

Green IT: The New Industry Shock Wave

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Environmental sustainability and climate change will present substantial opportunities and important risks for all stakeholders in the IT industry in 2008 and beyond. This Special Report examines the issue of "green IT," predicts how it will evolve and recommends how IT organizations should respond.

Analysis

Introduction

2007 marked a tipping point for the issue of environmental sustainability, or "Green IT," in the IT industry. We expect this issue to gain momentum through 2009, driven primarily by increased concerns about climate change as well as the clear opportunity for organizations to save money and avoid cost through increased energy efficiency. More importantly, 2008 and 2009 will mark an acceleration of debate, innovation and exploration in terms of how IT can be used to help tackle climate change.

IT organizations have an opportunity to improve the environmental footprints of their IT infrastructures, and an even bigger opportunity to make a real contribution to helping the enterprise contribute to tackling climate change.

This report outlines what IT management teams need to do to tackle both issues.

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Green IT Defined

The term "green IT" is widely used by the industry and in the media, but it lacks a precise definition. The Gartner definition, within the context of an enterprise is "optimal use of information and communication technology (ICT) for managing the environmental sustainability of enterprise operations and the supply chain, as well as that of its products, services and resources, throughout their life cycles."

What does that mean?

- **Optimal:** Environmental decisions usually demand balancing trade-offs. Those trade-offs are frequently cost-benefit-related, and frequently involve balancing different environmental impacts (for example, throwing out inefficient servers and replacing them with new, more-efficient ones, or extending the life of the old servers). Optimal means weighing the options and choosing the best path given the enterprise's goals and priorities. As such, it demands and is a set of management activities, processes and capabilities.
- **Environmental sustainability:** At the heart of green IT is the concept of environmentally sustainable development, defined as, "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition reaches beyond energy efficiency and addresses a broad range of environmental issues facing IT.

- **Enterprise operations:** This encompasses using ICT to improve the environmental sustainability of the activities and processes of the enterprise and includes its energy and material efficiency.
- **Supply chain:** Enterprise operations are often the "tip of the iceberg" in terms of actual enterprise impact. Therefore, analyzing and optimizing the supply chain through an environmental lens is important. IT plays a key role. For example, carbon accounting down the supply chain will be a key application, as well as ensuring compliance with enterprise environmental policies.
- **Products and services:** This involves designing and providing stewardship of enterprise products and services, as well as considering how ICT can be used to improve environmental sustainability.
- **Resources:** These are employed by the enterprise, including its capital assets (such as IT equipment and software), and have an environmental cost associated with them. Green IT encompasses managing and optimizing those resources in an environmentally sensitive way.
- **Life cycle:** Life cycle is particularly important in the definition, demanding consideration or stewardship from cradle to grave of those things over which the enterprise could reasonably be considered to have influence or choice. That may include managing the full life cycle of the enterprise products, and would certainly include considering the life cycle of the IT equipment being procured.

The definition encompasses increasing material and energy efficiency of the enterprise's IT infrastructure, as well as that of the enterprise's business activities. It also includes enterprises making IT-related product and service choices that reduce environmental impacts such as pollution, contamination and the unsustainable use of resources.

A rigorous and comprehensive green IT strategy should address these points:

- A policy stating what environmentally sustainable IT means to the enterprise
- A high-level environmental assessment of the enterprise, its supply chain, products and services, as well as the assessment of the IT infrastructure impact
- An assessment of where IT can have most impact and at what approximate relative cost
- A plan of programs for the IT organization's role in improving the environmental sustainability of enterprise operations, its supply chain, and its products and services
- An assessment of the current IT environmental performance
- An analysis of, and detailed plan to improve the energy efficiency of, all IT and supporting infrastructure (for example, air conditioning and power), including the data center, servers, networks, client devices and printing
- The definition of a process and policy for assessing ongoing architectural choices and for conducting environmental assessments of projects
- An analysis of and plan for reducing and managing waste appropriately, including disposition of PCs and more
- Procurement guidelines for the enterprise about choices of suppliers based on their environmental performance and that of their products and services

Most IT organizations understand the issues surrounding energy efficiency, but are less clear about those associated with material efficiency. Material efficiency is important because material resources cost money and are finite. As such, they need careful stewardship. Additionally, they have an inextricable link to climate change. It takes energy to manufacture, distribute and dispose of "stuff," so the more stuff is consumed, the more energy is expended. Therefore, enterprises can consider material efficiency as one of the tools they have to help address climate change.

