Supply Chain Social Audits

The following are the initial supplier audit results conducted for IBM by third-party agencies specializing in social responsibility between 2004 and 2007. The graph shows the cumulative findings for suppliers of manufactured products and services in Brazil, China, Czech Republic, Hungary, India, Mexico, Philippines, Poland, Romania, Slovakia, Taiwan and Thailand (IBM 2008, 64-69).

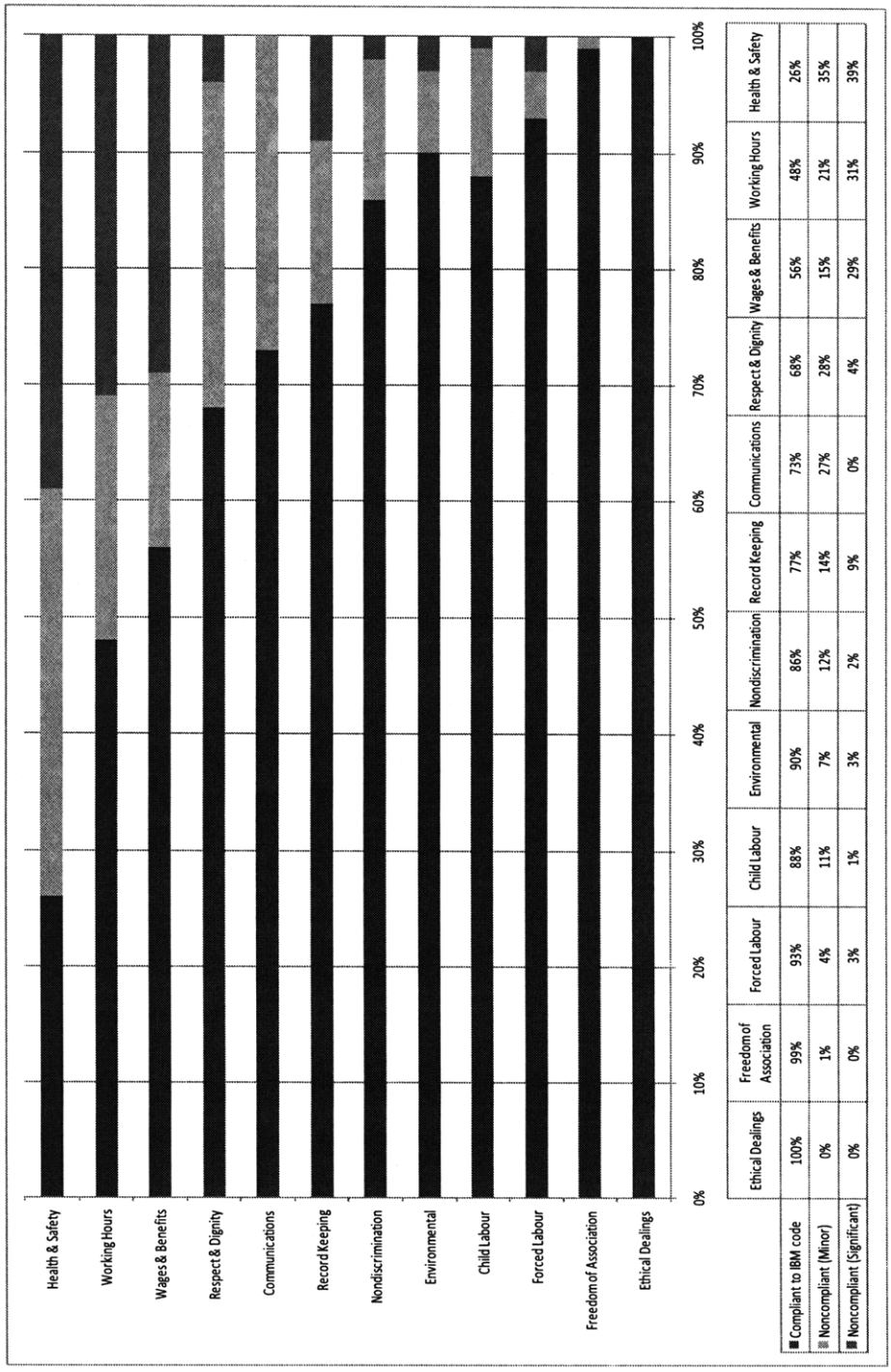

Figure 26: IBM CSR Key Performance Indicators for Supply Chain Social Audits

6.6 IBM Supplier Conduct Standards

The following are IBM's Supplier Conduct Principles. As IBM explains, "these principles speak to the commitments we make to our clients, our legacy of innovation and relationships built on trust and personal responsibility. They establish the standards required for conducting business with IBM" (IBM Integrated Supply Chain 2004). The company's goal is to work with its suppliers to ensure full compliance with these principles, as they in turn apply them to their own suppliers. IBM considers these principles during the selection of suppliers, and actively monitors their compliance (IBM Integrated Supply Chain 2004).

Forced or Involuntary Labor

IBM Suppliers will not use forced or involuntary labor of any type (e.g., forced, bonded, indentured or involuntary prison labor); employment is voluntary.

Child Labor

IBM Suppliers will not use child labor. The term "child" refers to any person employed under the age of 15 (or 14 where the law of the country permits), or under the age for completing compulsory education, or under the minimum age for employment in the country, whichever is greatest. We support the use of legitimate workplace apprenticeship programs which comply with all laws and regulations applicable to such apprenticeship programs.

Wages and Benefits

IBM Suppliers will, at a minimum, comply with all applicable wage and hour laws and regulations, including those relating to minimum wages, overtime hours, piece rates and other elements of compensation, and provide legally mandated benefits.

Working Hours

IBM Suppliers will not exceed prevailing local work hours and will appropriately compensate overtime. Workers shall not be required to work more than 60 hours per week, including overtime, except in extraordinary business circumstances with their consent. In countries where the maximum work week is less, that standard shall apply. Employees should be allowed at least one day off per seven-day week.

Nondiscrimination

IBM Suppliers will not discriminate in hiring and employment practices on grounds of race, religion, age, nationality, social or ethnic origin, sexual orientation, gender, gender identity or expression, marital status, pregnancy, political affiliation, or disability.

Respect and Dignity

IBM Suppliers will treat all employees with respect and will not use corporal punishment, threats of violence or other forms of physical coercion or harassment.

Freedom of Association

Suppliers shall respect the legal rights of employees to join or to refrain from joining worker organizations, including trade unions. Suppliers have the right to establish favorable employment conditions and to maintain effective employee communication programs as a means of promoting positive employee relations that make employees view third-party representation as unnecessary.

