Going green:
Sustainable growth strategies*

Technology executive connections
Volume 5

*connectedthinking

PRICEWATERHOUSE COOPERS

The survey

The quantitative findings presented in this report are based on a survey conducted by the Economist Intelligence Unit (EIU) in late 2007. The survey garnered 148 responses from senior executives based in five principal regions: 28% Asia; 31% Europe; 35% North America; 5% the Middle East and Africa and 1% Latin America.

The interviews

In addition, over 20 executives were interviewed for this report: some on the record, some willing to name their company but not attribute their quotes, and others insisting on complete anonymity.

On the record:

- Rob Bernard, Chief Environmental Strategist, Microsoft
- Holly Elwood, Environmental Protection Specialist, United States Environmental Protection Agency
- Tom Georgens, Executive Vice President of Product Operations, Network Appliance, Inc.
- Scott Gnau, Chief Development Officer, Teradata
- Rick Hind, Legislative Director, Toxics Campaign, Greenpeace International
- Lawrence Lamers, Member of Technical Staff, Office of the CTO, VMware and Director, The Green Grid
- Wes Muir, Director of Communications, Waste Management, Inc.
- Mark Small, Vice President, Health, Safety and Environment, Sony Electronics
- Kim Stevenson, Vice President, Communications, Media and Entertainment, EDS and Board of Directors Member, Climate Savers Computing Initiative
- Roger Tipley, Senior Technologist, HP and Director, The Green Grid
- Scott Wicker, Chief Marketing Officer, ZINK Imaging
- Paul Zeven, Chief Executive Officer, Philips Electronics North America Corporation

About PricewaterhouseCoopers

The firms of the PricewaterhouseCoopers global network (www.pwc.com) provide industry-focused assurance, tax and advisory services to build public trust and enhance value for clients and their stakeholders. More than 146,000 people in 150 countries across our network share their thinking, experience and solutions to develop fresh perspectives and practical advice.

PwC works with technology companies around the world to help them fulfill the promise of their great ideas. We are the trusted advisor and auditor to the majority of the Financial Times technology companies.

To help technology companies manage today's environmental challenges and make the most of environmental opportunities, PwC's robust sustainability practice concentrates on green performance improvement processes and sustainability risk management and reporting.

We have made a major commitment to train our people in industry-specific issues so that we can deliver services with a global perspective, local implementation, in-depth experience and a forward-thinking approach.

There is an ever-present state of change and evolution in the technology industries. PwC's ability to add value is a constant.

February 2008

Dear Executive,

Welcome to PricewaterhouseCoopers' fifth volume of Technology Executive Connections, a series of survey reports designed to help executives in technology industries better explore, understand and share ideas about today's pressing business and strategic issues.

Our unique combination of a broad, online, worldwide survey of senior executives and in-depth one-on-one interviews with industry leaders around the globe allows the Technology Executive Connections series to gauge the climate within the industry, gain insights into current views and opinions, and promote leading analysis of current issues.

In this, our fifth volume, we examine how the world's accelerating concern over climate change is affecting the technology industries as well as their plans to meet the growing clamour for environmentally friendly products and services. Not surprisingly, the majority of executives feel impelled to react to a rising demand for not only green products, but greener operations as well. And while protecting the environment is a fine objective, it's the promise of profits and an aversion to rising energy costs that drives the desire to change. To achieve both goals, the entire value chain—from suppliers to sales and marketing—needs to collaborate. Whether it's end-of-life issues for hardware manufacturers or excessive packaging of software, all segments of the technology industry are facing environmental challenges and opportunities.

To date, our Technology Executive Connections series has looked at such challenging issues as change management, the influence of convergence, talent retention and attraction, and maximising IP value. For soft or hard copies of these reports, please visit www.pwc.com/techconnect.

I hope this newest report provides interesting, thought-provoking reading to you and your colleagues and that it kindles discussions about environmental sustainability within your company. I welcome your thoughts on the issues we've addressed herein as well as your ideas for future topics to explore. Please feel free to contact us about this series via email at tech.connect@us.pwc.com.

Sincerely,

Bill Cobourn
Partner and Global Technology Industry Leader
PricewaterhouseCoopers

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Executive summary

Synthèse

Consumers, governments, regulators and, increasingly, businesses are seeing green. A growing wave of global environmentalism is forcing technology companies to produce greener products through greener processes. To assist executives in understanding the new "environmental" environment, in late 2007 the EIU and PricewaterhouseCoopers conducted a global survey of 148 executives and supplemented the findings with over 20 in-depth executive interviews. Though the specific focus may vary, the research shows that technology companies are indeed implementing a variety of green-oriented strategies.

Les consommateurs, les États, les régulateurs, et, de plus en plus, les entreprises, pensent vert. Cette montée en puissance mondiale de l'écologie contraint les dirigeants des entreprises technologiques à fabriquer des produits plus propres grâce à des procédés moins polluants. Pour aider les cadres à comprendre le nouvel environnement écologique, l'Economist Intelligence Unit (EIU) et PricewaterhouseCoopers ont conduit fin 2007 une enquête mondiale auprès de 148 cadres supérieurs, dont les résultats ont été complétés par une vingtaine d'entretiens approfondis. Bien que les priorités varient, l'enquête montre toutefois que les entreprises technologiques mettent en œuvre un éventail de stratégies axées sur la préservation de l'environnement.

Zusammenfassung

Konsumenten, Regierungen, Regulierungsbehörden und in steigendem Umfang auch Technologieunternehmen werden immer umweltbewusster. Denn das weltumspannende Umweltschutzbewusstsein zwingt auch Technologieunternehmen zur Herstellung umweltfreundlicherer Produkte durch umweltfreundlichere Prozesse. Um Entscheidungsträgern bei der erfolgreichen Bewältigung dieser neuen ökologischen Herausforderungen zu unterstützen, hat PricewaterhouseCoopers in Zusammenarbeit mit der Economist Intelligence Unit (EIU) eine weltweite Umfrage durchgeführt. Ende 2007 wurden dafür weltweit 148 Manager befragt und die Ergebnisse durch mehr als 20 vertiefende Interviews mit Führungskräften untermauert. Zwar unterscheidet sich der Fokus der Bestrebungen im Einzelnen. Unsere Umfrageergebnisse zeigen aber, dass Technologieunternehmen eine Vielzahl an Umweltschutzmaßnahmen eingeleitet haben.

摘要

政府、管理機構、消費者以及愈來愈多的企業都開始關注綠色環保的議題。一股全球環保主義的浪潮迫使科技公司採用環保的生產流程來製造綠色的產品。為協助企業管理人員瞭解當今的環保趨勢，經濟學人雜誌（EIU）和PricewaterhouseCoopers合作在2007年底對全球148位企業高階管理人員進行了一項問卷調查，並根據問卷調查的結果對超過20位高階管理人員進行了深入訪談。儘管企業各自關注的焦點不盡相同，調查結果顯示科技公司確實是在實施各種以環保為目的的策略。

The four principal observations are:
Les quatre principales observations sont les suivantes:
Die vier wichtigsten Beobachtungen in diesem Zusammenhang waren:
调查的四项主要发现如下：

1. **Green demand grows.**

   Demande croissante de produits verts.

   Das Umweltbewusstsein steigt.

   綠色環保需求的增長.

Though the industry does not feel it is particularly harmful to the environment, a solid majority of technology executives believe it is very important that their companies take measures to reduce or minimise their environmental impact. Thus, tech companies are taking steps both to expand the number of green-oriented products they produce and to reduce the reality or the appearance of a heavy environmental footprint.

Si le secteur n'a pas le sentiment d'être particulièrement nuisible pour l'environnement, une grande majorité de dirigeants d'entreprises technologiques jugent primordial de prendre des mesures pour réduire l'impact environnemental de leur société. Les entreprises technologiques prennent donc des dispositions pour développer le nombre de produits verts qu'elles fabriquent et réduire leur forte empreinte écologique, réelle ou apparente.

Bei börsennotierten Unternehmen weltweit übersteigt mittlerweile der Wert immaterieller Vermögensgegenstände den der materiellen. Dies gilt insbesondere für die Technologiebranche. Dennoch scheitern die betroffenen Firmen daran, den gesamten Nutzen aus ihrem geistigen Eigentum abzuschöpfen.

雖然科技企業並不認為該行業對環境存在特別的破壞，但絕大多數的科技企業高階管理人員相信公司有必要採取措施以降低或減少對環境的負面影響。因此，科技公司一方面擴大綠色環保產品生產的同時，另一方面積極減少對環境的損害和影響。

Some are developing a greener footprint because they believe it's the right thing to do.

But the strongest driver is economic. On the revenue side, a majority of technology executives maintain that the growing demand for green products creates significant market opportunities. On the cost side is a true desire to drive down their own energy outlays generated by servers, computers and employees themselves.

2. Green requires industry collaboration.

L'écologie nécessite une collaboration sectorielle.

Umweltbewusstsein erfordert Kooperationen.

綠色環保需要整個科技產業一起共同合作.

For the technology industries at large, going green requires transformation along virtually every step of every value chain. The creation of greener products affects everything from R&D processes to manufacturing, supply chains, marketing and HR—as well as relationships with customers, partners and shareholders.

Pour les secteurs de la technologie dans leur ensemble, adopter une démarche écologique impose de transformer quasiment chacun des maillons de la chaîne de valeur. La création de produits plus écologiques affecte tout, des processus de recherche et développement à la production, aux chaînes d'approvisionnement, au marketing en passant par les ressources humaines, ainsi que les relations avec les clients, les partenaires et les actionnaires.

Für Technologieunternehmen bedeutet steigender Umweltschutz eine Umgestaltung entlang der gesamten Wertschöpfungsketten: Denn die Produktion umweltfreundlicherer Produkte beeinflusst alle Prozesse, angefangen von Forschung und Entwicklung über die Herstellung, die Vertriebsstrukturen, das Marketing und HR bis hin zur Kundenbeziehung und der Beziehung zu Partnern und Anteilseignern.

對大多數的科技企業而言，往綠色環保目標邁進需要整個產業供應鏈的各個環節參與到變革中。綠色環保產品的創造影響到從研發、製造、供應鏈、行銷到人力資源的各個層面，同時也影響到企業與客戶、合作夥伴及股東的關係。

This interdependence requires technology companies to look as closely at the environmental practices of their partners and suppliers as they do at their own. This scrutiny can come in the form of audits, certifications and proprietary standards. In many ways, the entire value chain will succeed—or flounder—together.

3. Taking proactive steps towards sustainability.

Agir en amont pour la durabilité.

Einleitung proaktiver Maßnahmen zur Nachhaltigkeit.

採取積極主動的環保策略並成為持續性的行動.

A key driver in going green is the worry that there will be legislation, regulation or even a consumer backlash against companies seen to be environmental spoilers. Consequently, many actions taken by leading technology companies are intended to avert regulation and promote a greener image.

La crainte de législations et de réglementations hostiles aux entreprises jugées polluantes, voire du rejet des consommateurs, est un facteur déterminant de l'adoption d'une démarche écologique. De nombreuses mesures prises par des entreprises technologiques de premier plan visent ainsi à parer à la législation et à promouvoir une image plus propre.

Ein maßgeblicher Treiber des steigenden Umweltbewusstseins ist die Angst vor Reaktionen seitens des Gesetzgebers, des Regulierers oder der Kunden gegen vermeintliche Umweltschädiger. Daher zielen viele Maßnahmen von Technologieunternehmen darauf ab, Regulierung abzuwenden und ein umweltbewußteres Image zu fördern.

綠色環保的一個主要趨動力是因為企業擔心相關法規的建立，以及對有環保問題公司的聯合抵制。因此，許多處於領導地位的科技公司採取更為主動的措施以符合法律法規的要求，塑造自己成為環保企業的形象。

For example, technology companies are developing formal environmental policies, auditing internal green practices, appointing a senior executive to oversee green initiatives and creating a clearer linkage between green initiatives and performance. A growing number are also increasing the degree of external reporting relating to environmental sustainability.

4. Hardware and software opportunities.

Opportunités dans les secteurs du matériel et des logiciels.

Chancen im Hard- und Softwarebereich.

帶給軟硬體生產者的綠色商機.

Manufacturers of technology products pay significantly greater attention to green demand and green operating issues than do service-oriented businesses such as software makers, content developers and related entities. This is because both their products and their processes tend to involve more hazardous materials, packaging, end-of-life solid waste and energy consumption.

Les fabricants de produits technologiques sont beaucoup plus attentifs à la demande de produits verts et à l'aspect écologique des problématiques opérationnelles que les entreprises axées sur les services telles que les éditeurs de logiciels, les développeurs de contenus et autres entités assimilées. Cela parce que leurs procédés et leurs produits tendent à mettre en jeu davantage de matières dangereuses, d'emballages, de déchets solides en fin de vie et de consommation d'énergie.

Technologieproduzenten messen Umweltbewusstsein und umweltbewussten Themen einen größeren Stellenwert zu als dienstleistungsorientierte Unternehmen wie Softwarehersteller, Inhalteanbieter und verwandte Unternehmen. Dies liegt daran, dass ihre Produkte und ihre Prozesse tendenziell mehr umweltschädliche Materialien, Verpackungen, Abfallstoffe und Energiekonsum erfordern als ihre Dienstleistung.

科技產品的生產者比服務導向型企業（軟體製造商、開發商等）要更加關注綠色環保的需求及生產過程的環保程度。這是因為他們的產品及製造過程有可能牽涉到更多的有毒原料、包裝、殘餘的固態廢棄物及能源消耗。

But this by no means implies there isn't a role for software or service-oriented technology companies. For example, the need for green technology consulting is likely to rise as companies need assistance making more environmentally sound technology purchases as well as implementing greener technology-related business practices.

Similarly, software makers are already seeing opportunities in developing distributed meeting programmes (to reduce travel and thus carbon footprints), improving the power management of operating systems, developing energy efficiency software toolkits and reducing packaging.

Observation one:

Green demand grows.

Altruism tells part of the story, but the real drivers behind the rising tide in green technology products are customer demand and energy costs.

Nearly every form of commerce, no matter how smartly practiced, creates unwanted by-products.

Environmental sustainability in business is the art of profiting from the customers' needs without harming the world around us. Of course, some industries have more environmental impact than others. Over 70% of technology executives say they believe their companies do little harm to the environment.

An identical percentage believes that although consumers say they want green products, buyers are, in fact, highly resistant to paying the higher prices associated with the privilege.

This begs the question: is the pursuit of anything green by the technology industries little more than a feel-good exercise resulting in higher costs and possibly insignificant environmental benefits?

But green they go

Nonetheless, 61% of technology executives feel it is very important (29%) or important (32%) that their companies take measures to reduce or minimise their environmental impact.

No, technology companies do not exact an enormous carbon footprint, particularly relative to other industries such as metals and energy production. But as a spokesman from a large European technology manufacturer explains, going green is inevitable. "There could be many reasons why we say it's important," he explains. "It could be because our customers and investors feel it's important. It could be because we don't want so much restrictive regulation, as it is better if we as an industry self-regulate. You know, a lot of this is defensive; even though we are not a big polluter or energy user, we still need to be taking steps just to be on the safe side."

These reasons help explain the seeming contradiction between our finding that 71% of technology executives believe their companies do not harm the environment, while 61% of technology executives believe it is very important or important that their companies reduce their environmental impact.

Tech companies are indeed taking steps both to expand the number of green-oriented products they produce and to reduce the reality or the appearance of a heavy environmental footprint. They are cleaning up their act.

For example, Royal Dutch Philips Electronics pledges that by 2012 the percentage of green products it sells will double to 30% even as the company itself improves its own energy efficiency by 25%. [See page 46.]

Certainly, some are steering toward a greener footprint because of the widely held belief—be it among the growing number of green investors or consumers or society at large—that it's the right thing to do. Whether global capital markets reward the effort or not, 63% of executives say their teams are committed to environmental stewardship.

How important do you believe it is for technology industries to take measures to reduce or minimise their environmental impact? How important do you think it is for your company to take such measures?