In developing a program, each enterprise must establish its own priorities and determine its scope.

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Is Green IT a Fad?

We've recently had conversations with clients and industry observers who say they are suffering from "green fatigue." This is not surprising, given the media coverage of this subject during the past year. We certainly anticipate green IT going through the phases of a Hype Cycle, like any other issue or technology (see "The Research Incubator: A Journal of Unconventional Thinking, Volume 1").

A major contributing factor to green IT entering the Trough of Disillusionment will be the "greenwashing" (the selective disclosure of the positive, and often superficial, environmental aspects of the enterprise or its products and services) that is starting to dominate the industry. The marketing departments of technology and service providers are touting whatever products they have as green. Although some of this is genuine, or at least well-intended, much of the hype is a cynical attempt to jump on the bandwagon without actually addressing fundamental issues. Unfortunately, this situation will get much worse before it gets better.

Despite this skepticism, we do not believe that green IT will be a passing fashion. Instead, we believe it represents the start of a significant and material change. The fundamental difference between what we see today and previous fads and discontinuities is the combination of the political rhetoric and the science behind climate change. If the Intergovernmental Panel on Climate Change is correct, and if the political rhetoric turns into action, then we are headed toward a low-carbon economy.

Many state, national and regional governments and supranational bodies, including the U.K., European Union, Australia, California, the G8 and others, are in the midst of deciding the extent to which carbon dioxide (CO₂) emissions must be cut to prevent significant social and economic disruption. We can expect to see a flurry of climate change legislation during the next two years. Cuts in greenhouse gas emissions of 25% by 2020 and 60% to 80% by 2050 are likely targets. One thing is certain — the "business as usual model" is now widely accepted as being completely unsustainable and will not continue. Given that success so far in cutting emissions has been limited, expect to see significant change — voluntary and through fiscal and regulatory measures. That change will affect the IT industry, IT infrastructures and IT organizations as an opportunity and a risk.

Few enterprises, and even fewer IT management teams, have truly grasped the scale and speed of the shock wave that is likely to hit them. Most are struggling to connect the issues of sustainability with improved business performance. We believe this will change as the imperative for change starts to affect management teams. That imperative will most likely be created by a combination of three things:

- The escalating and combined costs of energy and carbon
- Climate change affecting brand values and influencing buyer behavior
- Regulations and fiscal measures

Unless the science behind climate change develops a more-optimistic view of the problem, or progress in technology development and adoption, along with behavioral changes, unfolds more quickly than expected, enterprises should anticipate that they will be motivated and forced to make significant improvements to energy and material efficiency in their business operations, supply chains, and products and services. That pressure will come down from policymakers and senior executives and up from customers and the supply chain. Most large enterprises will likely, at least, be required to participate in some kind of carbon cap and trade scheme.

The IT industry is also under increasing scrutiny from nongovernmental agencies such as WWF and Greenpeace (see "Greenpeace Report a Wake-Up Call for the IT Industry"). Greenpeace's "[Green Electronics Report](#)," which first came out in August 2006 and has been updated several times subsequently, has had a significant impact in the industry, prompting technology providers to improve their offerings.

The question for the enterprise has changed from "Why should we bother?" to "What risks do we face if we don't act and are not seen to act?" Each enterprise needs to decide on its position and consider the position of its stakeholders, and how those positions might change when faced with, for example, the three catalysts noted above. Although this question may be considered a distraction, it is going to demand the attention of the IT management team, if only because of the cost saving, cost avoidance and infrastructure security issues.

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Is Cost Savings or the Environmental Issue the Real Driver?

Cutting costs and improving environmental performance are not mutually exclusive topics. Adequate opportunity exists to do both. However, as noted in "Conflating Lean and Green Is Unwise," muddling the two issues is unwise.

The finding that midsize enterprises are motivated primarily by cost savings is not surprising (see "Findings: Midsize Business 'Green IT' Initiatives Are Driven Mostly by Cost Savings") and is consistent with the behavior seen in most large and small enterprises. Although most European organizations ask the "How much money can we save?" question, they tend to do so after they've asked "How much CO₂ and energy can I save?" In the U.S., on the other hand, the cost question tends to be the starting point. To some extent, this reflects higher levels of awareness of climate change in Western Europe, which is matched by a greater propensity to act (see "Environmentally Sustainable IT: U.S. Business Should Learn From Europe"). The Asia/Pacific region has the full spectrum of awareness and views, from being a complete nonissue with no propensity to act, to a program of work in progress or planned. In Australia, the environment has been a point of contention in the national election, and there is a sense of urgency among many enterprises, particularly because of the extended drought.