Health and Safety

Suppliers will provide their employees with a safe and healthy workplace in compliance with all applicable laws and regulations. Consistent with these obligations, IBM
Suppliers must have and implement effective programs that encompass life safety, incident investigation, chemical safety, ergonomics, etc., and provide the same standard of health and safety in any housing that is provided for employees. Suppliers should strive to implement management systems to meet these requirements.

Protection of the Environment

IBM Suppliers will operate in a manner that is protective of the environment. At a minimum, suppliers must comply with all applicable environmental laws, regulations and standards, such as requirements regarding chemical and waste management and disposal, recycling, industrial wastewater treatment and discharge, air emissions controls, environmental permits and environmental reporting. Suppliers must also comply with any additional environmental requirements specific to the products or services being provided to IBM as called for in design and product specifications, and contract documents. Suppliers should strive to implement management systems to meet these requirements.

Laws, Including Regulations and Other Legal Requirements

IBM Suppliers will comply with all applicable laws and regulations in all locations where they conduct business.

Ethical Dealings

IBM expects our suppliers to conduct their business in accordance with the highest ethical standards. Suppliers must strictly comply with all laws and regulations on bribery, corruption and prohibited business practices.

Communications

Suppliers must make the IBM Supplier Conduct Principles and other relevant information available to employees in the native language(s) of the employees and supervisors.

Monitoring/Record Keeping

Suppliers must maintain documentation necessary to demonstrate compliance with IBM's Supplier Conduct Principles and must provide IBM with access to that documentation upon IBM's request.

6.7 IBM's Environmental Performance Database

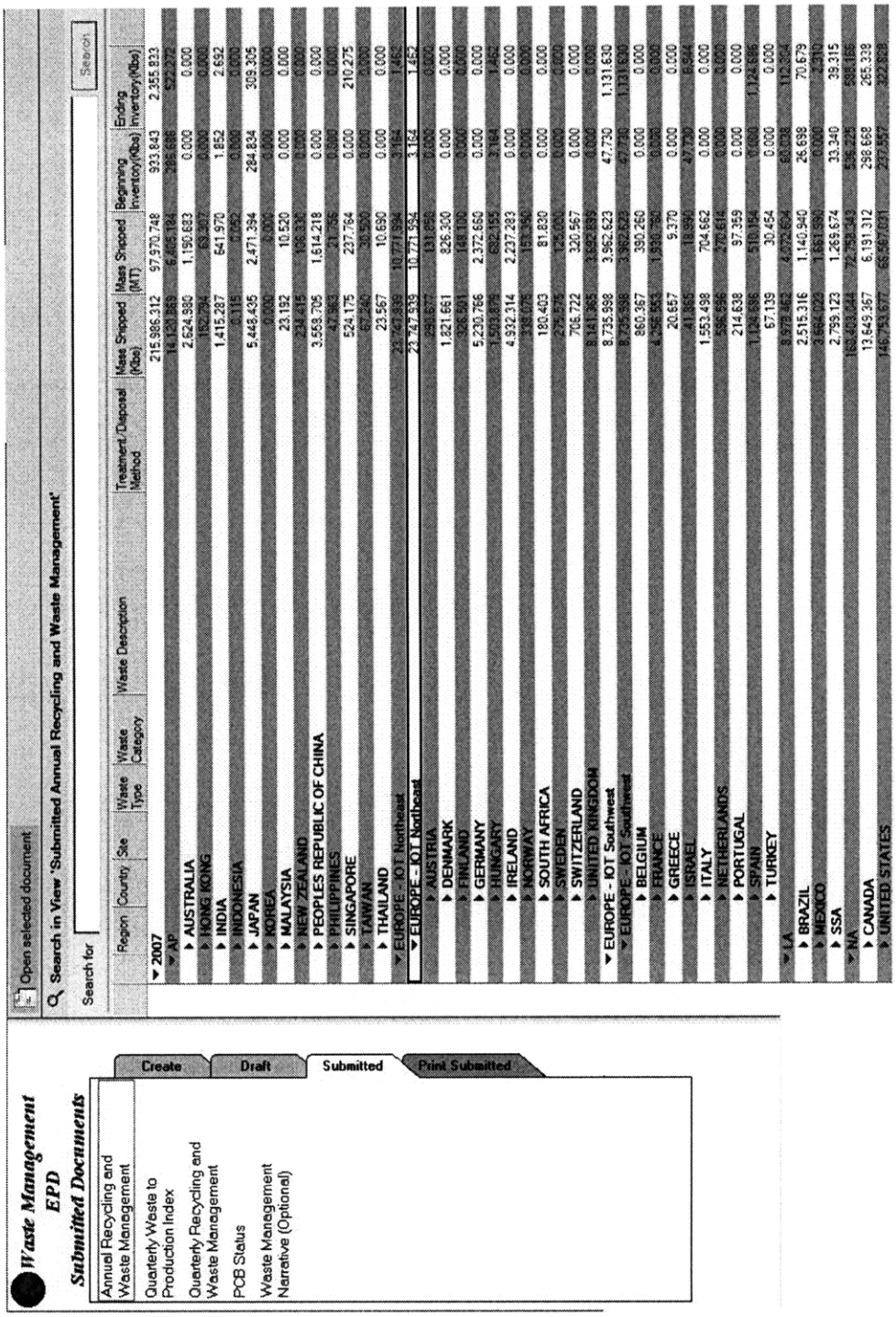

Figure 27: Image A of IBM's Environmental Performance Database

Note: the "zero" value in the field "Beginning Inventory" indicates a location had shipped out all waste volume generated in the prior year by the end of that year, resulting in none on hand at the beginning of the reporting year. The "zero" value in the field "Ending Inventory" indicates a location had shipped out all waste volume generated in the reporting year.