	Very important	Not at all important	Don't know

A. Technology industries
B. My company
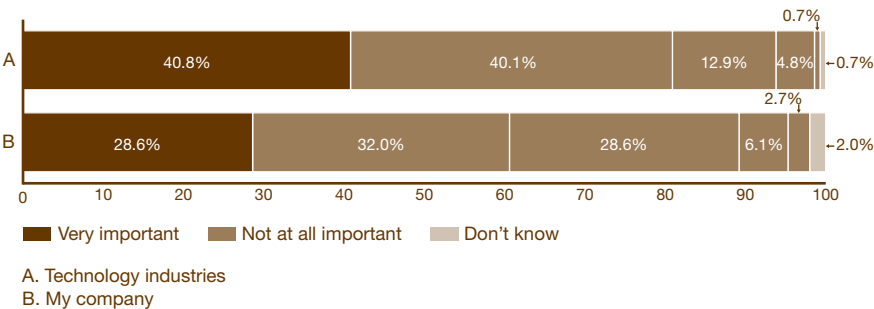
But when altruism alone fails to persuade, the pursuit of profit does the trick. Forty percent of executives say that the green movement creates significant opportunities for their companies. Once again, the percentage is significantly higher among manufacturers than among software developers and content or service providers. Of those who believed that green production offered their companies opportunities, 15% rated these opportunities as very significant, 19% deemed them significant and 30% considered them somewhat significant.

Who's buying green?

Green demand comes from all sectors—consumer, business and government—and is in every instance intensifying.

A separate PwC report, *How consumer conversation will transform business*, describes how the "go green" topic started as a whisper on blogs and message boards in 2006. By May of 2007 that whisper escalated to a loud and pervasive message. It was no longer a conversation driven by a small core of activists, but had spread to the wider public.

Overall green demand growth

	Today	In two years	Percentage increase
Business	48%	75%	(+56%)
Government	57%	76%	(+33%)
Consumer	54%	72%	(+33%)

% = percentage of executives seeing "very strong" or "strong" demand—1 or 2 on a 1–5 scale (where 1=strong demand and 5=weak demand).
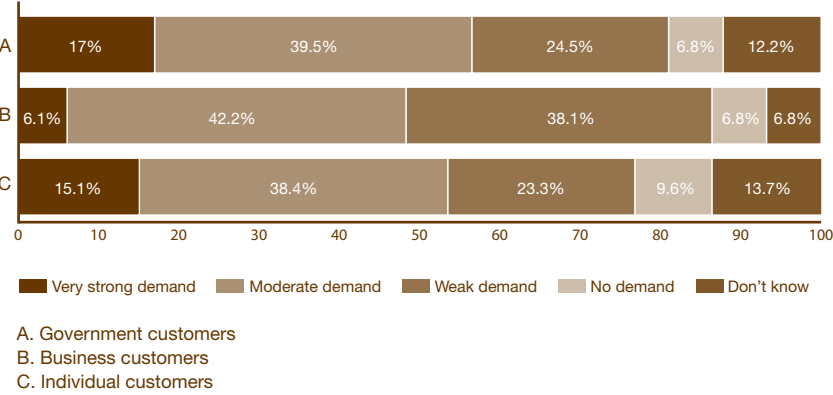
Green demand growth among core sectors

Technology executives report that today government customers are the most insistent upon green products and practices. Fifty-seven percent of respondents say that demand for green technology emanating from government customers is very strong (17%) or strong (40%). As powerful as that may be, within two years, technology executives expect this figure to rise to 76%, with 34% saying there will be a very strong demand for green products and 42% predicting a strong demand. A spokesperson for a large US-based computer maker explains that "a growing number of government procurement officers in the US and Europe are now being told they have to buy green whenever available."

As for their business customers, 48% of executives say green demand is very strong (6%) or strong (42%), a figure that rises to 75% (27% very strong and 48% strong) in the next two years. Note that the number of executives anticipating very strong demand for green products—or a 1 on a 1-to-5 scale—more than quadruples (from 6% to 27%) for the business segment and doubles for the government segment.

Furthermore, the growth in consumer demand will also rise sharply. Fifty-four percent of the executives surveyed say that today green demand among consumers is very strong (15%) or strong (38%). That figure rises to 72% (33% very strong and 40% strong demand) within the next two years. Once again, among consumers in the private sector, we see a projected doubling or more of the strong demand for environmentally responsible products.

How strong is demand for green technology products and services among these types of customers?

	Very strong demand	Moderate demand	Weak demand	No demand	Don't know
A	17%	39.5%	24.5%	6.8%	12.2%
B	6.1%	42.2%	38.1%	6.8%	6.8%
C	15.1%	38.4%	23.3%	9.6%	13.7%

■ Very strong demand ■ Moderate demand ■ Weak demand ■ No demand ■ Don't know

A. Government customers
B. Business customers
C. Individual customers

In two years' time, how strong do you expect demand will be for green technology products and services among these customers?

	Very strong demand	Moderate demand	Weak demand	No demand	Don't know
A	34.0%	42.2%	14.3%	2.7%	6.8%
B	26.5%	48.3%	19.0%	2.7%	3.4%
C	32.7%	39.5%	15.6%	2.0%	10.2%

■ Very strong demand ■ Moderate demand ■ Weak demand ■ No demand ■ Don't know

A. Government customers
B. Business customers
C. Individual customers
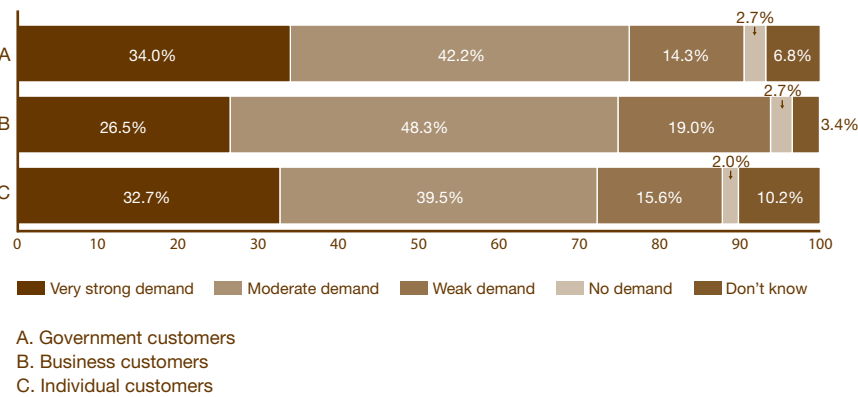
Energy: A driving force

So what's driving green demand? According to the survey, energy costs are a primary cause. For example, when asked which factors are most important in their company's environmental decision-making, executives cite potential energy savings (60%), followed by compliance with regulations (51%) and meeting customer demands (45%). The US-based computer maker spokesperson explains, "It's all about the cost of energy. That's the real driver in the server, storage and networking markets today, and it's going to become more pronounced in the near future."

Energy efficiency is also the top R&D priority. Specifically, 71% percent of executives say their R&D now (40%) or within the ne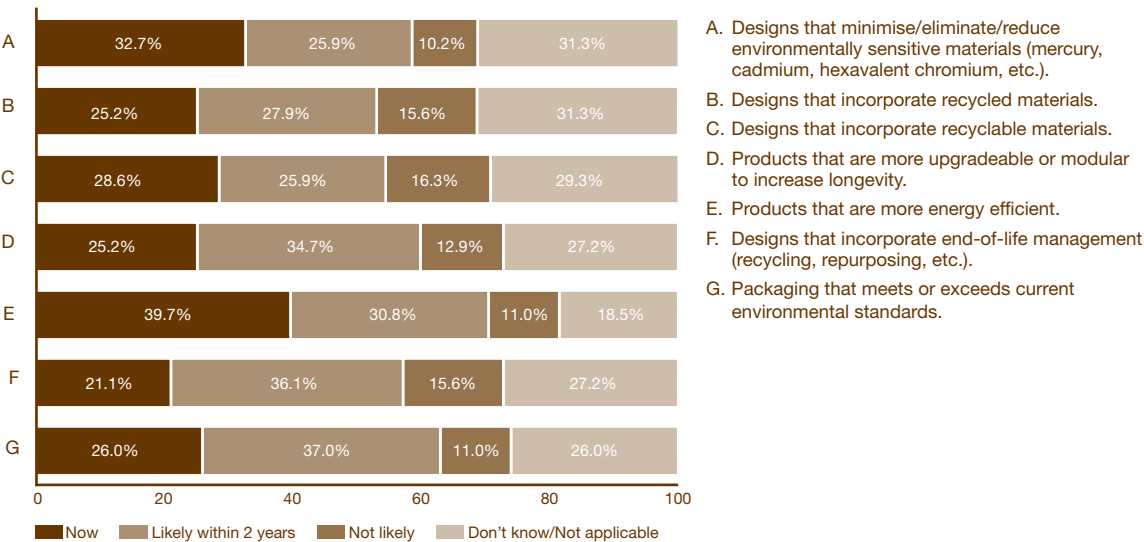xt two years (31%) will focus on the development of energy-efficient products. This focus is much more pronounced than the avoidance of hazardous materials (33% now, 26% additionally within two years) or designs that incorporate recyclable materials (29% now, 26% additionally within two years).

[For more on energy costs, see case studies pages 14 and 46]

The rise of green branding and green design

Consistent with all of the above is the expected growth in the number of companies offering an emphatically "green-branded" set of products or services. Today, only 7% of survey participants say their companies have such a product line. However, the figure climbs dramatically to 40% within the next two years.

Which of the following R&D, engineering and manufacturing efforts is your company making now, or is likely to make within two years?

A. Designs that minimise/eliminate/reduce environmentally sensitive materials (mercury, cadmium, hexavalent chromium, etc.).
B. Designs that incorporate recycled materials.
C. Designs that incorporate recyclable materials.
D. Products that are more upgradeable or modular to increase longevity.
E. Products that are more energy efficient.
F. Designs that incorporate end-of-life management (recycling, repurposing, etc.).
G. Packaging that meets or exceeds current environmental standards.

	Now	Likely within 2 years	Not likely	Don't know/Not applicable
A	32.7%	25.9%	10.2%	31.3%
B	25.2%	27.9%	15.6%	31.3%
C	28.6%	25.9%	16.3%	29.3%
D	25.2%	34.7%	12.9%	27.2%
E	39.7%	30.8%	11.0%	18.5%
F	21.1%	36.1%	15.6%	27.2%
G	26.0%	37.0%	11.0%	26.0%

Case study:

The "power" behind green technology demand

Staggering power needs

Tom Georgens, Executive Vice President of Product Operations at Network Appliance, says that much of the initial interest in his company's green technology products is driven by the high cost of electricity. "The power density and the power consumption inherent in a data centre is just staggering," explains Georgens. "All these network components and associated services use a great deal of electricity."

In particular, says Georgens, grouped servers or server farms generate enormous amounts of heat, yet they have to be kept cool in order to maintain reliable operation. What this means, says Georgens, "is that customers have to invest heavily in HVAC [heating, ventilation and air conditioning] systems" and then "need to cover the ongoing electricity bills, which are just huge." So as more and more companies amass more and more servers to manage day-to-day operations, business intelligence and data backup for disaster recovery, Georgens is sure, "the market for green servers and related technologies will grow."

Our survey and interviews show a rising demand for products incorporating green technology. This is not mere altruism on the part of consumers.

Conquering space

Another company focusing on the green aspects of servers and related components is Teradata. Chief development officer Scott Gnau says that his company is tackling the issue from several angles.

First, says Gnau, "We're working to conquer some of the space issues... One way to go about this is through server consolidation." The ideal, says Gnau, is "to have not only fewer servers, but also to have more efficient servers, more densely populated, more efficiently managed and then more efficiently utilised."

The idea of having fewer servers goes hand-in-hand with greater utilisation. As Gnau explains, "Imagine running 15 servers, all of them running at all times, each running one principal application, but none ever reaching anything like full utilisation." Now compare this "to a situation where you can use techniques like

virtualisation to enable a consolidated server farm to run all of those applications." In this way, "You can run fewer servers because you can manage for total utilisation and capacity." Not surprisingly, virtualisation initiatives are a hot commodity at both Teradata and Network Appliance.

A second approach, says Gnau, is to focus on ways to reduce heating costs associated with its servers. This involves a combination of building greater efficiency into each server as well as finding ways to improve its handling of heat.

"If you look at what the chip folks have been saying, at the rate they're increasing power density, pretty soon we'll have processors generating more heat than the surface of the sun," jokes Gnau. Fortunately, he continues, thanks largely to Moore's Law, "there's been tremendous innovation by engineers seeking to disrupt that trend line."

In Teradata's case, "We've developed a cooling system that better distributes the air around the server core and that can reduce heat by 30%." Such advances are doubly useful, he explains, "Because if the servers are cooler, they can also be more densely packed, taking up less real estate."

Efficiency, the ratio between computing power and power consumption, is also on the rise. Specifically, says Gnau, his company has made great strides in reducing the total power cost of computing while increasing computational and storage capacity. "Compare our current generation of hardware to what we had eight years ago," says Gnau. "If you take an aggregate view of what an average business intelligence user does in terms of workload, equipment, cooling — an integrated look at the entire stack used by a typical business intelligence user — today, you're getting 80% more computing for the same watt of power."

PwC connections

Tackle both sides of the environmental balance sheet*

Harvest new revenue

One company's carbon risk is another's revenue opportunity. The hunt is on for target markets that offer technology companies profitable relationships for green-related products and services.

This growing demand for environmental products and services could translate into the biggest new market in history. In order to direct precious product development resources, technology companies are quickly valuing different segments and measuring each segment's propensity to pay for green technology.

It all starts with developing a better understanding of the environmental market, customer needs and wants, and the company's targeted propositions. Gaining and acting effectively on such information requires marketing, finance and executive management to work together to keep the organisation's strategic direction at the heart of the green growth initiative.

Advisors like PwC help successful technology companies capture organic revenue growth by focusing on: strategy development; proposition development; tax strategy development; customer analytics; sales and distribution; and measurement, management and controls.

Governments are increasingly using taxation as an incentive for organisations to adopt a more sustainable business model. Monitoring and managing environmentally linked taxes provides an insight into sustainable effectiveness and enables sustainable investments to directly feed through to tax savings. Currently few tax functions have monitoring of such taxes on their agenda.

Slash energy costs

Technology companies around the world have announced plans to become carbon neutral. For many of these companies, the move is about managing operations to reduce energy costs.

Developing an energy-reduction strategy without compromising growth potential is a tricky proposition. Technology companies must proceed with caution—and knowledgeable counsel—to plan, implement and evaluate energy cost reduction and cost containment programmes.

Energy-hungry servers are prime targets to reduce costs. Many technology companies and their advisors start by profiling and analysing server use. Those assessments can find quick ways to cut electricity demand.

Longer term, maximising server utilisation is a powerful way of managing energy costs in the technology industry. Virtualisation—partitioning physical servers so they have multiple virtual environments inside them—promises huge savings. This allows fewer servers to operate during periods of off-peak activity. Server manufacturers are utilising cooler and more powerful semiconductor chips to create energy-efficient servers. Higher efficiency power supplies and more efficient cooling systems for servers are additional cost reduction technologies.

But technology companies still have a challenge to stay ahead of the increasing demand for more storage devices as data is kept for longer periods of time to comply with regulations. To minimise storage demands and thus the need for more servers, companies need to reduce the amount of stored data.

First, data duplication can be eliminated. Then, with a deliberate strategy and professional support from advisors like PwC, technology companies can develop data storage priorities, processes and controls that align to financial, operational and regulatory needs. The use of dashboards can track data storage efficiencies and measure the organisation's data storage performance from customer, operational, organisational and financial perspectives.

For more information on how PwC can help your company manage both sides of your environmental balance sheet, visit us at *www.pwc.com/techconnect* for links to solutions and contacts.

Questions for further reflection

Is your company committed to developing a business response to environmental sustainability?

How large is your company's impact on the environment? What are the causes of that impact? Could the impact from any of these areas be easily or incrementally reduced? When and how was your company's impact on the environment last measured?

Are there any compelling reasons for your company to become greener? Do you encounter any risks by taking no steps or limited steps?

Are the people who consume energy at your company accountable for its cost? For its sustainability aspects?

Are your customers demanding green products/services or greener operations?

Observation two:

Green requires industry collaboration.

Satisfying green demand stimulates collaboration and innovation across the technology value chain.