It also identifies one of the challenges we see that executive leadership is having — convincing the organization that they are serious about tackling climate change and/or addressing a broader environmental sustainability agenda. Unless this is driven through the enterprise, nothing actually changes.

IT Wins in a Low-Carbon Economy

The big opportunity for the IT industry and most IT organizations is using ICT to reduce the environmental impact of the enterprise, its supply chain, its products and its services, rather than simply focusing on IT's own CO₂ footprint. The Gartner estimate of IT's total CO₂ emissions is approximately 0.6 gigatonnes (Gt). Although these figures are still being debated, to limit the impact of climate changes, greenhouse gas emissions must be reduced by between 25 Gt and 30 Gt of CO₂ equivalents (CO₂e) annually by 2030 (against the "business as usual" projections). IT's impact will be helping enterprises achieve that measure, rather than simply making data centers more efficient.

Many opportunities exist to increase energy efficiency, cut CO₂ emissions, save money, and avoid cost at the same time. However, those opportunities are finite. As the [Stern Review](#) on the economics of climate change identified, there is going to be a cost to achieving sustainable levels of greenhouse gases in the atmosphere. That cost will be borne by all to varying degrees.

IT has a key role to play in helping enterprises in the private and public sectors increase energy and material efficiency, and will be critical in doing that economically. The impact of IT varies depending on the industry (see "Defining the Environmental Value of IT"), but it has a role to play in almost every industry.

In a low-carbon economy, where carbon has a price and energy costs are increasing ahead of inflation, it will not simply be about doing the same things in a more energy-efficient way. It is going to require rethinking about how to get things done and re-evaluating and optimizing value chains through an energy and greenhouse gas lens. The opportunities for innovation will be huge, and IT's role will be central for enterprises.

An obvious opportunity lies in travel substitution, using videoconferencing and telepresence technologies (see "How Green Does Your Video Look?"), and using communication and collaboration tools to build an infrastructure and culture that enable and encourage remote collaboration (see "High-Performance Workplace Scope and Point of View"). Increased employee sensitivity to climate change will create a change in attitude toward traveling, and will present an opportunity to encourage the use of these technologies — a challenge that most enterprises face today (see "How to Encourage Employees to Adopt Workplace Technologies Effectively"). We are starting to see some environmentally led incentive schemes to encourage people to make use of the technology. One enterprise is using a scheme similar to a supermarket reward card, where employees get points for making use of low-carbon travel and communication options.

Countless less obvious opportunities exist. Carbon accounting and tracking are good examples of an area in which IT can contribute. Evidence of this kind of change can be seen in Wal-Mart's pilot, asking selected suppliers to monitor energy use across the supply chain (see "Wal-Mart Pilot Project on Energy Use Portends Coming Change"). "IT's Role In A Low-Carbon Economy" identifies just some of the possibilities. "IT Organizations Will Need Eight Technologies to Provide 'Greener' Services" drills down on some of the opportunities in the services sector. We believe that one area in which IT will be particularly helpful in its potential to deliver carbon abatement will be supply chain management (see "A New Wave of SCM Innovation Must Address Climate Change Concerns").

An Industry View

The industries taking material action include:

- Financial services
- Retail
- Telecommunications
- Consumer packaged goods
- Utilities
- Logistics
- Enterprises with a strong ethical position, such as "not for profit" organizations

Most notable for its lack of material action is the public sector. Despite the political rhetoric, most public-sector organizations, rather than showing leadership, have been slow in tackling the issue. Most are pushing pressure down the supply chain, making demands of their suppliers, but doing little themselves (see "Findings: Government Organizations Lack a Green IT Drive"). This is clearly a topic that government CIOs should care about (see "Why Government CIOs Need to Care About 'Green IT'"). Government CIOs need to think about how

they build the business case for action (see "Embedding Environmental Issues in Government Business Cases").

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What IT Organizations Can Do

IT equipment and infrastructure are energy-inefficient. Until recently, there has been no compelling reason for technology, service providers or IT organizations to focus on energy as a resource because energy has been cheap and readily available. Few people were concerned about greenhouse gas emissions. The good news is that there is great opportunity in the short to mid-term to drive efficiency, save money and avoid cost.