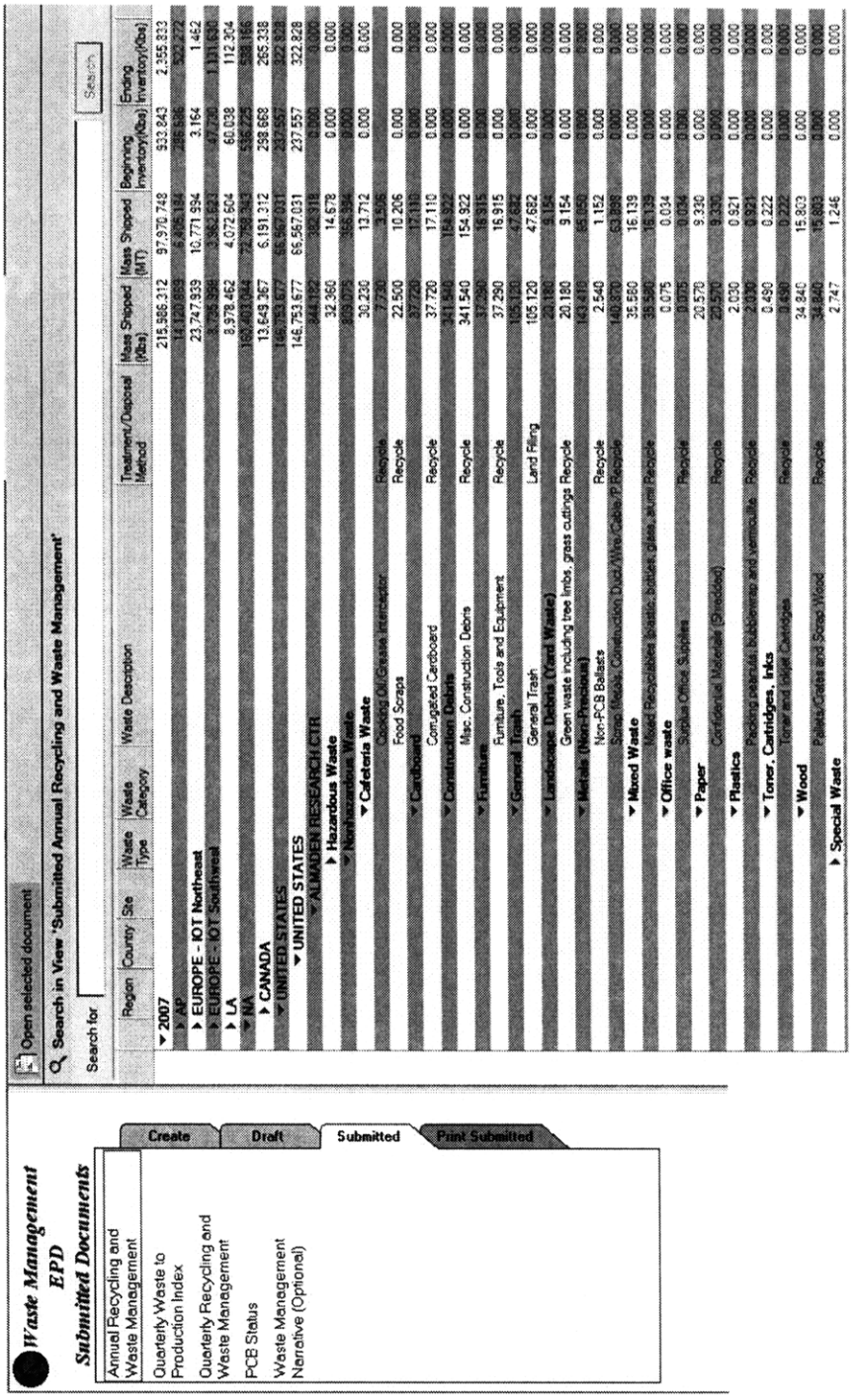

Figure 28: Image B of IBM's Environmental Performance Database

Note: the "zero" value in the field "Beginning Inventory" indicates a location had shipped out all waste volume generated in the prior year by the end of that year, resulting in none on hand at the beginning of the reporting year. The "zero" value in the field "Ending Inventory" indicates a location had shipped out all waste volume generated in the reporting year.

6.8 IBM's Energy & Environment Framework: Identified Client Challenges

The IBM Energy & Environment Model is a holistic framework to help organizations develop effective action plans to address environmental impacts across their operations. As explained by IBM, it works in two dimensions:

1. It helps identify environmental intersections across the business, and can therefore help organizations choose where to focus and how to prioritise their resources and efforts.
2. It guides organizations to environmental management solutions that help deliver environmental improvements in priority operational areas.

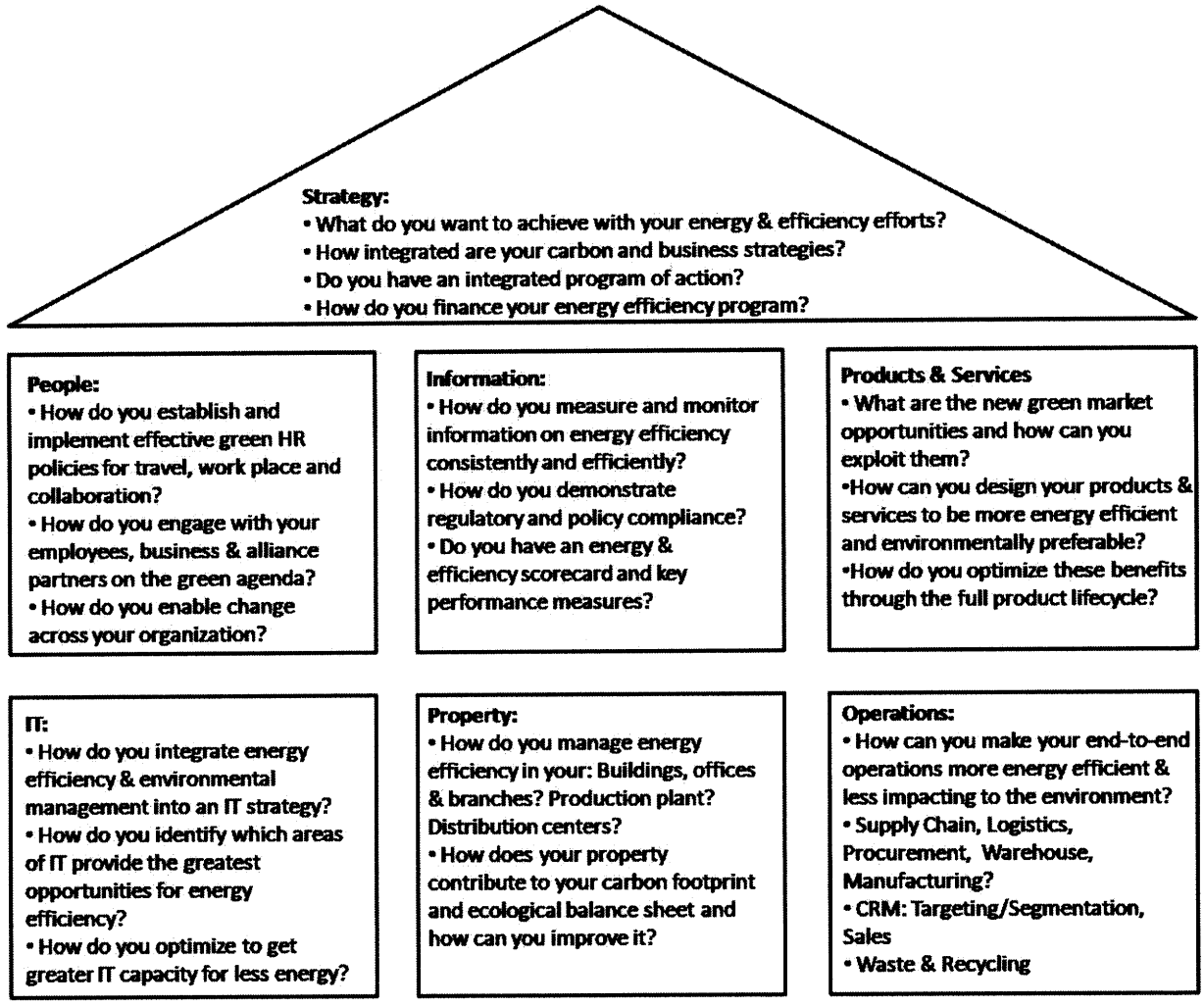

Figure 29: IBM's Energy & Environment Framework - Identified Client Challenges
(IBM 2008)