For the technology industries at large, going green requires transformation along virtually every step of every value chain. The creation of greener products affects everything from R&D processes to manufacturing, supply chains, marketing and HR—as well as customer, partner, shareholder and government relationships.

R&D processes

One of the principal areas where change is and will become even more evident is in R&D. Today, 39% of executives say the shift toward green products has a major (18%) or moderate (21%) impact on R&D. However, over the next two years, the figure rises to 57%, with 25% of technology executives expecting a major impact and 31% expecting a moderate impact.

It is also worth noting here that 28% of executives say their R&D teams have found themselves forced to reject certain green approaches—such as using alternative materials—due to cost considerations.

"Our goal is to make a high-performance product," says Mark Small, Vice President, Health, Safety and Environment at Sony Electronics North America. "Certainly, Sony is addressing environmental issues, such as designing energy-efficient products, providing for recyclability and avoiding the production of hazardous wastes." But ultimately, he explains "You won't see us sacrifice quality or cost to achieve zero impact on the environment. That's not realistic."

This is not to say that Sony Electronics doesn't care about going green. To the contrary, says Small, "the industry has made tremendous headway." As an example, he compares a cathode ray tube television set of ten years ago to a flat screen of today. "We've eliminated lead and other hazardous materials," Small explains.

In addition, "The weight is down from 300 pounds for a 36" set to 100 pounds for a 46" set," says Small. While producing "an even larger and brighter picture, we're more energy-efficient than ever." Moreover, "We've designed the sets to draw incredibly low power during standby—down from 10-15 watts to under a watt today." (Standby power is the "never off" mode required to enable the use of a remote control.)

Finally, says Small, "We've just entered into an agreement with Waste Management, Inc." that Sony believes will go a long way "to solving the issues surrounding" electronic waste disposal.

Sourcing/supply chain

Today, 41% of executives say the shift toward green products exacts a major (9%) or moderate (32%) impact on their sourcing and supply-chain strategies. Over the next two years, however, this figure rises to 55%—15% describing the impact as major and 40% as moderate.

Collaborating with local suppliers in the developed world to address environmental impacts is one thing. But in an effort to reduce costs, many if not most technology companies have significantly outsourced their supply chain to emerging markets. Here, local environmental regulations are rarely as strict as in developed nations. Moreover, compliance, not just with laws but also with manufacturing specifications, can also be suspect, as evidenced by the many recent recalls of products with excessive levels of lead. Many companies struggle to minimise both their supply costs and their environmental risk in emerging companies.

Sony's Small illustrates: "We specify what we expect from an environmental standpoint, and we require them to conduct testing to show they're meeting what we realise are some very tough standards," In addition, "We audit and control things, and we conduct tests ourselves."

A supplier executive from a Taiwan-based contract components maker says that clients from Europe and the United States "are becoming very demanding and very explicit in their environmental demands. They ask for compliance with the highest global standards, and they give us targets that must be achieved if we wish to continue the relationship."

Service providers are also subject to environmental scrutiny. Kim Stevenson, Vice President, Communications, Media and Entertainment at EDS remarks, "One of our prospective clients presented us with an RFP, and in it they were asking for detail on our environmental sustainability initiatives." Clearly, says Stevenson, "Companies are taking these environmental issues seriously."

For suppliers across the chain, there is a clear opportunity to turn sustainability into a competitive advantage through proactive and transparent management. For new technologies, however, there is always the risk of not meeting performance or availability expectations as well as that of leapfrogging by competitors.

Supplier and partnership practices

When it comes to environmental concerns, executives are keenly aware of their interdependence with their supply chains. Consequently, the survey shows that as closely as organisations will be watching their own business practices, they will also place the actions of their partners and suppliers under the environmental microscope.

For example, about one in five (18%) executives today say their companies practice environmentally preferred purchasing, the practice of selecting products or services that have a lesser effect on the environment than competitive products or services. However, over the next two years, the figure rises to over half (53%). Other related supplier- or partner-focused steps include the following:

- *Expanded supplier/partner audits* The number of companies that will be auditing their suppliers and partners is expected to rise sharply. Today, 10% of executives say they conduct supplier audits. This figure triples to 31% over the next two years. Furthermore, 9% of executives say that today they conduct ongoing audits of their partners' environmental practices; within the next two years this figure triples to 30%.

- *Required external certifications* Today, where applicable, 13% of executives say their companies require their suppliers to have their subcomponents and practices certified by such standards as EPEAT, Energy Star or REACH. The figure rises to 32% over the next two years. Correspondingly, 15% of executives say their own products are certified by such third-party entities, a figure that grows to 33% over the next two years.

- *Application of proprietary environmental standards* A growing number of companies also require their suppliers to meet expanding sets of home-grown standards. Today, 16% say they audit and certify their suppliers to "our own" environmental standards. Over the next two years, this figure grows to 31%.

Finally, although executives believe their industries and companies need to address environmental issues more actively, over half, 52%, say there is no need for regulatory bodies to police the technology industries. They believe that the industry is already doing what should be done on its own. A significant percentage, however, disagrees: 41% of technology executives say the industry is not doing enough on its own.

Manufacturing and operations

Since virtually every company is in some way a member of someone else's supply chain, interdependency or perhaps even a trickle-down effect is unavoidable. So, just as with supply chains, there is a significant commitment to green initiatives in manufacturing and operations. Today, 39% of executives say the shift toward green products exacts a major (16%) or moderate (23%) impact on their manufacturing operations. Over the next two years, the figure increases to 50%, with 24% of executives describing the impact as major and 26% as moderate.

A similar number of executives, 48%, say their organisations will probably make significant changes to operations or procedures to reduce their carbon footprint. Some companies look to cut the impact of their emissions through carbon offsets, the act of paying for emission reductions elsewhere instead of reducing one's own emissions.

However, a separate PwC study concluded that companies can do far better if they invest in carbon dioxide-reducing technologies for their own operations, rather than buying carbon offsets from others. PwC's Canadian climate change services leader, Christine Schuh, estimates that internal investments can be much less expensive than offsets.

For example, a large industrial facility generating two million tonnes of CO_2e in 2007 could spend up to $90 million to purchase offsets over the next 10 years or they could invest $10 million to retrofit in the first year (assuming the cost of the retrofit and offsets would be the same at $15/tonne of CO_2e) to reduce greenhouse gas emissions by the same amount according to PwC calculations.

One reason for the sharp difference, Schuh said, is that when you have reductions from internal measures, they carry forward from year to year. In the credit scenario, you have to purchase credits each year. Furthermore, investing in improved plant operations will make a company more competitive in international markets—an added bonus, Schuh noted. This spells opportunity for new technology innovations to help manufacturing plants upgrade operations to reduce their carbon footprints.

Sales/marketing

Not surprisingly, as organisations both target green demand and respond to environmental activism, the marketing and sales teams are bound to get involved. Six percent of our respondents say sustainable practices or products have a significant impact on their sales and marketing; 27% say these have a moderate impact on their selling strategies, for a total of 33% who cite some impact. Within the next two years, the figure will reach 49%, broken down as 12% significant and 37% moderate.

Scott Gnau, Chief Development Officer at Teradata, says, "There's a very significant amount of green design in our products—and if you take a look you'll see our marketing people are very much [invested] in this." Meanwhile, as a spokesperson for a large US-based computer maker explains, "We're at a tipping point where interest in green computing products is taking off, both for consumers and businesses."

The challenge, she says, is "to try and fathom whether this is your customer's core belief, as is often the case with individuals, or whether it's the desire to be perceived as environmentally conscientious, as is often the case with businesses." It's a subtle distinction, she says, "but it's an important one as you're developing product appeals and brands."

A significant risk in all of this is the potential for members of the industry to portray products as green when they really aren't. That's why it is "just so important," says Teradata's Gnau, that companies actually "deliver" on their promises. "If you say it is green, then you should be able to pin that on something measurable," says Gnau. "If you just slap a green label on a product when it doesn't deserve it, people will see through that very quickly, and it will hurt you in the long run."

Talent management

The rise of the green movement is having an impact on talent management, particularly in the areas of staff recruitment and development. Today, for example, 20% of executives say green issues are having a major (4%) to moderate (16%) effect on employee recruitment, a figure that rises to 35% within the next two years. The survey also shows that 24% say green issues have an impact on employee development, a figure that also rises to 35% in the next two years.

As explored in a separate PwC report, "Managing Tomorrow's People," this is an increasingly important differentiator for all companies in all industries when it comes to recruiting and retaining talent.

According to an HR executive from a European hardware maker, "This is an issue that is of growing concern to job candidates." Increasingly, "When we go out to campuses for recruitment, we are asked about our environmental policies... You need to be able to tell a good story or you run the risk of missing out on the best candidates. It's very noticeable today; there is a growing number of people who decide where to work based on their employer's impact on the environment."

Sometimes on campuses she addresses the issue with humour. Jokingly, she explains, "Yes, we are a contributor to environmental demise." The company's products "draw power, use plastics which are derived from petrochemicals, and not everything we use is recycled or even recyclable. We are a terrible burden on the planet."

But, she continues, "Computers and computer peripherals and networking equipment—none of this is going away." Meanwhile to attract talent, "We can point to numerous examples where we're working on improving power consumption, reducing waste or where we're in talks with customers, suppliers and industry groups to reduce the overall environmental impact."

The takeaway message? "We emphasise to prospects that it's easy to talk about fixing the environment. What we offer means really having to work, but it's a chance also to make a real difference."

Other likely effects

The survey also reveals some strong opinions about green consumption and good citizenship in the corporate community.

For example, nearly half the respondents, 49%, say they are likely to need to collaborate more closely with their supplier/customers to achieve regulatory compliance. As an executive from a large US chip maker explains, "We're actually involved in several forums where customers, manufacturers, suppliers and everyone we can think of who might have a role to play gets involved in discussions focusing on complying with evolving regulations around the world."

Nonetheless, only a minority of our respondents agreed that their companies should:

- Be required to respond to customer questionnaires regarding environmental policies and compliance (44%)

- Submit environmental policy/compliance questionnaires to or conduct certifications/audits of suppliers (37%)

- Renegotiate/modify supplier contracts as a consequence of environmental issues (30%)

- Expand the product portfolio to include more environmentally-minded products (28%)

- Renegotiate/modify customer contracts (17%)

- Withdraw a product owing to poor environmental performance (14%)

Case study:

Collaboration is the green key: Three successful examples

When it comes to improving the environmental processes within an entire industry, "it's important to involve as many of the key players as possible," says Holly Elwood, Environmental Protection Specialist at the United States Environmental Protection Agency. Three collaborative efforts illustrate this point.

The EPEAT standard

The Electronic Product Environmental Assessment Tool (EPEAT) is a shining example of the power of cooperation. EPEAT is a tool developed by government and industry to help purchasers buy greener electronics. The project has a huge array of stakeholders, including manufacturers, recyclers and customers. According to Elwood, the group has "come up with definitions of what it means to be green for desktops, laptops, monitors and other technology products."

EPEAT ratings are based on several attributes, including:

- Energy efficiency

- Design (product longevity/ life extension/toxic materials/recyclability)

- Product take-back (will the manufacturer participate in recycling?)

- Packaging

- Overall environmental performance of the manufacturer

Products can be EPEAT-rated bronze, silver or gold. Today there are over 650 products that have been rated and registered, with many more in the pipeline.

Elwood, who plays an active role in the agency's environmentally preferred purchasing programme, he says this creates "an objective means for buyers to evaluate the energy and overall environmental attributes of the technology products they're considering." Moreover, "Federal government buyers are now required to buy EPEAT products whenever available."

Next: The climate savers

Kim Stevenson is not only Vice President of Communications, Media and Entertainment for EDS, she's also an officer with the Climate Savers Computing Initiative, which is devoted to improving the energy efficiency of computers and servers. Stevenson says, "The group's goal is to reduce power consumption by 50% by 2010." Less than a year old but already boasting over 100 corporate members, the group exemplifies the sort of collaboration between corporate participants and consumers the EPA hopes will spread to other industries.

A key goal of the work is to educate both procurement executives and individual consumers. "Today, when you go to buy a PC, the most power-efficient models are only about $20 more," Stevenson says. "If we were to show you the graph of that, you'd see the added cost pays for itself in a matter of months. So over the life of the PC, you make that back many times over."

Stevenson and the Climate Savers Computing Initiative are also working with businesses and service providers to develop more energy-efficient business practices. For example, "We're encouraging people to turn off their computers at night," she says. And to overcome some of the strongest objections to such practices, "We're working with companies to create awareness of ways to send patches in sleep mode."

Enter: The Green Grid

For another model of collaboration, consider the Green Grid, a consortium of manufacturers, software makers and even government entities devoted to reducing the energy costs associated with data centres. According to Roger Tipley, a Senior Technologist with HP and the Director of the Green Grid, his organisation is not attempting to reduce the total energy consumed by data centres. "Data centres are the factories of the information age," he explains. "We fully expect the computational and storage needs to go up and up." So much so that "no matter how efficient we become, we aren't likely to stop the rise in power consumption."

However, the group does believe it can slow this growth with higher computing-power-to-energy-consumption ratios, and hence lower costs. To slow the growth in power consumption, the Green Grid believes it needs to incentivise manufacturers to create more energy-efficient products and to stimulate data centre owners to become more sophisticated purchasers.

According to Tipley, "Energy can represent as much as half or more of the total cost of running a data centre." But in many cases, there is no connection between this direct cost and the total cost of the data centre operation. Perhaps energy use is allocated by square footage or the bill comes in so late there are no attempts to relate the costs to the data centre's operations. "Or perhaps," says Tipley, "it's not part of the IT budget at all—the facility manager and the IT guy don't even talk to one another."

By making the link between energy costs and data-centre operations more visible, the Green Grid will enable executives to make better decisions and become more demanding of manufacturers and related providers regarding their products' energy costs.

Collaborate, then compete

Though programmes such as the Green Grid, Climate Savers Computing Initiative, and EPEAT each take a slightly different approach to green computing, they share at least one common element. All three require collaboration between roomfuls of staunch competitors. "Yes indeed," says EDS's Stevenson, "there's an awful lot of intellectual property in the room."

But that's acceptable, says Tipley, because everyone understands the objectives. Essentially, he says, "We're setting ground rules, a base condition that's in everyone's best interest." From there, says Tipley, "you're free to compete at will—and trust me, we're fierce."

PwC connections

Optimising and safeguarding the green supply chain*

Over the last decade, many technology companies have reduced their business costs and expanded their product lines through an aggressive supply chain strategy. Low-cost sourcing, multi-tiered supplier networks and business process outsourcing are among supply chain initiatives that technology companies of all sizes have successfully employed.

Now technology companies are faced with the challenge of ensuring environmental and social sustainability throughout the global supply chain while still optimising its performance. Few realise the extent of effort needed to create the systems, controls and governance needed to meet these environmental compliance standards.

Many technology companies look to outside advisors such as PwC to help "green" their supply chain in a variety of ways, starting with strategy alignment and partnership selection.

But with few local laws concerning the environment enacted and enforced around the world, managing environmental sustainability in the supply chain can be complex, resulting in imprecise outcomes. How can a technology company be sure that its suppliers produce according to the company's environmental standards?

To help our technology clients, PwC has developed an integrated set of diagnostic tools and related services that identify, prioritise and address environmental sustainability supply chain risks. We address three critical areas:

Supply-chain risk assessment

At every stage in the process—developing a sourcing and supply-chain strategy, selecting suppliers and partners, managing established relationships and processes or even discontinuing a relationship or process—all environmental risks need to be acknowledged to be effectively managed. With the help of qualified advisors, technology companies should make an inventory of these key risks, then evaluate their potential impact using established and tested risk-quantification tools.

Design of frameworks for supply-chain risk management

Next, technology companies need an appropriate risk-control framework. Our methodology systematically considers each of the components required for effective risk management—internal environment, business objectives, event identification, risk assessment, risk response, control activities, communications and monitoring procedures.

Until local laws are developed and enforced, codes of conduct can be a useful mechanism to address the social and environmental issues between the technology company and its suppliers. Top management involvement is crucial to convey commitment and influence behaviour. It is important to have a clear ethical sourcing policy embedded in the organisation. It is also important for suppliers to understand the business case for supplying green products so they are more willing and motivated to undertake necessary investments.