IT's environmental impact extends beyond simply greenhouse gas emissions. IT is a resource-intensive industry throughout its life cycle, with limited success in reuse and recycling. Despite the growing tendency of technology and service providers to use the "sustainable" word, the industry is far from operating in an environmentally sustainable way (see "IT Vendors, Service Providers and Users Can Lighten IT's Environmental Footprint").

There are many things IT organizations can do to improve the environmental sustainability of their IT activities (see "Ten Key Elements to a Green IT Strategy"), which provides an overview of the essential components from an environmental program for IT. Although technology providers clearly have a key role to play, the way IT organizations choose to deploy and operate hardware and software will have a significant influence on the environmental impact.

The IT organization should create its own set of environmental metrics, and integrate those metrics into its overall IT dashboard. The metrics should focus on energy; materials; emissions to air, land and water; supplier management; staff engagement; and IT's contribution to reducing the enterprise's wider environmental footprint (see "Tutorial for the Environmental Metrics of an IT Organization").

The IT industry has responded with various, but uncoordinated, initiatives. The Green Grid promises to enhance data center efficiency by focusing on developing industry-standard metrics and new standards that the industry can adopt, but it desperately needs more end-user enterprise membership and engagement if it is to really deliver something substantial. The [Climate Savers Computing Initiative](#) is trying to save energy and reduce greenhouse gas emissions through a range of measures, including improving the efficiency of power supplies and motherboards and raising awareness (see "IT Firms in Green Initiative Must Also Look at Themselves"). Other initiatives have also materialized, such as [The Green Technology Initiative](#). What's lacking, however, is a more holistic, integrated industry approach that is guided by user needs and breaks down providers' technology silos.

There has been a continual flow of headline-grabbing announcements from most major vendors, including announcements from Google and Dell about their plans to go carbon-neutral (see "Look Beyond Google's Plan to Become Carbon Neutral" and "Dell Should Focus on Cutting Supply Chain CO2 and Energy"). Although they have merit, these commitments are not especially hard, expensive or effective at tackling the wider problem. IBM, for its part, announced "Project Big Green" (see "'Big Blue' Goes Green With Energy Efficiency Initiative").

We have seen a flurry of legislation during the past three years, such as the EU's WEEE, RoHS, EuP (see "EU's Energy-Using Product Directive Heralds Arrival of Ecological Product Profiles") and REACH ([Registration, Evaluation, Authorisation and Restriction of Chemical Substances](#)). As sensitivity to the environmental issues associated with the industry increases, the amount of legislation will also increase.

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The Client Side

PCs, printers and other client devices represent an easy and significant opportunity for improvements through the application of basic good practices (see "Cut Costs and Boost Environmental Benefits by Shutting Off PCs and Monitors" and "Understand the "Green" Impact of Power Management Settings on PCs"). We estimate that potential power cost and CO₂ emission reductions of 50% are available (see "PC Power Management Activation Leads to Significant Power and Cost Savings" and "PC Power Management Policies Greatly Cut CO2 Emissions").

The market is growing for power management tools to help enterprises enforce power management policies and better understand the potential for savings (see "PC Power Management Tools, Vendor Overview: 2H07"). We anticipate the entire area of energy-monitoring tools will grow tremendously during the next two years. The tools are important, but much of the challenge and the solutions will be behavioral (see "Vista Power Savings Helpful, but Behavior Changes Needed Too"). It is important that IT organization efforts connect into a wider enterprise environmental program to truly deliver substantial and sustained change.

Thin-client vendors have been trying to persuade customers that thin-client architecture is more environmentally

sustainable than fat-client architectures. Although there is merit to the argument, these vendors do not help their case by being optimistic about the energy requirements of a thin-client architecture and drawing a selective system boundary around what they want to count.

Printing also presents opportunities. The biggest issue is paper use, but with some analysis and a move toward multifunction devices, IT organizations can reduce the environmental impact of printers and printing (see "How to Manage the Environmental Impact of Printing" and "Eliminate Banner Pages and Save Up to 20% in Printing Consumables"). "Green Is the New Monochrome" outlines a three-pronged approach to choosing a printer with the lowest environmental footprint.

It is also important to consider procurement guidelines. Particularly on the client side, some eco-labels are useful in helping buyers to select products with a lower environmental footprint — for example, [EPEAT](#) and the new Energy Star 4 standard (see "Use Existing Standards for a Quick Start to Green IT Procurement" and "Managing Through a New PC Energy Star Specification").