6.9 List of Interviews

The following people were interviewed between June 6 2008 and December 10 2008, either in person or over the phone. The list is organized in alphabetical order by last name, and includes IBMers based at facilities across the United States (including Armonk NY, Somers NY, Yorktown NY, Burlington VT, and Raleigh NC), France, Brazil, and India.

Name	Position
Adams, Jackie	Senior Technical Staff Member and Technical Lead Chair, Centre of Excellence for Worldwide Product Environmental Compliance, Global Procurement
Amand, Eric	Program Manager, Global Logistics – Americas, Integrated Supply Chain
Aurrichio, Patrick	Program Manager, Global Environmental Management System, Corporate Environmental Affairs (CEA)
Baker, Paula	Vice President Global Community Initiatives, Corporate Citizenship & Corporate Affairs
Balta, Wayne	Vice President Corporate Environmental Affairs & Product Safety
Bartels, Guido	General Manager, Global Energy & Utilities Industry, Sales and Distribution
Bianchini, Joao Luis	Program Manager, Real Estate Site Operations, Brazil
Bolz, Michelle	Program Manager, Engineer on Wafer Recycle Project, Systems & Technology Group, Burlington Semiconductor Fabricator, VT
Bousquet, Isabelle	Practice Leader, Strategic Outsourcing Data Centre Operations, IBM Global Services Europe
Brech, Brad	Distinguished Engineer, Software Strategy & Architecture, Systems & Technology Group, responsible for Energy Efficiency in Hardware Products
Brinkley, Anne	Advisory Engineer, Engineering Centre for Environmentally Conscious Products, Corporate Operations, Research Triangle Park
Castel, René	Project Manager, Demanufacturing, Global Asset Recovery Services, IBM Montpellier, France
Charrut, Jean-Louis	Program Manager, Quality Environmental Health & Safety, IBM Montpellier
Dietrich, Jay	Senior Technical Staff Member and Program Manager, Energy and Climate Stewardship, CEA
Dionne, Edan	Director, Corporate Environmental Affairs
Farro, Erika	Program Manager, Intelligent Utility Network Coalition, Global Energy & Utilities Industry, Sales and Distribution
Ferretti, Louis	Director, Centre of Excellence for Environmental Compliance & Supply Chain Social Responsibility, IBM Integrated Supply Chain, Worldwide Engineering, Global Procurement
Fields, Alex	Program Manager, Supply Chain Environmental Initiatives, Global Procurement
Fiske, Nathan	Environmental Manager, Systems & Technology Group, Burlington Semiconductor Fabricator, VT
Fleming, Martin	Vice President Corporate Strategy
Gabriel, John	Program Manager, Global Procurement Supply Chain Social Responsibility & Chair of EICC, Global Procurement
Gonzalez, Ricardo	Program Manager, Waste and Product End-of-Life Management, CEA
Hamann, Hendrik	Manager, Photonics and Thermal Physics, Watson Research Centre

Helsen, Jacques	Site Manager, Montpellier, France
Hill, Bill	Engineering Manager, Systems & Technology Group, Burlington Semiconductor Fabricator, VT
Izor, Ray	PFC Reduction Efforts, Systems & Technology Group, Burlington Semiconductor Fabricator, VT
Jagielski, Thom	Environmental Engineering and Operations Manager, Systems & Technology Group, Burlington Semiconductor Fabricator, VT
Kadam, Priti	Program Manager, Country India, CEA
Kohli, Ruma	Program Manager, Environmental Engineering and Operations, Systems & Technology Group, Burlington Semiconductor Fabricator, VT
Laguerquist, Mark	PFC Reduction Efforts, Systems & Technology Group, Burlington Semiconductor Fabricator, VT
Langone, Frank	Senior Engineer, Environmental and Safety Services Research Division, Thomas J. Watson Research Centre
Lechner, Richard	Vice President Energy and Environment (Business Opportunities)
Legrand, Charles	Program Manager, Global Asset Recovery Services, Montpellier, France
Legrand, Jean-Marc	RESO Manager, IBM France Northwest Africa
Litow, Stan	Vice President Corporate Citizenship & Corporate Affairs
Lyon, Diana	Program Director, External Relations, CEA
MacDowell, Laird	Engineer, Chemical Supplier Liaison , Systems & Technology Group, Burlington Semiconductor Fabricator, VT
Mann, Tim	Manager, Environmental Product & Process Stewardship, CEA
Mathur, Rajeev	Program Director, Real Estate Site Operations, Asia-Pacific Integrating Operating Team
Molloy, Chris	Distinguished Engineer, Data Centre Energy Efficiency, Integrated Technology Delivery, Global Technology Services
Mooney, Gerard	General Manager, Global Government and Education, Sales and Distribution
Nora, Henrique	Manager, Site Operations, Brazil
Nunes, Sharon	Vice President Strategic Growth Initiatives, Big Green Innovations
Peterson, Greg	Manager, Global Energy, RESO
Pochitaloff-Huvale, Michel	Program Manager, France and BENELUX, CEA. BENELUX is Belgium, the Netherlands and Luxemburg
Rodriguez, Jean-Michel	Infrastructure Architect, "Green" Data Centres, Montpellier, France
Rolita, George	Environmental Affairs Program Manager, RESO Americas U.S.
Roux, Philippe	Manager, System z and High-end p Manufacturing, ISC, Montpellier, France
Ruf, Mary_Sue	Chemical Coordinator/IH, IBM T.J. Watson Research Centre
Sablich, Anthony	Program Manager, Real Estate Site Operations, Latin America
Sams, Steve	Vice President Global Sites and Facilities Services, Global Technology Services
Sindhu, Kuldip	General Manager, Real Estate Site Operations, Daksh Subsidiary
Souza, Demlo	Manager, Data Centre & Energy, Brazil
Terme, Marie-Christine	Team Leader, Broker Sales,, Global Asset Recovery Services, Montpellier, France
Visalli, Nicolette	Manager, Environmental & Chemical Services, Watson Research Centre
Wysmuller, Steve	Program Manager, Supplier Evaluation and Environmental Performance Database Management, CEA

6.10 Guiding Questions for Interviews

The following are some of the questions that were used to guide our case study interviews. Note that these and other questions were tailored according to the responsibilities of the interviewee. An interview guideline was usually shared with people before the interview took place. Before the start of each conversation, I would explain, first, the purpose of the interview, and second, that their responses would be treated as confidential.