Supply-chain risk mitigation

One of the most challenging aspects of environmental supply-chain risk management is ensuring the proper implementation and continued application of an effective risk-control framework—procedures, training, monitoring and reporting. Companies that have identified their key risks and defined the appropriate responses require adequate capabilities and the organisational discipline to implement the risk-control framework effectively. PwC helps clients to implement effective risk-mitigating activities and controls by providing training and monitoring services. We have found that environmental sustainability monitoring is most effective when it concentrates more on education and less on policing.

For more information on how PwC can help your company optimise and safeguard your green supply chain, visit us at *www.pwc.com/techconnect* for links to solutions and contacts.

Questions for further reflection

How much do you know about your suppliers' environmental impact or commitment to environmental sustainability?

To what extent might your organisation be harmed by a supplier's or a partner's environmental issues?

Does your company participate in carbon trading? Might this be a strategy you can pursue?

Are you adequately weighting concerns such as product energy consumption, hazardous material content or end-of-life issues in the R&D phase?

Are your sales and marketing departments involved with your company's overall environmental efforts? How/what could they contribute?

Are you being asked by potential employees about your company's environmental impact? Do you have a good story to tell?

Observation three:

Taking proactive steps towards sustainability.
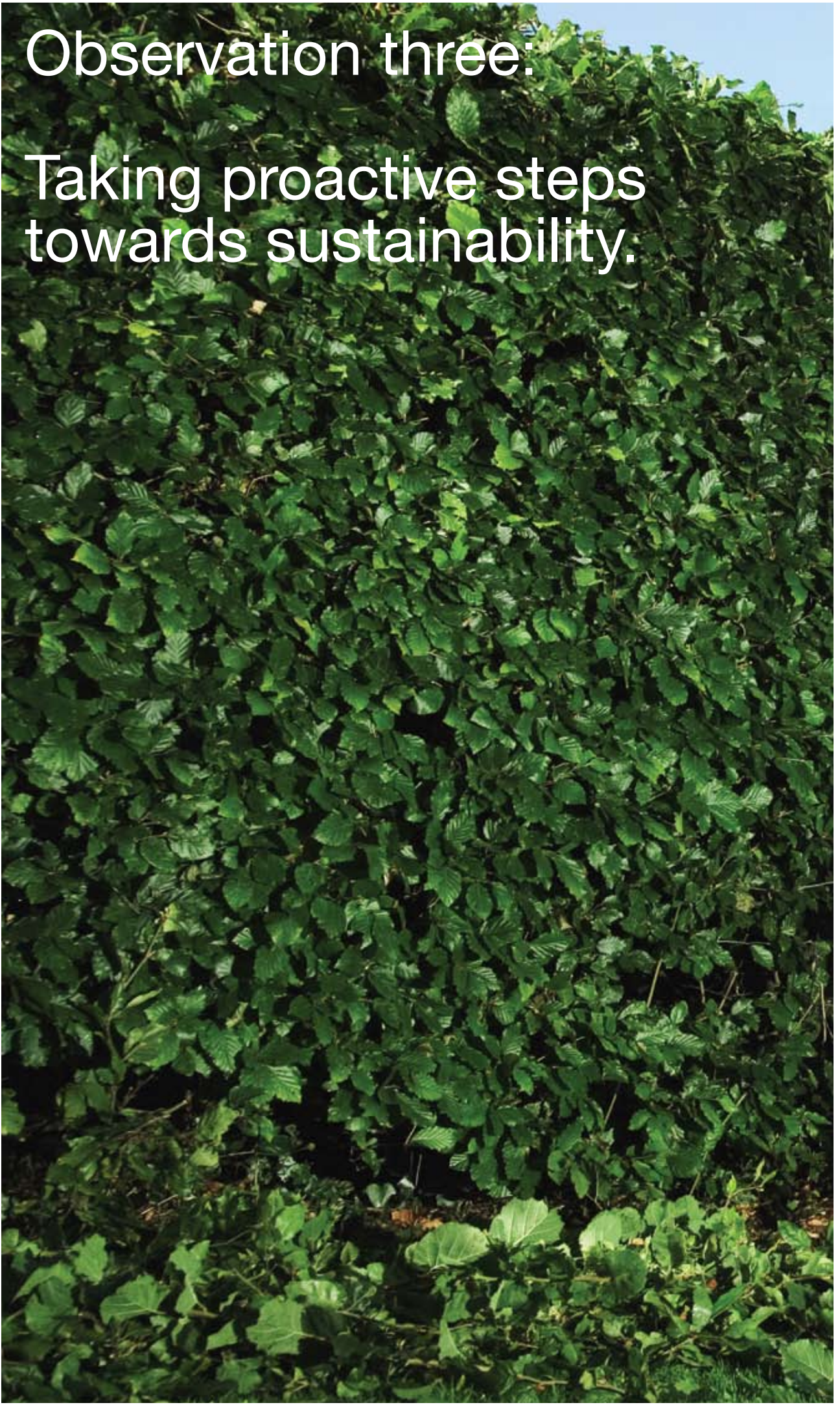
Seeking to stem the rise of environmental regulations, the technology industry develops its own green-oriented controls.

Green demand, energy costs and even a degree of altruism all motivate companies to pursue green initiatives.

Another driver is the fear that industry inaction will lead to activism by regulators and courts. Rick Hind, a Legislative Director for the toxics campaign at Greenpeace, feels companies are motivated by the dangers of doing nothing or moving too slowly.

"Liability is unpredictable, and it can balloon quickly," says Hind. So when it comes to hazardous materials in technology products or carcasses of used televisions and computers piled in town dumps, Hind says, "like it or not, the potential for liability is a great motivator." Overall, he believes, technology companies will tend toward greener business practices "because they see it's the way to reduce liability and avoid regulation."

Is regulation a bad word?

Among technology executives, one view is widely held but rarely stated for attribution: there is nothing more inefficient, ineffective and ultimately costly than regulation. The level and intensity of environmental governance and compliance varies around the world. At the more active end of the spectrum are regulators from the European Union, where technology companies are learning the ins and outs of compliance with such legislation as the "REACH" and "WEEE" directives.

REACH, an acronym for Registration, Evaluation, Authorisation and Restriction of Chemical substances, essentially raises the level of company responsibility when it comes to the chemicals they use.

WEEE stands for Waste Electrical and Electronic Equipment. Here, the EU is mandating collection and recycling targets for electronic devices ranging from large home appliances to hand-held toys and other devices. WEEE complements yet another directive, RoHS or Restriction of Hazardous Substances, which limits the use of lead, mercury, hexavalent chromium and materials deemed harmful to the environment.

Both the WEEE and REACH directives are designed to reduce industry's impact on the environment. But as shown by a separate PwC study, "Saving the planet—can tax and regulation help?" such sweeping regulatory actions are often too unclear and too complex to deliver the desired change. John Manning, Head of Environmental Tax and Regulation for PwC, explains that technology companies actually seek a clearer and more consistent policy framework so they can make the long-term decisions necessary to benefit the environment.

In countries where environmental regulations and compliance have not yet grown into programmes such as REACH and WEEE, executives are working hard to do their own housecleaning, if for no other reason than to forestall government intervention.

Concerted lobbying helps. For example, a North America-based executive says that his company is working with other technology companies to try to deter the passage of similar legislation in the US. He says, "No matter how you structure your environmental approach, ultimately, the cost of those efforts is going to be funded by the consumer. The higher costs will be passed on."

That being the case, says the executive, "creating a regulatory-based compliance model is the absolutely least effective and probably the most expensive way to move forward." So to the extent the technology industry can do its own policing, says the executive, "everybody wins."

Not all technology executives are happy to comply with their own rules yet loathe to comply with government rules. A full 41% of our respondents thought government regulations should be stronger.

Better grades on the way

Asked to grade their own organisations on environmental performance, the industry average is a B- or as one executive described it, just above a gentleman's C. Could the industry do better? "No doubt, but at the moment, the benefits aren't worth the incremental effort. We're already doing a decent job where an incredible job just isn't necessary."

But if today's practices earn any given company a B-, that won't be enough to avoid greater regulatory activism in the very near future. So, executives are taking dramatic steps to lift the curve and raise their environmental standards and practices.

For example, a growing number of technology companies are:

- **Developing formal environmental policies** Today, 20% of our respondents say their companies maintain a formal and widely distributed environmental policy. Over the next two years, the figure more than doubles, to 48%. For best practices, these companies might look to other industries (e.g., chemicals and energy) that have been doing this for decades and have a head start on developing policies and controls.

- **Auditing internal green practices** Similarly, the number of companies conducting audits and self-assessments of compliance and performance with those policies will rise from 17% to 41% over the next two years.

- **Appointing a green leader** Companies are also starting to assign a senior executive to execute and evaluate environmental policies. This executive has clear responsibility for all environmental issues. There's a "green leader" today at 9% of companies, and within the next two years there will be one in place at 32% of companies.

- **Creating greater linkage between green initiatives and performance** Today, 7% of executives say that performance relating to green initiatives is now an element of senior-executive compensation. Here, the expectation is for more than fourfold growth within two years, to 32% of companies. Meanwhile, 14% of companies say their managers are today incentivised to devise environmentally-friendly business practices, a figure that grows to 45% over the next two years.

Similarly a mere 5% of technology companies say attention to environmental issues is presently an element of individual employee evaluation. Once again this figure rises dramatically, to 29%, over the next two years.

- **Encouraging green thinking throughout the enterprise** Companies also say that they will be increasing the use of internal communications that focus on green performance issues. Today, 25% promote the importance of green initiatives via newsletters, campaigns and related tools, with the figure rising to 46% over the next two years.

Furthermore, today 55% of technology companies say they encourage telecommuting, and they expect this figure to grow by 31% to 87% within the next two years.

Eleven percent say their organisations purchase green power: that is, power produced by carbon-neutral providers. This will increase fourfold to 45% in the next two years.

- **Providing greater external visibility into their environmental strategies and practice** As executives enhance the visibility of environmental issues within their organisations, they will also expand the degree of related external reporting. Today, 11% of executives say they share green compliance data with their shareholders. Again, the frequency of this practice rises nearly fourfold, to 41%, in the next two years. Similarly, within the next two years, 32% of executives say they will provide shareholders with formal reports on performance regarding green initiatives.

A word of caution! Companies should be careful not to make exaggerated assertions about the green nature of their operations. If statements of environmental practice don't correlate with publicly available data, this can stimulate unwanted scrutiny and negative publicity.

The CTO of a large European electronics components maker explains, "The last thing you want to do is say 'yes, we believe we're doing a great job of policing our environmental practices,' because no matter your actual record, you'll be begging for closer scrutiny—and that's trouble."

Case study:

Sony Electronics and Waste Management, Inc.: A model for managing electronic waste

Waste Management, Inc. (WMI), one of the world's largest solid-waste handlers, is out to solve one of the key environmental challenges for technology companies. According to Director of Communications Wes Muir, electronic waste—cell phones, televisions, computers—represents perhaps "the fastest-growing area of solid-waste disposal." Consequently, Muir says, leading electronics makers "are looking for ways they can cost-effectively provide a recycling solution to their customers." So WMI has opened some 75 recycling centres throughout the United States, with plans to open 150 more over the next few years. The near-term plan, says Muir, "is to locate a plant within 20 miles of 80% of the US population."

The revenue model

Electronics companies should start solving their e-waste problem before regulation sets in, say Muir. They need to recognise that for skilled waste handlers dealing with sufficient volumes, there is economic value in e-waste. "The copper wiring, the aluminium, the plastic and other metals are recoverable and can be resold," Muir asserts.

Nonetheless, creating e-waste capability on the necessary scale requires significant investment. To help offset both development and ongoing costs, WMI is seeking partnerships with leading electronics manufacturers.

First up to the plate is Sony Electronics North America. In fact, says Muir, "We've been working jointly with Sony to develop this for some time." The way it works is that for a fee any person can drop off their e-waste at any of the facilities. However, there's no fee for Sony customers. The cost of such drop-offs, Muir explains, is covered by a payment based on weight/volume to WMI by Sony. What this represents, says Muir, is an immediate turnkey recycling model "that manufacturers can begin providing to their customers."

A collaboration

Mark Small, Vice President of Health, Safety and Environment for Sony Electronics North America, says the programme with WMI is "an idea whose time has come." Small earned a Ph.D. in environmental affairs in 1979, but has been working in this particular area for the past fifteen years. The problem of e-waste has been growing for some time, says Small. But timing is everything. As Small maintains: "For the first time, we've got the perfect set of conditions to make this work."

First, says Small, this is a service that customers absolutely want and absolutely need. "What are they going to do with that old 50-inch projection television?"

Second, says Small, "This is going to give us an immediate market advantage. If our name is on it, then that means the end-of-life issues have been addressed. It won't be our customer's headache, environmentally or socially." Though the service isn't yet fully "branded," that's "definitely something we're working on," says Small. For

example, "We're looking at a series of promotions—we have a programme in place to trade up your computer which we are expanding to your television."

Third, says Small, "We want to be good corporate citizens. And we want to be thought of as a socially responsible company."

But what really seals the deal for Small is the cost-effective nature of the programme. Yes, there is a fee paid by Sony to WMI based on volume. In addition, the cost per pound will vary based upon a number of factors including the distance the product must be transported from the collection point to the recycling operation and the type of product. However, says Small, "the cost per pound is insignificant in relation to what we get up front for the initial product."

A model for others?

Moreover, says Small, it's an especially small price to pay if the effort can translate into a model the rest of the industry can follow. "We produce 300m–600m pounds of products in North America alone every year," says Small. He is one of the few executives interviewed who would like increasing federal regulation. "We've been hoping for a federal law standardising the end-of-life issues for electronics, but it just hasn't happened." Today, he continues, "We're going well beyond what the states or the federal government currently require." Ultimately, he maintains, "What we're

doing is putting out a model that we hope regulators can use; where those who use and create this waste are the ones who pay for its management; and that will standardise the duties and practices in e-waste and actually help solve the challenge."

Essentially, says Small, "The consumer electronics industry has a significant impact on the environment." Nonetheless, "there's no one who's going to say we should all give up our televisions and our entertainment." So it remains "in Sony's and everyone else's interest to take this seriously and to be proactive—and that's just what we're doing."

PwC connections

Redefining sustainability risk*

Environmental sustainability is a business landscape modifier that, like the Internet, threatens to unleash its own wave of creative disruption across the corporate world. The pressure is growing on companies to act swiftly to manage environmental risk while making the most of its opportunities.

Yes, you can manage the risk

There are significant challenges in integrating environmental risk management processes with strategic decision making and day-to-day operations. PwC recommends a multi-step framework to manage environmental sustainability risk:

1. Measure and monitor your carbon footprint—including your supply chain—using an independent and credible audit to communicate your footprint.

2. Forecast carbon growth and set reduction targets. Give stakeholders information to help their investment decisions.

3. Create a senior environmental sustainability management position to set the tone and culture from the top.

4. Monitor competitors' environmental responses that might impact the industry.

Reinventing risk

Environmental and social risks add to the multitude of risks organisations already manage. In many companies, each new risk or regulation is often addressed by creating a new oversight or designing a specific new process—on the presumption that each additional control will bring the company nearer to zero risk.

However in a separate PwC report, *Making smarter risk decisions—reinventing risk*, we observe that organisations must proactively and constantly define and update their risk culture and risk appetite. Failure to do so results in misaligned risk systems as new processes build up. That creates the ultimate risk: making corporate decisions based on a skewed system.

Many organisations also believe they eliminate risk through compliance. But in truth, risk has not been eradicated by regulation—it has been driven underground. The thing we should be worried about is not the burden of compliance, but the suppression of risk taking. Problems can be caused if management does not have a proper understanding of appropriate risk appetite and tolerance, enabling risk-taking decisions.

Today's businesses must reinvent prudent risk-taking within a desired framework of compliance to strike an appropriate balance between risk, return and growth to create lasting value.

How does the organisation bring this vision to life? At PwC we believe an organisation will need to consider:

- **Aligning performance and conformity** – articulating an explicit risk appetite to ensure potential gain and desired compliance are viewed in conjunction with governing action;

- **Optimising performance through effective risk taking** – linking risk appetite to business strategy and operations; leveraging risk choices to support commercial benefit; and

- **Embedding risk appetite in organisational culture** – driving the behaviours and measures required to support consistent recognition and application of the desired risk appetite across all business units, functions and people.