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The Data Center

The data center is rightly an area for focus within the enterprise. Data center cooling has been a focus of attention because of how inefficient it usually is (see "Important Power, Cooling and Green IT Concerns"). Cooling problems and whether heat in the data center can get reused is explored in "Questions on Power and Cooling Issues From Gartner's European Data Center Summit in October 2007." We expect to see significant changes as data centers shift from an always-on culture toward a more-dynamic energy management environment in which the power status of equipment will change based on demand managed by a wide selection of tools, including job schedulers, virtualization layers and more (see "The Role of Job Schedulers in Reducing Power Consumption and Carbon Dioxide Emissions" and "Cassatt Addresses Important Need for Data Center Power Saver").

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The Network

Few enterprises are tackling the network, and are instead working under the misconception that the network has a low environmental impact or that not much can be done. In fact, the network's impact can be significantly reduced. It does present a number of challenges, because it must be operational 24 hours a day, seven days a week. In "Greening the Enterprise Network," an action plan is outlined for reducing the environmental impact of the network by increasing the energy efficiency, dematerializing the network, applying better capacity management, and favoring network technology providers that are applying environmental best practices in their own operations, in their products and in the management of their supply chain.

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Services

The main focus in 2007 has been the energy efficiency of hardware. Service providers have been quiet. Most simply have not understood how the green shock wave affects them, or they have not acted because their clients are not asking them about what they are doing. Many IT support providers are facing a dilemma in making their services more environmentally sustainable, as highlighted in "The Long Road to Green for the IT Support Industry."

Even the service groups within the large vendors that have been vocal on the hardware side have not offered more than consulting services to assess energy efficiency and CO₂ emissions, and they have failed to look at how they deliver services.

We've seen a few announcements about service contract awards that mention the environmental performance built into the contract. However, for the most part, it has been of mutual convenience for both parties to talk about the environmental factors — the deals have not been won or lost based on them. Some midmarket and niche service providers are more active, even if their environmental strategy simply involves buying renewable energy certificates. This hardly rates as a strong strategy.

Some of the providers of shared-service models, such as software as a service, claim their models have a lower environmental footprint. There is some merit in the idea that shared services can be substantially more energy- and material-efficient than traditional internal models. However, the reality depends on how the service providers

implement the service. Enterprises should ask service providers making such claims to prove them (see "Are Alternative Environmental Delivery Models More Environmentally Sustainable?").

We strongly recommend that management teams ask their service providers what they are doing to reduce the environmental footprint of operations and services.

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Software

The manner in which software is architected, designed and developed has a direct impact on the power consumed by the platforms on which it runs. However, little consideration has been given to how this will change. "Eight Software Approaches Can Enable Energy-Efficient Computing" explores insights into some research in this area and how the lessons learned and the technology used to develop software for energy-constrained platforms (such as mobile phones) can be applied to mainstream software development.

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Recycling

Electronic and electrical waste is one of the fastest-growing waste streams. It is not biodegradable and frequently contains hazardous substances, and as such, it requires special measures to ensure safe disposal. Europe has some of the strongest regulations in the WEEE Directive, but there is little consistency around the world. IT organizations need to plan for disposal at the time of acquisition and implement environmentally preferable purchasing programs. IT organizations looking to set a more progressive environmental agenda should look at how they can increase material efficiency by using less equipment or more materially efficient equipment and by extending the life of the equipment they need. "Electronic Waste: Take It Back" addresses the issues of e-waste.

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Bottom Line

Environmental concerns, and most directly climate change, will have a massive impact on the IT industry's products and services, as well as the choices that IT organizations will make. By 2009, more than one-third of IT organizations will have one or more environmental criteria in their top six buying criteria for IT-related goods and services. Although not statistically valid because the participants were effectively self-selecting, it is interesting to note that in some recent polling we did at our Symposium in Australia, 38% of attendees at a session on green IT said that environmental criteria would be as or more important than price within the next 12 months.

Most enterprises do not yet understand the scale of the disruption that society's response to climate change will create. But that realization will solidify during the next three years. IT and IT organizations will have a huge opportunity to tackle climate change. CIOs must develop a green IT strategy that tackles IT's own impact, as well as helping the enterprise meet its growing environment-related challenges and exploiting the environment-related opportunities.

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