1. What are your key business and environmental responsibilities?

2. What are your key business and environmental goals? How are these established, and how are they revised? Who is involved in this process?
    a. How do you select and define the metrics you will focus on?

3. With respect to your environmental responsibilities, which are your top three challenges, and how do you approach them? Can you tell me a story that illustrates these challenges?

4. How has IBM's concern towards sustainability affected its products and processes? Can you illustrate this with stories?

5. What resources do you rely on for accomplishing your environmental and sustainability responsibilities and goals, and for addressing the challenges you are faced with?

6. What have been your major environmental achievements? What has enabled such achievements? Whose buy-in did you need, and how did you get it? Have you run into any obstacles?

7. Can you describe a general timeline of change in environmental and sustainability activities at IBM?

8. What does sustainability mean for you and your organization, formally and in practice?

GLOSSARY

CCCA	Corporate Citizenship & Corporate Affairs
CEA	Corporate Environmental Affairs
CEO	Chief Executive Officer
CDP	Carbon Disclosure Project
CMA	Chemical Manufacturers Association
CoE	Centre of Excellence for Environmental Compliance
CSR	Corporate Social Responsibility
CTRC	Computing-Tabulating-Recording Company
DFE	Design for Environment
E&E	Energy & Environment
EBO	Emerging Business Opportunity
ECECP	Engineering Centre of Environmentally Conscious Products
EET	Environmental Engineering Team
EIA	Environmental Impact Assessment
EICC	Electronics Industry Citizenship Coalition
EIRS	Environmental Incident Reporting System
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPD	Environmental Performance Database
ESG	Environmental, Social & Governance
GBS	Global Business Services
GEO	Global Environment Outlook
GHG	Greenhouse Gas
GIO	Global Innovation Outlook
IBM	International Business Machines Corporation
IPD	Integrated Product Design
ISO	International Organization for Standardization
IT	Information Technology
ITD	Integrated Technology Delivery
IUN	Intelligent Utility Network
NHW	Non-Hazardous Waste
PBBs	polybrominated biphenyls
PBDEs	polybrominated diphenyl ethers
PELM	Product End-of-Life Management
PEP	Product Environmental Profile
PWB	Printed Wiring Board
RECD	Real Estate & Construction Division
RESO	Real Estate Site Operations
SCEI	Supply Chain Environmental Initiatives
SCSR	Supply Chain Social Responsibility
STG	Systems & Technology Group
UNEP	United Nations Environment Programme
VP	Vice-President
WBCSD	World Business Council for Sustainable Development
WCED	World Commission on Environment and Development

BIBLIOGRAPHY & REFERENCES

Alexander, John. "Environmental Sustainability Versus Profit Maximization: Overcoming Systemic Constraints on Implementing Normatively Preferable Alternatives." *Journal of Business Ethics* 76 (2007): 155-162.

Andrews, Richard N. L., Nicole Darnall, and Deborah Rigling Gallagher. "Environmental Management Systems: A Sustainable Strategy for a Sustainable World?" *Paper prepared for presentation at the Eigth International Conference of teh Greening Industry Network, "Sustainability: Ways of Knowing, Ways of Acting".* Chapel Hill, North Carolina, November 14-17, 1999.

Andrews, Richard N.L., et al. "Environmental Management Systems: Do They Improve Performance?" National Database on EMSs - Project Final Report: Executive Summary, The University of North Carolina at Chapel Hill, Chapel Hill, 2003.

Ashford, Nicholas. "An Innovation-Based Strategy for a Sustainable Environment." In *Innovation-Oriented Environmental Regulation: Theoretical Approach and Empirical Analysis*, edited by Jens Hemmelskamp, Klaus Rennings and Fabio Leone, 67-107. Heidelberg, New York: ZEW Economic Studies, 2000.

Ashford, Nicholas, and Ralph Hall. "Overview of the Book." In *Technology, Globalization, and Sustainable Development*, by Nicholas Ashford and Ralph Hall. Forthcoming.

Bhat, Vasanthakumar N. *The Green Corporation: The Next Competitive Advantage.* Westpor, CT: Quorum Books, 1996.

Bjelland, Osvald M., and Robert Chapman Wood. "An Inside View of IBM's "Innovation Jam"." *MIT Sloan Management Review* (Massachusetts Institttute of Technology) 50, no. 1 (Fall 2008): 32-40.

Browner, Carol. *US EPA History: Pollution Prevention Takes Center Stage.* September 21, 2007. http://www.epa.gov/history/topics/ppa/01.htm (accessed August 12, 2008).

Carroll, Archie. "A Three-Dimensional Conceptual Model of Corporate Performance." *The Academy of Management Review* 4, no. 4 (October 1979): 497-505.

Carroll, Archie. "The Four Faces of Corporate Citizenship." *Business and Society Review*, 1998: 1-7.

Cary, F.T. "IBM Corporate Policy on Conservation." September 9, 1974.

CERES, RiskMetrics Group. *Corporate Governance and Climate Change: Consumer and Technology Companies.* Boston: CERES, 2008.

Chandler, Jr., Alfred D. *Inventing the Electronic Century: The Epic Story of the Consumer Electronics and Computer Industries.* New York, NY: The Free Press, 2001.

Chouinard, Yvon. *Let My People Go Surfing: The Education of a Reluctant Businessman.* New York, NY: The Penguin Press, 2005.

Christensen, Clayton M. *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail.* Boston, MA: Harvard Business School Press, 1997.

Clapp, Jennifer. "The Privatization of Global Environmental Governance: ISO 14000 and the Developing World." In *The Business of Global Environmental Governance*, edited by David L. Levy and Peter J. Newell, 225-248. Cambridge, MA: The MIT Press, 2005a.

Clapp, Jennifer, and Peter Dauvergne. *Paths to a Green World: The Political Economy of the Global Environment.* Cambridge, MA: The MIT Press, 2005b.

Climate Counts. *Climate Counts - Scorecard Sectors: Electronics.* 2008. http://www.climatecounts.org/scorecard_sectors.php?id=13 (accessed November 15, 2008).

CNN. *Fortune 500.* 2009a. http://money.cnn.com/magazines/fortune/fortune500/2008/full_list/ (accessed January 10, 2009).

—. *Global 500.* 2009b. http://money.cnn.com/magazines/fortune/global500/2008/full_list/ (accessed January 10, 2009).