Organisations that reinvent their view of environmental and other risks will be positioned to identify, holistically assess and embrace those risks that will bring success and differentiate the organisation in the market.

Organisations that do not alter their way of thinking about risk can continue to use compliance as a security system and secretly harbour hope that one day pure compliance will be a differentiator. But at PwC, we think that's a pretty risky proposition.

For more information on how PwC can help your company redefine and manage environmental risk, visit us at *www.pwc.com/techconnect* for links to solutions and contacts.

Questions for further reflection

How deeply is your company affected by already existing environmental regulations? What potential legislation do you need to consider?

Does your company have a formal environmental policy? Is it known and followed from the top down?

How committed are your current employees toward being greener? Do you offer incentives to be environmental?

Could your company withstand close scrutiny of its environmental policies? Would a closer look have positive or negative effects?

Are you involved in any collaborative industry initiatives? Are you in communication with governments around the world?

Observation four:

Hardware and software opportunities.
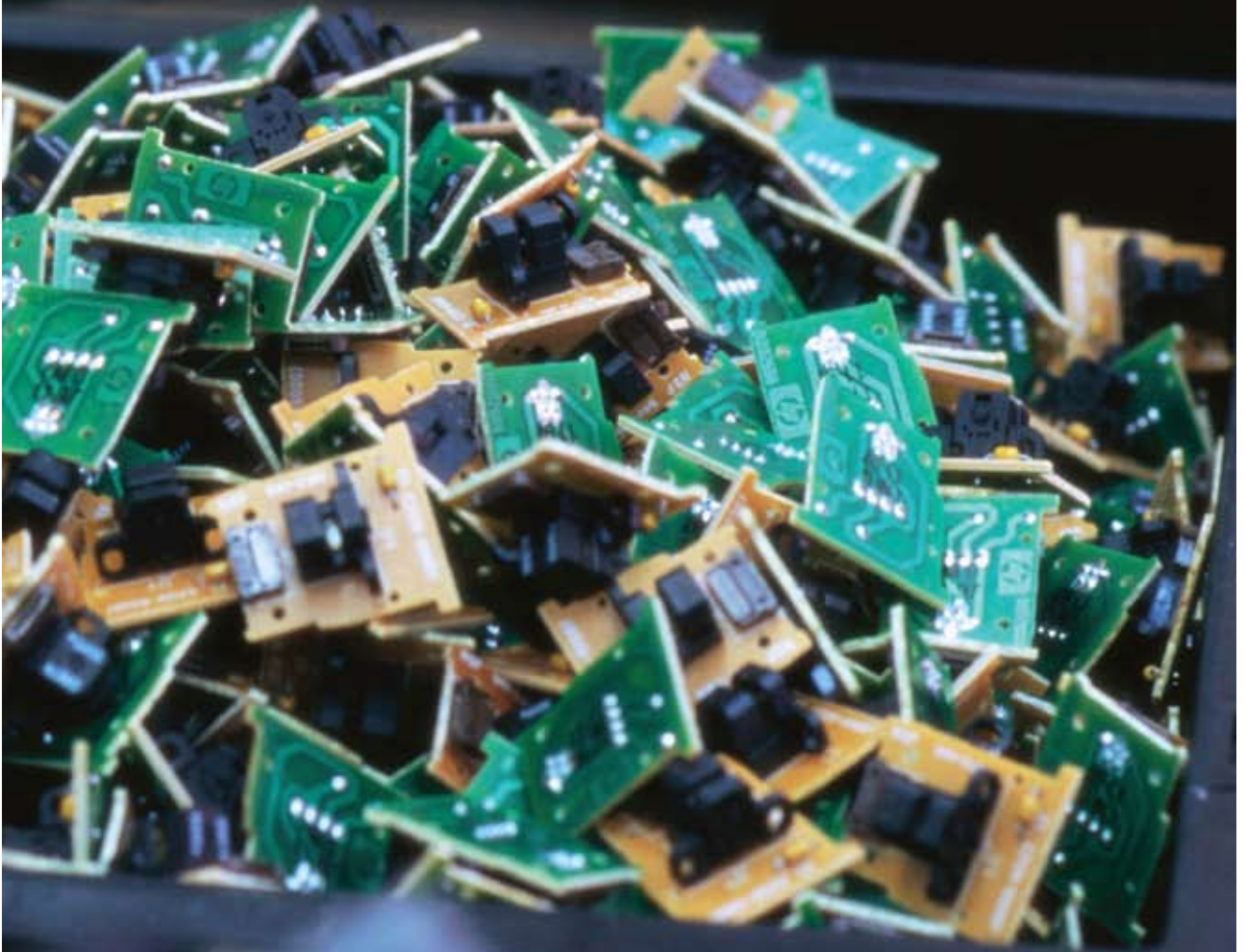
Hardware manufacturers have the greatest incentive to adopt green initiatives, but opportunities exist for software companies too.

Chip makers and manufacturers of technology products pay much greater attention to green demand and green operating issues than do service-oriented businesses such as software makers, content developers and related entities. Forty-seven percent of manufacturers describe the arrival of the green movement as a significant opportunity for their companies, compared to only 37% of nonmanufacturers.

Furthermore, manufacturers are developing environmentally friendly products at a rate nearly double that of nonmanufacturers. Sixty percent of technology manufacturers say they are developing green products and services, compared to only 33% of nonmanufacturers.

The statistics consistently demonstrate greater interest and associated green activity on the part of technology manufacturers relative to other sectors, which is natural enough, considering their products. After all, a computer is harder to recycle than a software programme or a Web page.

Differing motivations

It is important to recognise the different forces driving each of these industry subsegments. A look at the drivers for manufacturers versus nonmanufacturers highlights some stark differences, most likely because of the different levels of environmental impact between hardware and software.

For service-oriented technology companies, the primary drivers behind the development of green technology products and services include, first, strong market growth opportunities (46%), followed by management's commitment to environmental responsibility (32%). In a distant third, 16% of service-oriented executives say their pursuit of green technology is a result of their customers demanding they start going green. Finally, a mere 5% of nonmanufacturers are pursuing green technology out of concern for consumer or regulatory backlash.

Manufacturers, by contrast, are pursuing green technology because, first, their customers demand that they do so. Cited by 36% of manufacturing executives, this figure is over twice that of nonmanufacturers.

Number two on the list of motivations for green initiatives, cited by 27% of manufacturers, is concern over consumer or regulatory backlash. Manufacturers are five times more likely to list this driver than their nonmanufacturing counterparts.

Third and fourth on manufacturers' lists of motivations are marketing opportunities and management's commitment to environmental responsibility, both weighing in at 18%.

Two sets of motivations for going green

Technology service providers**	Manufacturers of technology products*
• Market opportunities (46%)	• Customers demand we do so (36%)
• Management commitment to environmental responsibility (32%)	• Concern for regulatory or consumer backlash (27%)
• Customers demand we do so (16%)	• Market opportunities/commitment to environmental responsibility (18%)

** *Service providers include content developers (entertainment and business); software developers; hardwired distribution service operators (e.g., cable television); and wireless distribution service providers.*

* *Manufacturers include consumer electronics/device makers; nonconsumer hardware makers; and semiconductor and other components makers.*

Green design and manufacturing

To meet the demand for green technology while slowing the tide of environmental regulations, technology manufacturers' green-oriented "to do" lists are extensive:

Pursue energy efficiency Discuss green initiatives with any executive from any segment of the technology industry, and soon enough, the focus will turn to energy consumption. "Power consumption," says HP's Tipley, "is becoming the number-one issue relating to server technology and the environment."

Energy is a concern to industry customers because it is increasingly identified as a rising and highly visible element of IT cost. "And the more this becomes an issue for customers," says Tipley, "the more focus will be placed on this by manufacturers and other providers."

Today, 68% of manufacturers say they are paying significant attention to this area. Within two years, the number climbs to 84%.

Avoid hazardous materials Manufacturers are working hard in their pursuit of designs that reduce or eliminate the use of hazardous materials such as mercury, cadmium and hexavalent chromium. This is a core initiative, being undertaken now by 65% of manufacturers, a figure that rises to 89% within two years.

The avoidance of hazardous materials is an issue that strongly resonates with Scott Wicker, Chief Marketing Officer at ZINK Imaging, a company that has developed what it refers to as a "small, simple, mobile and earth friendly" printing technology that it licenses to manufacturers. Essentially, the process uses special paper with embedded dye crystals that react to the heat of a ZINK-enabled laser printer.

ZINK Imaging, Wicker explains, was a spin-off of Polaroid and as a result "acquired some world-class R&D talent." And one area where "they were very well trained," says Wicker, "is to always insure any technologies we develop are as safe and as environmentally friendly as possible."

In particular, says Wicker, "If at all possible, you want to avoid the use of new chemicals or anything that hasn't been tested or approved."

Use recycled materials Today, 41% of manufacturers say they are encouraging their R&D teams to incorporate recycled materials wherever feasible. The figure rises to 68% over the next two years.

This is an area where service-oriented companies are also able to participate, particularly in packaging and printing. Here, 20% follow this practice today, a figure that rises to 48% within two years.

Use recyclable materials Similarly, 38% of technology manufacturers are today expanding their use of recyclable materials, a group that will expand to 68% within two years. Nonmanufacturers follow this course at rates of 26% today and 50% within two years.

Build to last By making products last longer, "it's simple," says Teradata's Gnau, "there's going to be less waste." Consequently, he explains, "We're always looking for ways to improve our products in terms of making them more upgradeable or modular." Here, 32% of technology manufacturers say this is an element of their design strategies today; within two years the figure rises to 59%.

Watch the packaging Today, 43% of manufacturers say they work to packaging standards that meet or exceed global environmental standards. Here, the figure rises to 73% within the next two years.

Worth noting is the growing interest in packaging emanating from the technology industries' nonmanufacturers. Packaging and printing can be significant elements of software and content provision. Not surprisingly, 20% of these executives say they pay significant attention to this area today. Moreover, within two years, the number triples to 60%. Overall, the goal is to reduce packaging and minimise its environmental impact.

Address "end-of-life" issues Not only should products feature recyclable materials, companies need to plan for the reclamation of their products. Certainly, there is no tried and true model. For example, in Europe, taxes on products such as televisions cover the cost of many products' recovery, with similar plans in effect in California and under consideration elsewhere.

But as Peter Zeven, CEO of Philips Electronics North America Corporation, argues, "If you read a newspaper, you throw it in the trash. When you finish with a tire, you throw it in the trash. Why then is it the manufacturer's full responsibility and cost if you finish with a television?"

Still, Philips actively addresses end-of-life issues, working to constantly reduce the weight of its products and improve their recyclability. However, says Zeven "there needs to be more discussion on what is the best model to follow."

Opportunities for nonmanufacturers

As we have seen, software and service-oriented technology companies must also think green. Kim Stevenson, Vice President, Enterprise Service Management at EDS says, "We play a role in advising our clients on total cost of ownership." With energy becoming such a large element of total IT costs, "It is very important that we present the complete cost picture so our clients can make the most informed decisions." EDS advises clients in many industries.

Helping other industries

Our survey shows that 81% of executives believe that the most important contribution technology companies can make toward improving the environment is through the provision of tools that will enable other industries to develop breakthrough solutions.

Rob Bernard, Chief Environmental Strategist at Microsoft cites LiveMeeting as a software programme that can help companies in all industries shrink their carbon footprint. "That's software that enables people to collaborate without having to drive or fly to work together." Such "distributed" meetings, says Bernard, "make people and companies more efficient" while at the same time reducing carbon emissions."

But software makers can do much more to reduce energy consumption. "The industry has a huge opportunity here," says Bernard. "There are a large number and many types of applications that can be written around energy and carbon reduction."

Another area of focus, says Bernard, "is improving the power features and power management scenarios of our software." For example, "the default energy saving features in Windows VISTA are aggressive. We're delivering an energy-efficient solution that performs right out of the box; the customer doesn't need to configure anything to realise this." That not only lengthens the usable battery life on a laptop, "it reduces total power consumption" of laptops and desktops, says Bernard.

Next up: Power consumption

For all three markets—laptops, desktops and servers—"we're writing a much more robust set of instructions" for optimising power management. Overall, says Bernard, "power management—how much more efficiency we can gain with minimal friction to the system—is something the industry has been working on for a long time." But only now, says Bernard, is it becoming a primary focus for customers. So from here on, he says, "you'll see a lot more optimised settings by default and a lot more [tips and suggestions] in the manuals." In addition, says Bernard, "you'll see more virtualisation capability as well."

Toolkits

Another huge set of opportunities for software companies to aid other organisations' energy conservation efforts is the provision of what Bernard calls "tool kits." Here, for example, Microsoft is working with the Clinton Foundation and the International Council for Local Environmental Initiatives (ICLEI) to develop a set of standardised metrics to enable comparisons between major cities. "Local governments— cities—use an enormous amount of energy in their buildings, street lights, airports," and so on, says Bernard. So standards are important, "because cities can use these to measure, track, learn and improve their greenhouse emissions as they've pledged under the Kyoto protocol." Although the US has not ratified the Kyoto agreement, many US cities—such as Seattle, New York, Los Angeles and Chicago—have pledged to abide by it.

Microsoft is also turning the next generation to discern green opportunities. The company's annual competition, the "Imagine Cup," encourages students worldwide to develop software that can make a difference in the world. The contest's 2008 theme, says Bernard, "asks kids to try and imagine the ways that technology can enable a sustainable environment."

In a related vein, for its headquarters operations in Redmond, Washington, the company is experimenting with a mass transportation system. Called the Microsoft Connector, the system is actually "a set of pickup locations serviced by 800 vehicles covering 32,000 miles a day," says Bernard. By concentrating employees and using a mass transit model, "we believe we can significantly reduce the energy used getting to and from work." So far, "the results are marginal," says Bernard, "but more people are using the system every day." Overall, says Bernard, "it's an example of how we're looking at the entire life cycle of our energy consumption."

Meanwhile, Lawrence Lamers, a senior executive with VMware and a director of the Green Grid, says that software developers can play an absolutely crucial role in the development of green products. "There are some tremendous advances being made in the area of virtualisation—a technique for making servers more efficient."

Similarly, he explains, "a tool these people running these large data centres would love to see would be a sort of dashboard, something that connects power utilisation to activity and cost." With all three variables under control, executives could monitor their organisation's usage in real time to pursue an optimisation.

At storage-oriented Network Appliance, EVP of Product Operations Tom Georgens says his company's software excels at reducing the total amount of information that needs to be stored, which in turn reduces the number of required servers and, of course, the amount of electricity consumed.

"Most companies have more data backup than they really need—often by a factor of five, six or even ten," Georgens says. For example, "One document might exist in five or ten forms, little changed in each instance." Through software techniques such as de-duplication and compression, say Georgens, "we can cut way back on the total amount of data needing to be managed."

Bottom line, notes Georgens: "There are plenty of opportunities for software companies to play a role in creating more environmentally friendly computing."

Case study:

Royal Dutch Philips Electronics:
The pursuit of green products and operations

Today, green products account for approximately 15% of group sales at Philips Electronics. But Philips announced in September 2007 that by 2012 that figure will double to 30%.

In the same announcement, Philips stated that it intends to increase the energy efficiency of its operations by 25% while simultaneously doubling its investment in green operations (to €1bn, or US$1.4bn), both within the next five years.

As CEO of Philips Electronics North America, Paul Zeven maintains, "It's safe to say we're a green-focused company and are constantly looking at new ways to improve on this."

Profit and sustainability

According to Zeven, the pursuit of profit and the pursuit of environmental sustainability are not mutually exclusive. "Our stakeholders expect the achievement of the right balance."

The balance in question, says Zeven, "means observing the limits of sustainability while pursuing the lifestyle we love." For a practical example, consider how many of the world's televisions and other electronic devices continue drawing power even when not in use. Why is this? Zeven explains: "Consumers want to be able to use a controller to turn on their devices, and when they push the button, the device should come on quickly." To do this, the appliance must be left in standby mode, continuing to draw power at a rate of around one watt per hour. If customers really viewed sustainability as the principal attribute for their products, they would buy televisions that don't operate on standby, or they would unplug their televisions when they're not in use. But products such as these have been tried and were rejected by customers, says Zeven. "People are not willing to give up their lifestyle in order to achieve that level of sustainability."