Council of the European Union. *Resolution of the Employment and Social Policy Council on CSR.* December 2002. http://ec.europa.eu/employment_social/soc-dial/csr/csr_resolution.html (accessed December 5, 2008).

Deutsch, Claudia H. "Managing; Giving the Environment Teeth." *The New York Times*, March 3, 1991.

Dionne, Edan. "Supply Chain Environmental Management Presentation." July 31, 2008.

Doppelt, Bob. *The Power of Sustainable Thinking: How to Create a Positive Future for the Climate, the Planet, your Organization and your Life.* London: Earthscan, 2008.

Ebbers, Mike, Alvin Galea, Michael Schaefer, and Marc Tu Duy Khiem. *The Green Data Center: Steps for the Journey.* Red Paper, IBM Corporation, 2008.

EICC. *EICC .* 2008. http://www.eicc.info/ (accessed November 13, 2008).

—. "Elecronic Industry Citizenship Coalition Code of Conduct, Version 2.0." EICC, October 2005.

Elkington, John. "Towards the Sustainable Corporation: Win-Win-Win Business Strategies for Sustainable Development." *California Management Review* 36, no. 3 (1994): 90-100.

Enkvist, Per-Anders, Tomas Nauclér, and Jeremy M. Oppenheim. "Business Strategies for Climate Change." *McKinsey Quarterly* (McKinsey & Company, Inc.), no. 2 (June 2008): 24-33.

Esty, Daniel D., and Andrew S. Winston. *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage.* New Haven, CT: Yale University Press, 2006.

Eurosif, WestLB. "ICT Hardware Sector Report." Sector Report, 2008.

Ferreti, Lou. "Integrated Supply Chain Presentation." August 2008.

Friedman, Milton. *Capitalism and Freedom.* 40th Anniversary Edition. Chicago, IL: The University of Chicago Press, 2002.

Gallagher, Deborah Rigling. "Building Environmental Management Systems Focused on Sustainability: The Influence of Employees, Company Leaders and External Stakeholders." In *New Horizons in Research on Sustainable Organisations: Emerging Ideas, Approaches and Tools for Practitioners and Researchers*, edited by Mark Starik, Sanjay Sharma, Carolyn Egri and Rick Bunch, 60-78. Sheffield: Greenleaf Publishing Ltd, 2005.

Gallagher, Deborah Rigling, Nicole Darnall, and Richard N. L. Andrews. "International Standards for Environmental Management Systems: A Future Promise for Environmental Policy?" *Paper for presentation at the Twenty-First Annual Research Conference for the Association for Public Policy Analysis and Management Fall Conference: "Public Policy Analysis and Management: Global and Comparative Perspectives".* Washington, November 4-6, 1999.

Garvin, David A., and Lynne C. Levesque. "Emerging Business Opportunities at IBM (A)." *HBS Case* (Harvard Business School), February 2005.

Gerstner, Jr., Louis V. "IBM Corporate Policy on Environmental Affairs (139A)." July 14, 1995.

—. *Who Says Elephants Can't Dance?* New York, NY: HarperCollins Publishers Inc., 2002.

Global Leadership Network. *What is the global leadership network?* 2008. https://www.globalleadershipnetwork.org/whatisgln.php (accessed November 23, 2008).

Goldman Sachs. *GS SUSTAIN Monthly Focus: Technology Hardware added to GS SUSTAIN.* The Goldman Sachs Group, Inc., 2008.

Goldman Sachs. *Introducing GS SUSTAIN.* The Goldman Sachs Group, Inc., 2007.

Govindarajan, Vijay, and Chris Trimble. *10 Rules for Strategic Innovators: From Idea to Execution.* Boston, MA: Harvard Business School Press, 2005.

Grimm, Ed. "Update on Safety, Energy And the Environment." *Think*, 1992, Special Report ed.

Hamilton, Martha M. ""Clean" IBM Tackles a New, Toxic Problem; High-Tech Industries Create Own Brand of Pollution." *The Washington Post*, October 15, 1984: 1.

Hart, Stuart L. *Capitalism at the Crossroads: Aligning Business, Earth, and Humanity.* 2nd Edition. Upper Saddle River, New Jersey: Wharton School Publishing, 2007.

Hart, Stuart L., and Mark B. Milstein. "Creating Sustainable Value." *Academy of Management Executive* 17, no. 2 (2003): 56-67.

Hawken, Paul, Amory Lovins, and L. Hunter Lovins. *Natural Capitalism: Creating the Next Industrial Revolution.* New York, NY: Back Bay Books / Little, Brown and Company, 1999.

Hirshberg, Gary. *Stirring It Up: How to Make Money and Save the World.* New York, NY: Hyperion, 2008.

Hoffman, Andrew J. *Competitive Environmental Strategy: A Guide to Changing Business Landscape.* Washington, D.C.: Island Press, 2000.

Hoffman, Andrew J. *Getting Ahead of the Curve: Corporate Strategies That Address Climage Change.* Report on Strategies for Climate Change, Arlington: Pew Center on Global Climate Change, 2006b.

Hoffman, Andrew J. "Institutional Evolution and Change: Environmentalism and the U.S. Chemical Industry." *Academy of Management Journal* 42, no. 4 (1999): 351-371.

Hoffman, Andrew J., and Max H. Bazerman. "Changing practice on sustainability: understanding and overcoming the organizational and psychological barriers to action." In *Organizations and the Sustainability Mosaic: Crafting Long-Term Ecological and Societal Solutions*, edited by Sanjay Sharma, Mark Starik and Bryan Husted, 84-105. Cheltenham: Edward Elgar, 2006a.

Hoffman, W. Michael, Robert Frederick, and Jr., Edward S. Petry, . *The Corporation, Ethics, and the Environment.* Westport, CT: Quorum Books, 1990.

Howard-Grenville, Jennifer A. *Corporate Culture and Environmental Practice: Making Change at a High-Technology Manufacturer.* Cheltenham, Gloucester: Edward Elgar Publishing Limited, 2007.

Howard-Grenville, Jennifer A., Andrew J. Hoffman, and C.B. Bhattacharya. "Who can act on sustainability issues? Corporate capital and the configuration of organizational fields." In *Organizations and the Sustainability Mosaic: Crafting Long-Term Ecological and Societal Solutions*, edited by Sanjay Sharma, Mark Starik and Bryan Husted, 193-215. Cheltenham: Edward Elgar, 2006.

IBM. *2007-2008 Corporate Social Responsibility Report.* CSR Report, New York: IBM, 2008.

IBM. *Annual Report.* Corporate Annual Report, Armonk, NY: IBM Publication, 2007.

IBM Archives. *Endicott Chronology 1991-2005.* 2008. http://www-03.ibm.com/ibm/history/exhibits/endicott/endicott_chronology1990.html (accessed November 11, 2008).

—. "Endicott Chronology 1991-2005." *IBM.* 2008. http://www-03.ibm.com/ibm/history/exhibits/endicott/endicott_chronology1990.html (accessed November 11, 2008).

—. "History of IBM: 1910s." *IBM.* 2008. http://www-03.ibm.com/ibm/history/history/decade_1910.html (accessed October 14, 2008).

—. "History of IBM: 1990s." *IBM.* 2008. http://www-03.ibm.com/ibm/history/history/decade_1990.html (accessed October 17, 2008).

IBM CEA. "Corporate Facilities Practice 1410 - Underground Liquid Storage Systems." January 1979.

—. "Corporate Instruction ENV 119: Product Stewardship and design for environment." IBM Corporate Documents, May 12, 2008.

IBM CEA. *Environment & Well-Being Progress Report.* Corporate Environmental Report, Somers, NY: IBM Publication, 2001.

IBM CEA. *Environment and Well-Being Progress Report.* Corporate Environmental Report, Somers, NY: IBM Publication, 2002.

IBM CEA. *Environment: A Progress Report.* Corporate Environmental Report, Somers, NY: IBM Publication, 1996.

—. "Environmental Goals - Internal Document." June 2007.

IBM CEA. *Environmental Report.* Corporate Environmental Report, Somers, NY: IBM Publication, 1994.

IBM CEA. *IBM and the Environment: A Progress Report.* Corporate Environmental Report, Somers, NY: IBM Publication, 1992.

—. "International Business Machines Corporation Worldwide Environmental Management System Manual." IBM Internal Document, August 1, 2008.

—. "Key Worldwide Challenges and Issues." *Internal IBM Confidential Document.* 1990.

IBM Corporate Responsibility. *Corporate Responsibility Key Performance Indicators.* 2008. http://www.ibm.com/ibm/responsibility/performance-indicators.shtml (accessed November 23, 2008).

IBM Environment. *Global Environmental Management System.* 2008. http://www.ibm.com/ibm/environment/ems/ (accessed December 6, 2008).

IBM. *Environmentally Conscious Products - Awards.* November 15, 2008. http://www-03.ibm.com/servers/greenpen/awards.html (accessed November 15, 2008).

IBM GIO. *Global Innovation Outlook.* December 2008. http://domino.research.ibm.com/comm/www_innovate.nsf/pages/world.gio3.html (accessed December 7, 2008).

IBM Global Services. *The Green Data Center.* IBM, 2007.

IBM. *IBM Quarterly Earnings: 2008 Fourth-Quarter and Full-Year Results.* 2009. http://www.ibm.com/investor/4q08/press.phtml (accessed February 15, 2009).

—. "IBM Unveils Plan to Combat Data Centre Energy Crisis; Allocates $1 Billion to Advance "Green" Technology and Services." *IBM Press Room.* May 10, 2007. http://www-03.ibm.com/press/us/en/pressrelease/21524.wss (accessed November 13, 2008).

IBM Integrated Supply Chain. "IBM Supplier Conduct Principles." IBM Corporation, 2004.

IBM. *Intellectual Property and Licensing.* 2009. http://www.ibm.com/ibm/licensing/ (accessed January 10, 2009).

—. "Introducing the IBM Energy & Environment Model: A framework to help organizations address carbon." IBM Corporation, 2008.

IPCC UNEP. *About IPCC.* 2008. http://www.ipcc.ch/about/index.htm (accessed November 24, 2008).

ISO. *About ISO.* 2008. http://www.iso.org/iso/about.htm (accessed October 19, 2008).

—. *ISO 14001 Essentials.* 2008. http://www.iso.org/iso/iso_catalogue/management_standards/iso_9000_iso_14000/iso_14000_essentials.htm (accessed October 19, 2008).

King, Andrew, and Michael W. Toffel. "Self-Regulatory Institutions for Solving Environmental Problems: Perspectives and Contributions from the Management Literature." *Working Paper.* July 2007.

Koomey, Jonathan G. "Estimating Total Power Consumption by Servers in the US and the World." 2007.

Lantos, Geoffrey P. "The boundaries of strategic corporate social responsibility." *Journal of Consumer Marketing* (MCB University Press), 2001: 595-630.

Levitt, Theodore. "The Dangers of Social Responsibility." *Harvard Business Review*, September-October 1958: 41-50.

Levy, David L., and Peter J. Newell. "A Neo-Gramscian Approach to Business in International Environmental Politics: An Interdisciplinary, Miltilevel Framework." In *The Business of Global Environmental Governance*, edited by David L. Levy and Peter J. Newell, 47-69. Cambridge, MA: The MIT Press, 2005.

Levy, David L., and Peter J. Newell, . *The Business of Global Environmental Governance.* Cambridge, MA: The MIT Press, 2005.

Lewis, Jack. *US EPA History: The Birth of EPA.* September 21, 2007. http://www.epa.gov/history/topics/epa/15c.htm (accessed August 12, 2008).

Lovins, Amory B., L. Hunter Lovins, and Paul Hawken. "A Road Map for Natural Capitalism." *Harvard Business Review* 77, no. 3 (May-June 1999): 145-158.

Makower, Joel. *Strategies for the Green Economy: Opportunities and Challenges in the New World of Business.* McGraw-Hill, 2009.

Marshal, R. Scott, and Darrell Brown. "The Strategy of Sustainability: A Systems Perspective on Environmental Initiatives." *California Management Review* 46, no. 1 (Fall 2003): 101-126.

May, Steve, George Cheney, and Juliet Roper. *The Debate Over Corporate Social Responsibility.* New York: Oxford University Press, Inc., 2007.

McDonough, William, and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things.* New York, NY: North Point Press, 2002.

Meadows, Donella. "The Limits to Growth Revisited." In *The Global Citizen*, by Donella Meadows, 29-33. Washington, DC: Island Press, 1991.

Melnyk, Steven A., Robert P. Sroufe, and Roger Calantone. "Assessing the impact of environmental management systems on corporate and environmental performance." *Journal of Operations Management* 21 (2003): 329-351.

Morris, Jr., Robert B. "Memorandum on Site Groundwater Protection Plan." June 21, 1978.

Murray, Alan. "A Whole World of Responsibilities." *The Wall Street Journal*, March 29, 2006.

Murray, James. "Could IBM Be the World's First Green Business Behemoth?" *GreenBiz.com*, August 22, 2007.

O'Neill Packard, Kimberly, and Forest Reinhardt. "What Every Executive Needs to Know About Global Warming." *Harvard Business Review* 78, no. 4 (July-August 2000): 129-135.

Oye, Kenneth, and James Maxwell. "Self Interest and Environmental Management." In *Local Commons and Global Interdependence: Heterogeneity and Cooperation in Two Domains*, by R.O. Keohane and E. Ostrom. London: Sage, 1995.