So the real objective of green products, Zeven explains, "is to push the limits of what is technologically possible in terms of both function and sustainability." Again, in the example of a television's standby mode, "we've engineered that from 10–15 watts per hour down to 1 watt today and soon even less—we are working on 0.2 watts."

That sort of energy consciousness is an example of making a product greener without compromising lifestyle. Of course, products such as these "cost more to develop," says Zeven, but his company believes, "This gives us a strong competitive edge over the competition." The investment, he insists, "is well worth it."

Green design and operation

According to Zeven, Philips takes a systematic approach to the design of green products and the formation of green operations. He also points out that it is often the smallest details that result in the most significant savings, be it in energy costs, reduced packaging, the avoidance of hazardous materials or any number of relevant sustainability issues.

For example, consider packaging. Rather than creating products and then determining how they can be packaged for shipment and retail, Philips begins thinking about those issues while the product is still in early design. "We try to create designs and packaging that take into account the size of [transport] containers." The less packaging required, the less weight; the less volume, the more items can be packed in a single container; hence, less fuel and other raw materials consumed in shipping and handling. Philips maintains, "We set very aggressive targets for our designers in these areas."

A common theme at Philips is the "total view" of the sustainability issues relating to any product's production, delivery and performance. According to Zeven, "We look at the total footprint, not just the energy cost to operate but also the energy required to make it and to transport it"—and at end-of-life, to recycle it.

Green to the core

Zeven says that this same sort of "total view" thinking goes into all phases of the company's operations. In addition, the company routinely audits the operations and actions of its supply chain, holding participants to strict standards. So from product conception to design, including product content and use of hazardous wastes; from the choice of recyclable or recycled materials to product weight and longevity, Philips keeps a close watch on sustainability.

Ultimately, says Zeven, "This commitment to development amid sustainability—it's in our DNA."

PwC connections

Measuring up: Sustainability reporting in the technology industries*

The concept of the triple-bottom-line is emerging in the technology industries. This approach focuses on the economic value of an entity (the financial report) as well as the company's environmental and social impacts (the sustainability reports).

Sustainability reporting creates linkages across the entire value chain. Within an organisation, the report can be used to better manage operations while minimising risks. Externally, technology companies can use the report to clarify their environmental advantage in the marketplace with competitors, regulators, the public and consumers.

European companies have a longer history of sustainability reporting as mandatory environmental reporting requirements have been established in a number EU countries. US companies with European operations and with a desire to stay ahead of any forthcoming US regulations are developing their own sustainability reporting strategies.

Producing a meaningful report

While this reporting is appreciated, stakeholders have become frustrated with the inconsistency of the sustainability reports and benchmarks.

To bring clarity, consistency and control to their environmental impact reporting, many technology companies are turning to independent third-party firms such as PricewaterhouseCoopers to provide sustainability reporting assurance.

A sustainability report must contain certain criteria:

- A clear explanation of the company's environmental sustainability strategic priorities aligned with the overall corporate strategy;

- A clear explanation of the key measures of success for each environmental strategic priority;

- Key performance indicators for each environmental priority for prior periods (trend line) and quantified targets for the future;

- Summary of key risks and assumptions underpinning future outlook and a level of sensitivity analysis;

- Quantification, where possible, of both the cost and benefits of implementing the environmental sustainability strategy.

A number of technology companies use a sustainability report as a means to highlight their effort to achieve carbon neutrality—a practice where the amount of carbon released through operations is balanced by an amount held back (by limiting energy usage or by tapping a renewable energy source) or an amount offset (by investing in a responsible carbon project like planting trees or by buying carbon credits).

Can tax and regulation help?

PwC's survey, *Saving the planet—can tax and regulation help?* reports that a majority of companies would welcome the idea of using the tax system to incentivise them to become carbon neutral. But many companies feel that current environmental taxes and tax incentives are unclear and complex.

In the European Union, REACH (described on page 32) became law in 2007. Through PwC's REACH Business Impact Assessment and Healthcheck tools, we've identified over 30 critical areas that these regulations touch throughout the organisation. Active management of these areas will help technology companies define the actions they must take to comply with REACH and ensure they're prepared for any implications.

For more information on how PwC can help your company develop an annual environmental sustainability report as well manage tax compliance demands, visit us at *www.pwc.com/techconnect* for links to solutions and contacts.

Questions for further reflection

Where does the biggest opportunity lie for improving your company's environmental footprint (i.e., energy efficiency, recycled materials, etc.)?

Has your company addressed end-of-life issues for your products? Do you need to?

Have you determined whether your customers are willing to pay a higher price for greener products?

What proactive steps can be taken to address increasing shareholder and other stakeholder concerns related to environmental sustainability?

Do you anticipate organisational change to reduce your environmental risk?

Conclusion

The real reason technology companies are examining their green practices is because of genuine market opportunities.

A growing number of market participants now take a dim view of hazardous substances, solid waste and the emission of greenhouse gases.

Survey respondents may be correct when they assert that technology industries are not prime offenders in these regards. But this by no means grants them an exemption to implementing environmentally responsible policies and practices. A failure to act will inevitably lead to negative consequences such as a consumer and investor backlash as well as regulatory action.

But the real reason technology companies are examining their green practices is because of genuine market opportunities. Consumer demand for green technology products is on the rise. Government customers are increasingly mandated to purchase green where available, and the spectrum of products covered by such provisos is growing.

As for business customers, if they demonstrate a return on investment in green products, then demand will materialise. Here, the greatest opportunities are in products that reduce energy consumption. Even so, a growing number of business buyers can be expected to be motivated by nothing more than the desire to be perceived as supporting environmental sustainability.

So change is coming. The green in technology products is being installed in the R&D phase. Products are being reconfigured to use fewer hazardous substances, require less shipping material, operate on less energy and promote end-of-life recycling.

So in terms of environmental sustainability, the technology industries are embracing change. They are changing to avoid negative consequences or to meet green demand or to achieve both. Whatever their motivation, as this survey and these interviews demonstrate, they are incontrovertibly shifting toward green.

Appendix

Survey methodology

The analysis in this report is based on the results of a survey conducted in late 2007 by the Economist Intelligence Unit.

Analysis

The survey relies on a variety of question formats. For example, on a number of questions, respondents were asked to respond on a scale of 1 to 5 with 1 being 'strongly agree' and 5 being 'strongly disagree.' In other cases, comparison phrases such as 'highly accurate/not accurate' or 'very extensively/not extensively' were utilised within a similar 5-point scale to capture attitudes and practices. In still other cases, respondents were asked to choose their top three answers or select all that apply.

The report itself uses actual percentages from the survey in every case. But in many situations, the analysis may combine two similar categories of answers (such as all those respondents who chose 1 or 2) to draw its conclusions. While such combinations are referenced in all cases, the tables themselves (appearing throughout the report and again below) are often useful for a more detailed view of the responses.

Industry sectors

The findings are drawn from surveys completed by 148 executives in the technology, telecom and digital media sectors. In order of frequency, the specific sectors include software (43%), business information content developers (20%), B2B hardware manufacturers (10%), consumer electronics/device makers (10%), entertainment content developers (5%), wireless distribution providers (4%), semiconductors and other component makers (5%) and hard-wired distribution providers e.g., cable providers (4%).

Seniority of respondents

A good cross-section of executives responded to the survey. Again in terms of frequency, the specific titles include manager (26%), CEO/president/managing director (24%), SVP/VP/Director (15%), head of business unit (7%), head of department (5%), CIO/technology director (6%), board member (4%), CFO/treasurer/comptroller (3%) and 'other' title (8%).
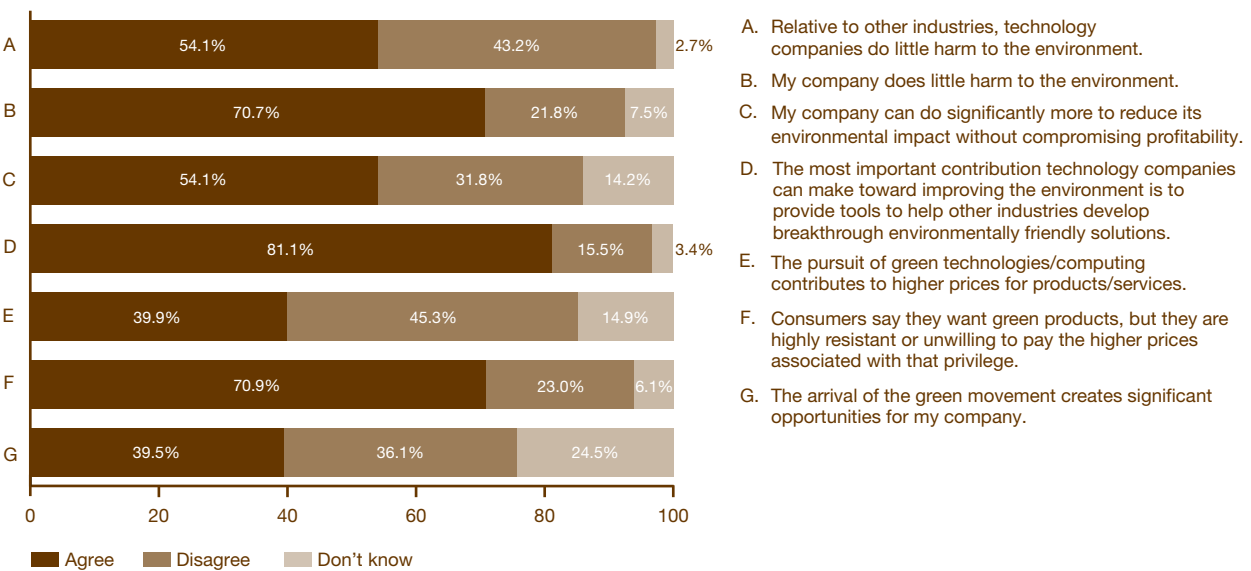
Geography

The respondent profiles are also well dispersed geographically. Just over one third (35%) come from North America, 28% from Western Europe and another 28% from Asia-Pacific. Other regions represented in the survey include Eastern Europe (3%), Middle East and Africa (5%) and Latin America (1%).

Results of the survey

In late 2007 the Economist Intelligence Unit conducted an online survey of 148 technology company executives globally on the sustainability challenges faced by their companies. Our sincere thanks go to all those who participated in the survey.

Responses to survey questions (in the order asked) are provided on the pages that follow as the share of respondents giving the particular answer. Please note that not all answers add up to 100%, because of rounding or because respondents were able to provide multiple answers.

1. Do you agree or disagree with following statements?

	Agree	Disagree	Don't know
A	54.1%	43.2%	2.7%
B	70.7%	21.8%	7.5%
C	54.1%	31.8%	14.2%
D	81.1%	15.5%	3.4%
E	39.9%	45.3%	14.9%
F	70.9%	23.0%	6.1%
G	39.5%	36.1%	24.5%

- A. Relative to other industries, technology companies do little harm to the environment.
- B. My company does little harm to the environment.
- C. My company can do significantly more to reduce its environmental impact without compromising profitability.
- D. The most important contribution technology companies can make toward improving the environment is to provide tools to help other industries develop breakthrough environmentally friendly solutions.
- E. The pursuit of green technologies/computing contributes to higher prices for products/services.
- F. Consumers say they want green products, but they are highly resistant or unwilling to pay the higher prices associated with that privilege.
- G. The arrival of the green movement creates significant opportunities for my company.

Legend: Agree · Disagree · Don't know

2. How important do you believe it is for technology industries to take measures to reduce or minimise their environmental impact? How important do you think it is for your company to take such measures? Rate on a scale of 1 to 5, where 1=Very important and 5=Not at all important.

A	40.8%	40.1%	12.9%	4.8%	0.7% / ←0.7%
B	28.6%	32.0%	28.6%	6.1%	2.7% / ←2.0%

Legend: Very important · Not at all important · Don't know
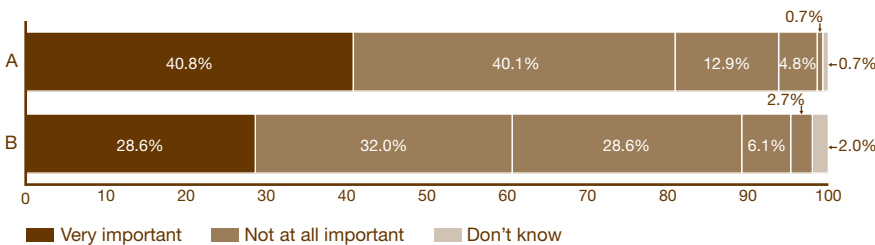
A. Technology industries
B. My company

3. How significant are the market opportunities presented to your company by the green movement? Rate on a scale of 1 to 5, where 1=Very significant and 5=Not at all significant.

1	15.1%
2	19.2%
3	30.1%
4	16.4%
5	15.1%
6	4.1%

1. Very significant
2.
3.
4.
5. Not at all significant
6. Don't know
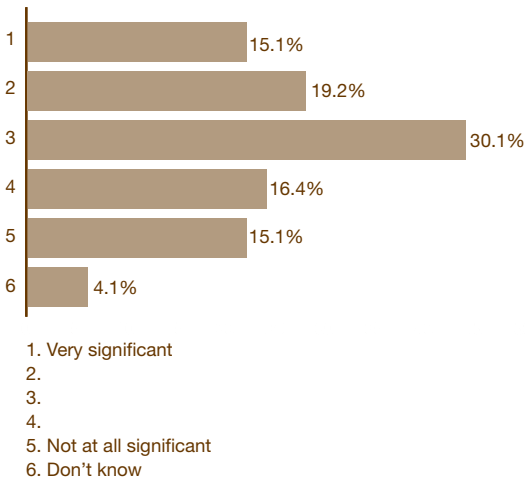
5. How detailed a risk assessment has your organisation carried out to determine the impact of the green movement to your business?

A	6.1%
B	23.6%
C	30.4%
D	31.1%
E	8.8%

A. Highly detailed assessment
B. Detailed assessment
C. Cursory assessment
D. No risk assessment
E. Don't know
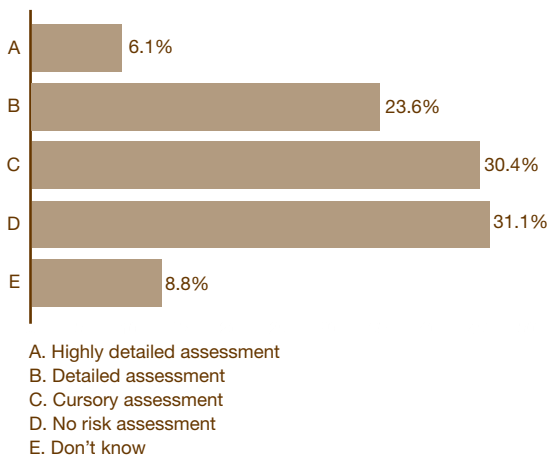
4. Which of these real or potential impacts of the green movement is the most significant one faced by your company, in your view?

A	35.6%
B	17.1%
C	16.4%
D	15.8%
E	6.2%
F	4.8%
G	4.1%

A. Higher operating costs
B. Greater regulatory risk
C. Higher procurement costs
D. Higher compliance costs
E. Higher taxes
F. Other
G. Lower sales as a result of necessarily higher prices
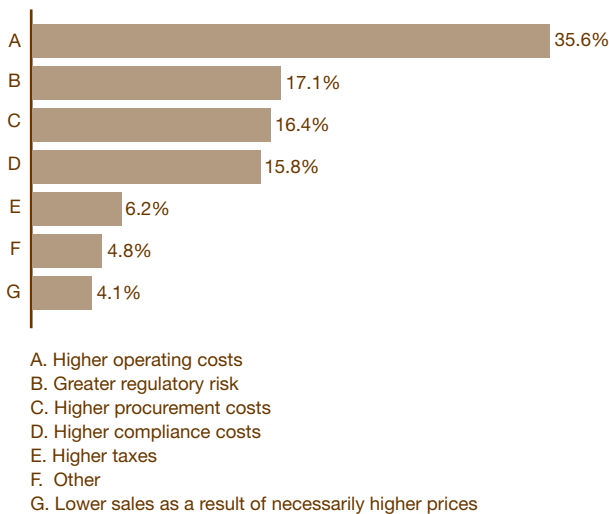
6. Is your company developing green technology, products and services?

39.9%
60.1%

■ No
■ Yes
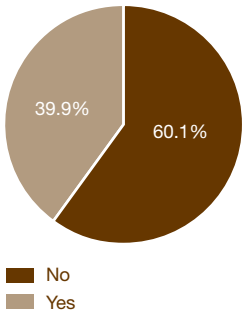
6a. If "yes," why? We are developing green technology, products, and services because:

- Of the market opportunities
- Of our management's commitment to environmental responsibility
- Customers demand we do so
- Out of concern for a regulatory or consumer backlash
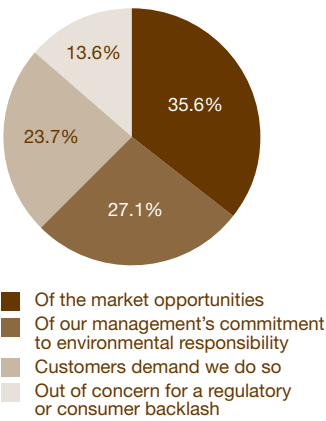
6b. If "yes," how do you think your company will derive the most opportunity?
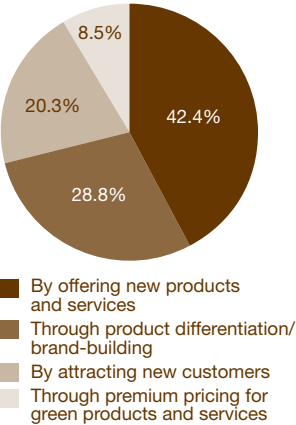
- By offering new products and services
- Through product differentiation/ brand-building
- By attracting new customers
- Through premium pricing for green products and services

7. How strong is demand for green technology products and services among these types of customers?

	Very strong demand	Moderate demand	Weak demand	No demand	Don't know
A	17%	39.5%	24.5%	6.8%	12.2%
B	6.1%	42.2%	38.1%	6.8%	6.8%
C	15.1%	38.4%	23.3%	9.6%	13.7%

A. Government customers
B. Business customers
C. Individual customers

8. In two years' time, how strong do you expect demand will be for green technology products and services among these customers?

	Very strong demand	Moderate demand	Weak demand	No demand	Don't know
A	34.0%	42.2%	14.3%	2.7%	6.8%
B	26.5%	48.3%	19.0%	2.7%	3.4%
C	32.7%	39.5%	15.6%	2.0%	10.2%

(scale 0 to 100)

Legend: Very strong demand · Moderate demand · Weak demand · No demand · Don't know

A. Government customers
B. Business customers
C. Individual customers
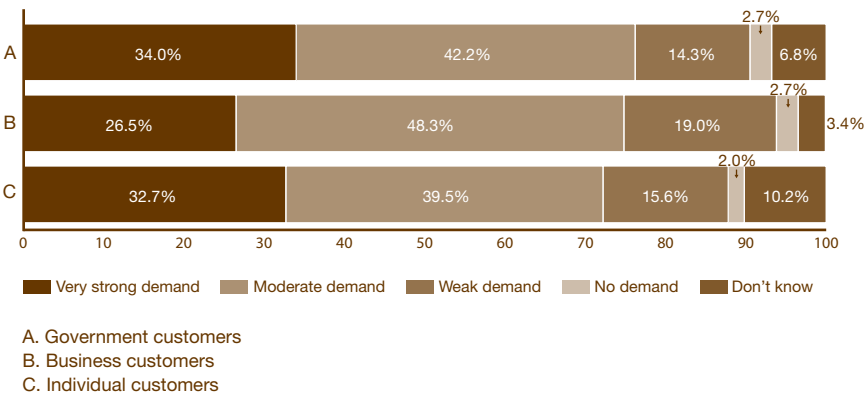
**9. Which of the following factors are most important in your organisation's environmental decision making? Select up to three.**

A	60.1%
B	50.7%
C	44.6%
D	43.2%
E	17.6%
F	14.9%
G	14.2%
H	8.8%
I	3.4%

A. Potential cost saving from energy efficiency
B. Complying with environmental legislation and regulation
C. Meeting customer expectations/requirements
D. Potential for gaining competitive advantage
E. Obtaining tax incentives
F. Matching the environmentally focused actions of competitors
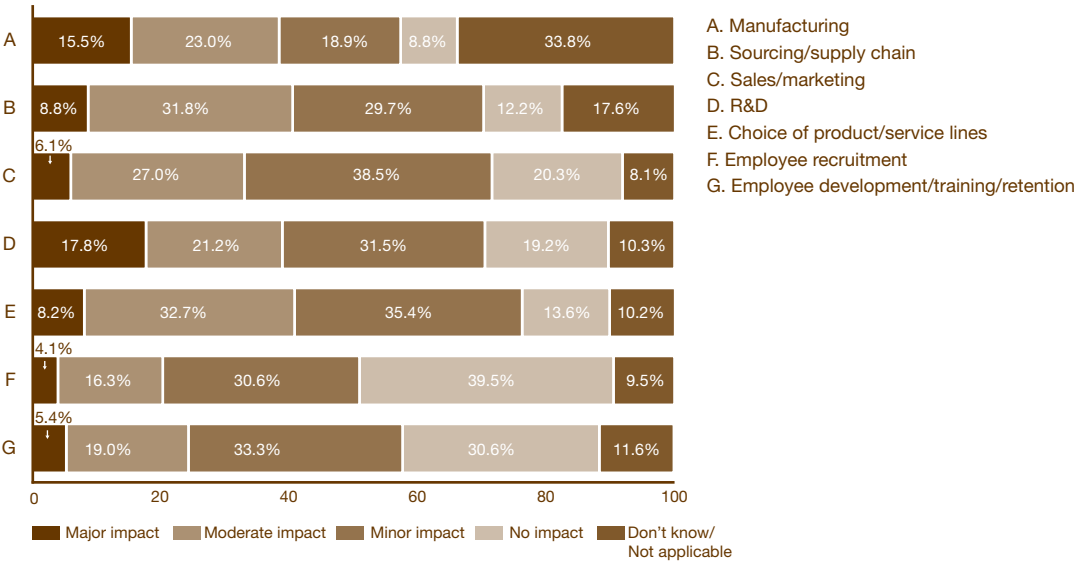G. Attracting and retaining staff
H. Meeting investor/shareholder demands
I. Don't know/not applicable

10. Which one of these three outcomes do you think is the most likely for your company as a result of going green?

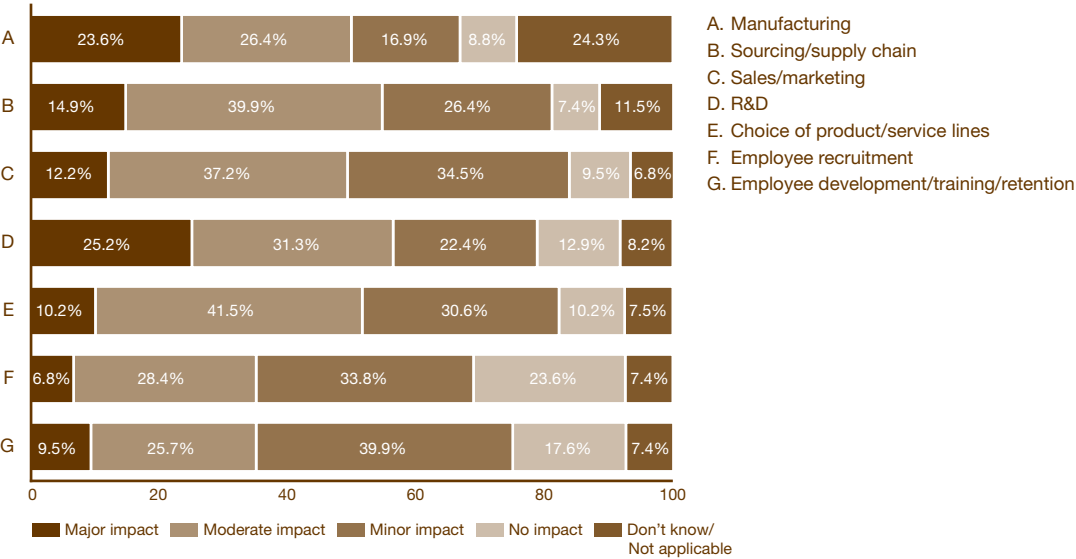|	
A	42.2%
B	40.1%
C	8.2%
D	9.5%
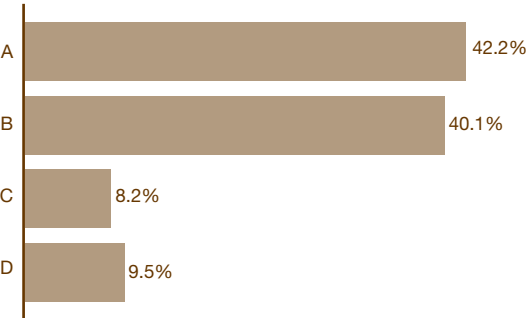
A. Increased costs (costlier processes, costlier materials, more compliance)

B. Increased opportunities (new products/services, new branding/differentiation)

C. Increased business risks (lawsuits, consumer boycotts)
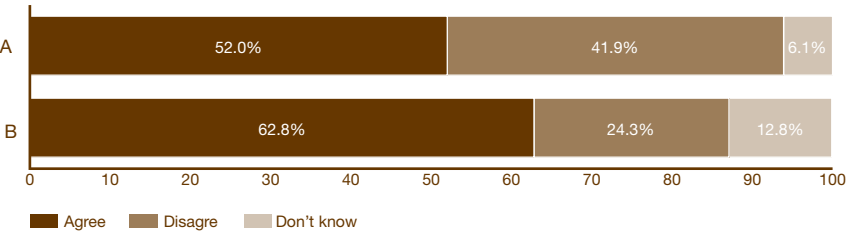
D. Don't know/Not applicable

11. How much impact is being felt on these operations at your company as a result of the migration to green operations?

A. Manufacturing
B. Sourcing/supply chain
C. Sales/marketing
D. R&D
E. Choice of product/service lines
F. Employee recruitment
G. Employee development/training/retention

	Major impact	Moderate impact	Minor impact	No impact	Don't know/Not applicable
A	15.5%	23.0%	18.9%	8.8%	33.8%
B	8.8%	31.8%	29.7%	12.2%	17.6%
C	6.1%	27.0%	38.5%	20.3%	8.1%
D	17.8%	21.2%	31.5%	19.2%	10.3%
E	8.2%	32.7%	35.4%	13.6%	10.2%
F	4.1%	16.3%	30.6%	39.5%	9.5%
G	5.4%	19.0%	33.3%	30.6%	11.6%

12. Over the next two years, how much impact do you think will be felt on these operations?

	Major impact	Moderate impact	Minor impact	No impact	Don't know/Not applicable
A	23.6%	26.4%	16.9%	8.8%	24.3%
B	14.9%	39.9%	26.4%	7.4%	11.5%
C	12.2%	37.2%	34.5%	9.5%	6.8%
D	25.2%	31.3%	22.4%	12.9%	8.2%
E	10.2%	41.5%	30.6%	10.2%	7.5%
F	6.8%	28.4%	33.8%	23.6%	7.4%
G	9.5%	25.7%	39.9%	17.6%	7.4%

A. Manufacturing
B. Sourcing/supply chain
C. Sales/marketing
D. R&D
E. Choice of product/service lines
F. Employee recruitment
G. Employee development/training/retention

- Major impact
- Moderate impact
- Minor impact
- No impact
- Don't know/Not applicable

13. Do you agree or disagree with following statements?

|	Agree	Disagre	Don't know
A	52.0%	41.9%	6.1%
B	62.8%	24.3%	12.8%

- Agree
- Disagre
- Don't know

A. There is no need to regulate our company or industry; we are making environmentally responsible decisions on our own

B. Our board and management team are committed to the pursuit of a bottom line that includes not only profits but also environmental stewardship

14. Do you think your company is likely to have to take any of the following actions as a result of environmental issues or regulation? Select all that apply.
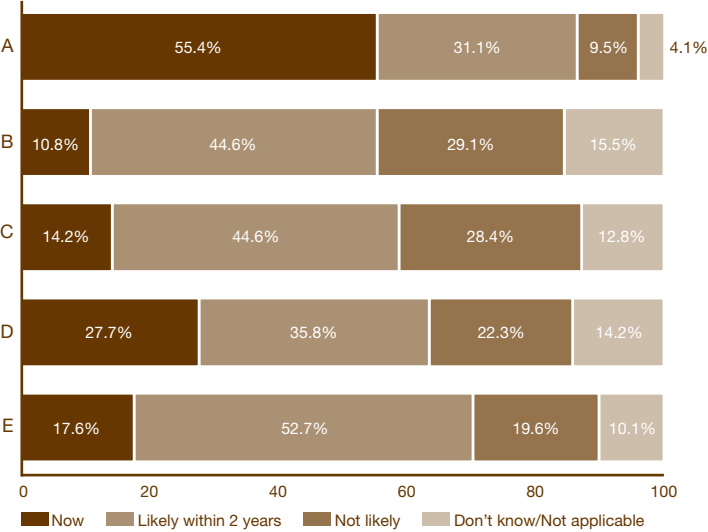
A	49.3%
B	48.0%
C	43.9%
D	37.2%
E	30.4%
F	27.7%
G	16.9%
H	13.5%
I	14.9%
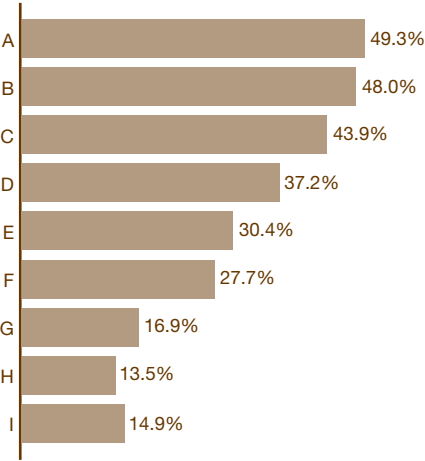
A. Collaborate with suppliers/customers to achieve regulatory compliance
B. Change our operations/procedures
C. Respond to customer questionnaires, certifications or audits
D. Submit questionnaires to, or conduct certifications/audits of, suppliers
E. Renegotiate/modify supplier contracts
F. Expand product portfolio
G. Renegotiate/modify customer contracts
H. Withdraw a product
I. Don't know/not applicable

15. If they were to occur, which of the following actions would be most disruptive? Select up to two.
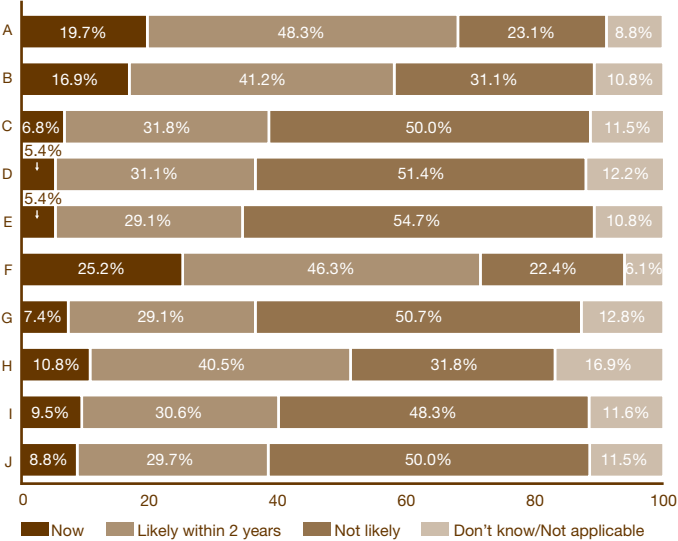
A	38.5%
B	34.5%
C	22.3%
D	19.6%
E	13.5%
F	12.2%
G	11.5%
H	5.4%
I	10.8%
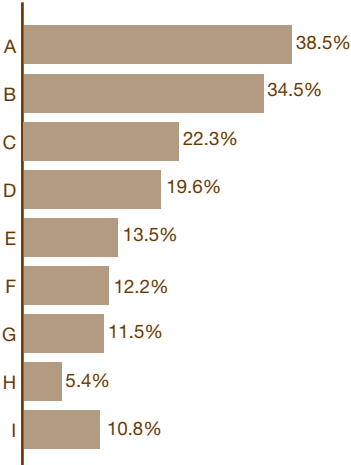
A. Withdraw a product
B. Change our operations/procedures
C. Renegotiate/modify supplier contracts
D. Renegotiate/modify customer contracts
E. Collaborate with suppliers/customers achieve regulatory compliance
F. Respond to customer questionnaires, certifications or audits
G. Submit questionnaires to or conduct certifications/audits of suppliers
H. Expand product portfolio
I. Don't know/not applicable