Paine, Lynn Sharp. *Value Shift: Why Companies Must Merge Social and Financial Imperatives to Achieve Superior Performance.* New York, NY: McGraw-Hill, 2003.

Palmisano, Sam. "A Smarter Planet: The Next Leadership Agenda." *Ideas from IBM.* November 6, 2008. http://www.ibm.com/ibm/ideasfromibm/us/smartplanet/20081106/sjp_speech.shtml (accessed November 15, 2008).

Pohle, George, and Jeff Hittner. *Attaining Sustainable Growth Through Corporate Social Responsibility.* IBM Publication, Somers: IBM Global Business Services, 2008.

Porter, Michael E., and Claas van der Linde. "Green and Competitive: Ending the Stalemate." *Harvard Business Review* 73, no. 5 (September-October 1995): 120-134.

Porter, Michael E., and Forest L. Reinhardt. "A Strategic Approach to Climate." *Harvard Business Review* 85, no. 10 (October 2007): 22-23,26.

Porter, Michael E., and Mark R. Kramer. "Philanthropy's New Agenda: Creating Value." *Harvard Business Review* 77, no. 6 (November-December 1999): 121-130.

Porter, Michael E., and Mark R. Kramer. "Strategy & Society - The Link Between Competitive Advantage and Corporate Social Responsibility." *Harvard Business Review*, December 2006: 78-92.

Porter, Michael E., and Mark R. Kramer. "The Competitive Advantage of Corporate Philanthropy." *Harvard Business Review*, December 2002: 56-69.

PR Newswire Association, Inc. "A.J. Hedge Jr. Appointed to IBM Environmental Post." *PR Newswire*, May 22, 1990.

Prakash, Aseem. *Greening the Firm: The Politics of Corporate Environmentalism.* Cambridge: Cambridge University Press, 2000.

Reinhardt, Forest L. "Bringing the Environment Down to Earth." *Harvard Business Review* 77, no. 4 (July-August 1999): 149-158.

—. *Down to Earh: Applying Business Principles to Environmental Management.* Boston, MA: Harvard Business School Press, 2000.

Salisbury, David F. "High-tech's clean image begins to tarnish." *Christian Science Monitor*, December 4, 1984: 36.

Semiconductor Solutions IBM. *Big Green Innovations.* 2008. http://www-03.ibm.com/technology/greeninnovations/ (accessed November 23, 2008).

Sen, Amartya. *Development as Freedom.* New York: Anchor Books, 1999.

Senge, Peter, Bryan Smith, Nina Kruschwitz, Joe Laur, and Sara Schley. *The Necessary Revolution: How Individuals and Organizations are Working Together to Create a Sustainable World.* New York, New York: Doubleday, 2008.

Sharma, Sanjay. "Managerial Interpretations and Organizational Context as Predictors of Corporate Choice of Environmental Strategy." *Academy of Management Journal* 43, no. 4 (2000): 681-697.

Siggelkow, Nicolaj. "Persuasion with Case Studies." *Academy of Management Journal* 50, no. 1 (2007): 20-24.

Solow, Robert M. "Sustainability: An Economist's Perspective." In *Economics of the Environment*, by Robert N. Stavins, edited by Robert N. Stavins, 505-513. New York, NY: W. W. Norton & Company, Inc., 2005.

Starik, Mark, and Alfred A. Marcus. "Introduction to the Special Research Forum on the Management of Organizations in the Natural Environment: A Field Emerging From Multiple Paths, With Many Challenges Ahead." *Academy of Management Journal* 43, no. 4 (2000): 539-546.

Starik, Mark, and Sanjay Sharma, . *New Horizons in Research on Sustainable Organizations: Emerging Ideas, Approaches and Tools for Practitioners and Researchers.* Sheffield: Greenleaf Publishing Ltd, 2005.

State of World Resources Program. *Are Business and Industry Taking Sustainability Seriously?* Earth Trends, World Resources Institute, 1998.

Stavins, Robert N., ed. *Economics of the Environment: Selected Readings.* 5th Edition. New York, NY: W. W. Norton & Company, Inc., 2005.

Sterman, John D. *Business Dynamics: Systems Thinking and Modeling for a Complex World.* McGraw-Hill Higher Education, 2000.

Sterman, John D. "Risk Communication on Climate: Mental Models and Mass Balance." *Science* 322 (October 2008): 532-533.

The Economist. "In Search of the Good Company." *The Economist*, Septemter 6, 2007.

Toynbee, Arnold J. "Thinking Ahead." *Harvard Business Review*, September-October 1958: 23-170.

Tushman, Michael L., and Charles A. O'Reilly III. *Winning through Innovation: A Practical Guide to Leading Organizational Change and Renewal.* Boston, MA: Harvard Business School Publishing Corporation, 2002.

UNEP. *Global Environment Outlook: Environment for Development, Summary for Decision Makers.* Summary for Decision Makers, Nairobi: United Nations Environment Program, 2007.

USEPA. *SmartWay - Basic Information.* July 2, 2008. http://www.epa.gov/smartway/basic-information/index.htm (accessed December 5, 2008).

Viscusi, W. Kip. *Economics of Regulation and Anti-Trust.*

Viscusi, W. Kip, Jr., Joseph E. Harrington, and John M. Vernon. *Economics of Regulation and Anti-Trust.* 4th Edition. Cambridge, MA: The MIT Press, 2005.

Vogel, David J. "Is There a Market for Virtue? The Business Case for Corporate Social Responsibility." *California Management Review* 47, no. 4 (Summer 2005a): 19-45.

Vogel, David J. "The Low Value of Virtue." *Harvard Business Review* 83, no. 6 (June 2005b): 26.

Watson, Jr., Thomas J. "A Business and Its Beliefs: The Ideas That Helped Build IBM." In *The Best Business Books Ever (Book Summaries)*, edited by Ultimate Business Library, 25-26. Bloomsbury Publishing Plc, 2003.

—. "IBM Corporate Policy on Environmental Responsibility." May 26, 1971.

WBCSD. "IBM Data Center Energy Efficiency." *Case Study.* 2008.

WBCSD. "IBM Enterprise Energy Management System." *WBCSD Case Study* , 2008.

WCED. "Report of the World Commission on Environment and Development: Our Common Future." 1987.

Wetzstein, Michael E. *Microeconomic Theory: Concepts & Connections.* US: Thomson South-Western, 2005.

Willard, Bob. *The Sustainability Advantage.* Gabriola Island, British Columbia: New Society Publishers, 2002.

WRI, WBCSD. "The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard." 2004.

Yin, Robert K. *Case Study Research: Design and Methods.* 3rd Edition. Thousand Oaks, California: Sage Publications, Inc., 2003.