16. Which of the following are now, or are likely to become, elements of your business operations?
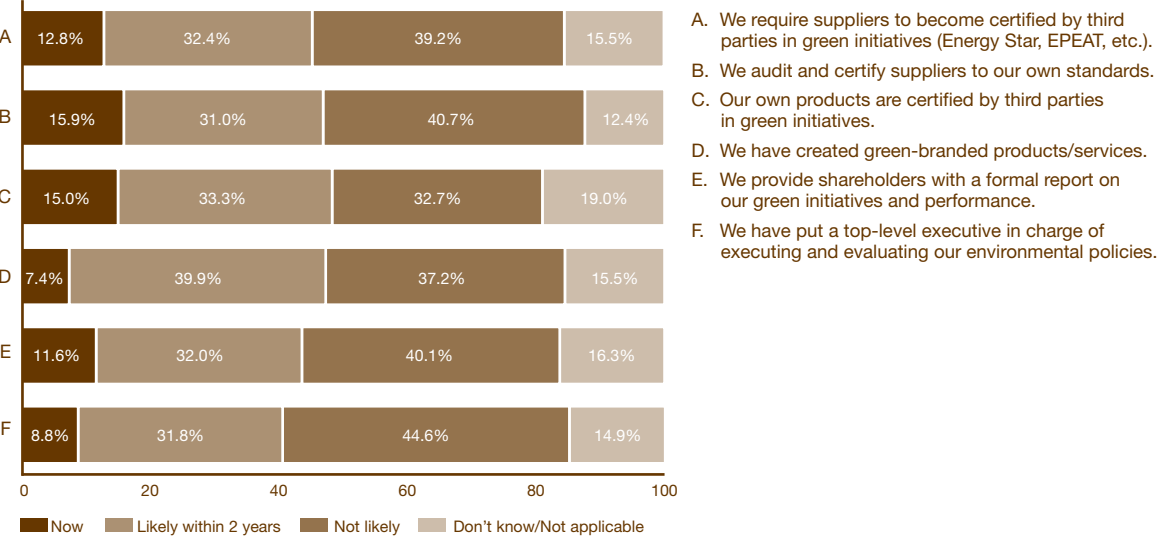
	Now	Likely within 2 years	Not likely	Don't know/Not applicable
A	55.4%	31.1%	9.5%	4.1%
B	10.8%	44.6%	29.1%	15.5%
C	14.2%	44.6%	28.4%	12.8%
D	27.7%	35.8%	22.3%	14.2%
E	17.6%	52.7%	19.6%	10.1%

A. We support/encourage telecommuting.
B. We purchase green power.
C. Managers are incentivised to devise environmentally friendly business practices.
D. We incorporate green concepts into product design.
E. We practice environmentally preferred purchasing.

17. Which of the following elements of compliance/control are now, or will be, in evidence at your company?

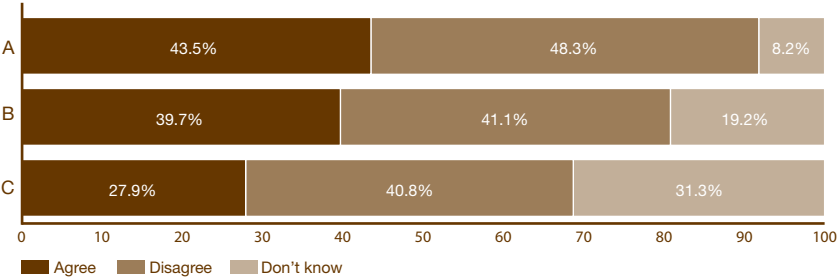|	Now	Likely within 2 years	Not likely	Don't know/Not applicable
A	19.7%	48.3%	23.1%	8.8%
B	16.9%	41.2%	31.1%	10.8%
C	6.8%	31.8%	50.0%	11.5%
D	5.4%	31.1%	51.4%	12.2%
E	5.4%	29.1%	54.7%	10.8%
F	25.2%	46.3%	22.4%	6.1%
G	7.4%	29.1%	50.7%	12.8%
H	10.8%	40.5%	31.8%	16.9%
I	9.5%	30.6%	48.3%	11.6%
J	8.8%	29.7%	50.0%	11.5%

A. We maintain a formal and widely distributed environmental policy.
B. We conduct audits and self-assessments of compliance and performance our environmental policy.
C. Performance on green initiatives is an element of senior executive compensation.
D. Performance on green initiatives is an element of line-manager evaluation.
E. Performance on green initiatives is an element of employee evaluation.
F. We promote the importance of compliance with green initiatives internally via newsletters, campaigns, etc.
G. We have a formal awards programme for employee/manager achievements in green initiatives.
H. We share green compliance data with shareholders.
I. We conduct ongoing audits of the environmental practices of our suppliers.
J. We conduct ongoing audits of the environmental practices of our partners.

18. Which of the following strategies does your company have in place, or is likely to have in place within 2 years?
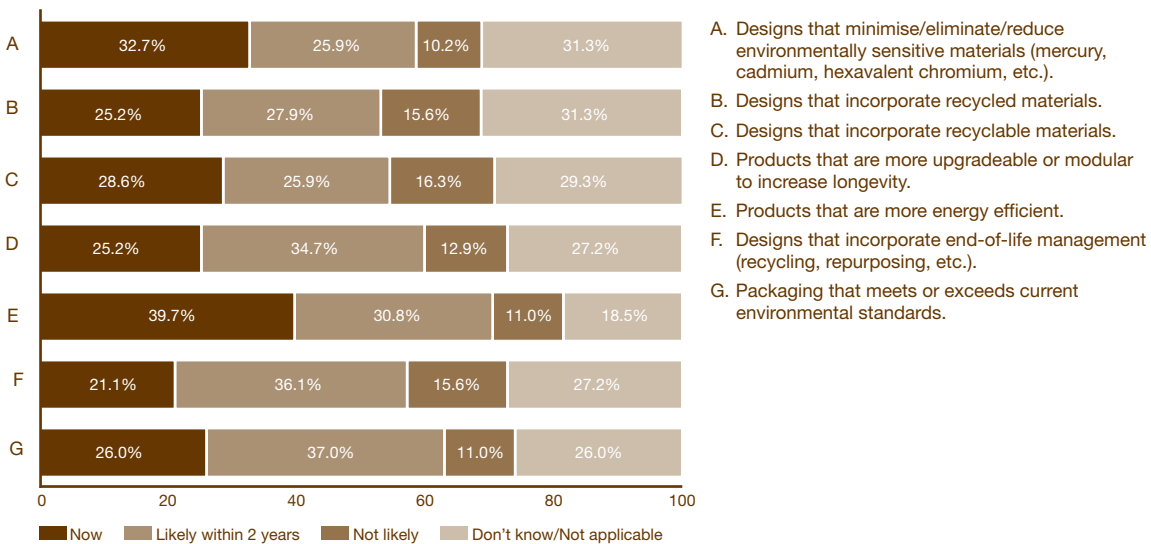
	Now	Likely within 2 years	Not likely	Don't know/Not applicable
A	12.8%	32.4%	39.2%	15.5%
B	15.9%	31.0%	40.7%	12.4%
C	15.0%	33.3%	32.7%	19.0%
D	7.4%	39.9%	37.2%	15.5%
E	11.6%	32.0%	40.1%	16.3%
F	8.8%	31.8%	44.6%	14.9%

■ Now ■ Likely within 2 years ■ Not likely ■ Don't know/Not applicable

A. We require suppliers to become certified by third parties in green initiatives (Energy Star, EPEAT, etc.).
B. We audit and certify suppliers to our own standards.
C. Our own products are certified by third parties in green initiatives.
D. We have created green-branded products/services.
E. We provide shareholders with a formal report on our green initiatives and performance.
F. We have put a top-level executive in charge of executing and evaluating our environmental policies.

19. Do you agree or disagree with following statements?

	Agree	Disagree	Don't know
A	43.5%	48.3%	8.2%
B	39.7%	41.1%	19.2%
C	27.9%	40.8%	31.3%

■ Agree ■ Disagree ■ Don't know

A. Technology consumers are willing to pay a premium for environmentally friendly products and services.
B. We are actively incorporating green concepts in the design phase of our products and services.
C. We have rejected a significant number of green concepts (such as alternative materials) due to cost considerations.

20. Which of the following R&D, engineering and manufacturing efforts is your company making now, or is likely to make within two years?

	Now	Likely within 2 years	Not likely	Don't know/Not applicable
A	32.7%	25.9%	10.2%	31.3%
B	25.2%	27.9%	15.6%	31.3%
C	28.6%	25.9%	16.3%	29.3%
D	25.2%	34.7%	12.9%	27.2%
E	39.7%	30.8%	11.0%	18.5%
F	21.1%	36.1%	15.6%	27.2%
G	26.0%	37.0%	11.0%	26.0%

A. Designs that minimise/eliminate/reduce environmentally sensitive materials (mercury, cadmium, hexavalent chromium, etc.).
B. Designs that incorporate recycled materials.
C. Designs that incorporate recyclable materials.
D. Products that are more upgradeable or modular to increase longevity.
E. Products that are more energy efficient.
F. Designs that incorporate end-of-life management (recycling, repurposing, etc.).
G. Packaging that meets or exceeds current environmental standards.

21. Which of the following constituencies and interest groups are the most influential in driving your company's green initiatives? Select up to three.

	%
A	45.9%
B	38.5%
C	35.8%
D	33.1%
E	29.1%
F	16.9%
G	14.2%
H	8.8%
I	8.1%
J	7.4%
K	2.7%
L	2.0%
	3.4%

A. Customers
B. Regulators
C. Corporate customers
D. Government customers
E. Management team/CEO
F. Employees
G. Shareholders
H. Industry groups
I. Suppliers
J. Partners
K. Environmental activists
L. Other, please specify
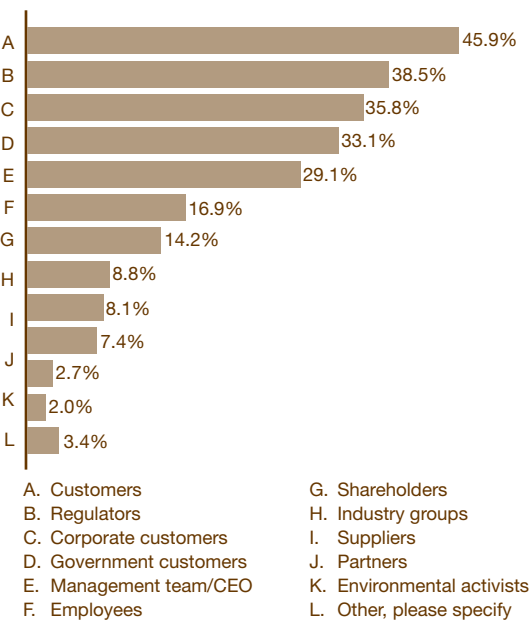
22. Overall, what grade would you give to your company in terms of its green initiatives?

	%
A+	4.1%
A	7.4%
A-	16.9%
B+	10.8%
B	23.6%
B-	14.9%
C+	8.1%
C	6.8%
C-	3.4%
D	2.7%
F	1.4%
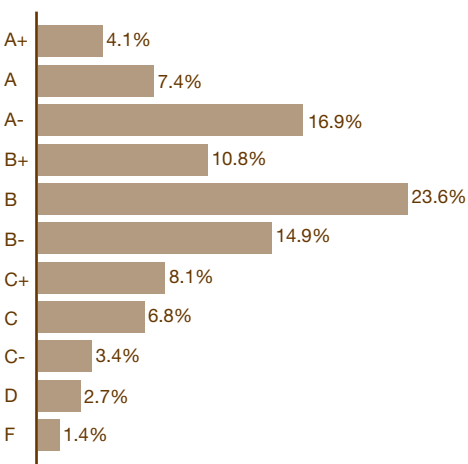
Profile of the survey respondents

In which region are you personally based?

North America	35.1 %
Asia-Pacific	28.4 %
Western Europe	28.4 %
Middle East and Africa	4.7 %
Eastern Europe	2.7 %
Latin America	0.7 %
Total	100.0 %

What type of company do you work for?

Software developer	42.6 %
Content developers (business information)	18.8 %
Nonconsumer hardware manufacturer	10.1 %
Consumer electronics/device manufacturer	9.5 %
Content developers (entertainment)	5.4 %
Semiconductors and other components maker	5.4 %
Hard-wired distribution service provider (e.g., cable TV operator)	4.1 %
Wireless distribution service provider	4.1 %
Total	100.0 %

What are your company's annual global revenues in US dollars?

$500m or less	55.1 %
$500m to $1bn	10.2 %
$1bn to $5bn	16.3 %
$5bn to $10bn	6.8 %
$10bn or more	11.6 %
Total	100.0 %

What is your title?

Manager	25.9 %
CEO/President/Managing director	23.8 %
SVP/VP/Director	15.0 %
Other	7.5 %
Head of business unit	6.8 %
CIO/Technology director	6.1 %
Head of department	5.4 %
Board member	4.1 %
CFO/Treasurer/Comptroller	2.7 %
Other C-level executive	2.7 %
Total	100.0 %

What are your main functional roles?
Please choose no more than three functions.

General management	34.5 %
IT	34.5 %
Strategy and business development	33.1 %
Marketing and sales	27.0 %
R&D	18.2 %
Information and research	12.8 %
Finance	12.2 %
Customer service	11.5 %
Operations and production	8.1 %
Human resources	6.1 %
Supply-chain management	4.7 %
Other	2.7 %
Legal	2.0 %
Risk	1.4 %

Acknowledgments

This report was developed by PricewaterhouseCoopers' Global Technology Industry Group, with contributions from a number of PwC subject matter experts across the globe. We gratefully acknowledge the following team members who contributed their thoughts, knowledge and experience:

Additional environmental sustainability thought leadership from PricewaterhouseCoopers includes:

Corporate responsibility: Strategy, management and value – How PricewaterhouseCoopers can help
A handbook covering the main issues that businesses operating in a variety of regions and industries are facing, and providing guidance on leading practices.

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A global survey report investigating the impact of sustainability on business today including the challenges, the progress so far and best practices.

Saving the planet – Can tax and regulation help?
A report on businesses' views of the effectiveness of government price fixing of carbon–taxing or emissions trade schemes.

Sustainable investments for conservation – The business case for biodiversity
This PwC study recommends a new financing model to increase funding for conservation projects.

Sustainability yearbook 2008 – Executive summary
A global publication covering sustainability trends such as climate change, new energy technologies and the global shortage of natural resources.

The right combination
A report on the role of assurance providers and stakeholder panels in the development of corporate responsibility reports.

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Exploiting intellectual property in a complex world
How IP management is shifting from protection to asset maximisation

Successful strategies for talent management
How technology companies are responding to the increasing scarcity of the right talent

Shaping digital convergence through mergers & acquisitions
What M&A activity is telling us about the market's approach to convergence

Embracing change in the technology industries
How successful technology companies manage and respond to constant change

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PwC can help

PricewaterhouseCoopers delivers value with a global perspective through local implementation. Please contact the technology industry leader nearest you to discuss the challenges facing your company and how we can help you.

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By printing at a facility that uses wind-generated electricity:

6,336 lbs of greenhouse gases was prevented

equivalent to 5,447 miles driven in an automobile was eliminated

equivalent to the planting of 427 trees

By using postconsumer recycled fibre in lieu of virgin fibre:

23 trees were preserved for the future

68 lbs of waterborne waste was not created

10,031 gallons of wastewater flow were saved

1,110 lbs of solid waste was not generated

2,185 lbs net of greenhouse gases was prevented

16,726,725 BTUs of energy not consumed