

# building a **better future**

innovation  
technology &  
sustainable development

a progress report



Innovation, whether through technology or otherwise, will continue to play a crucial role in securing a more sustainable future. Companies provide a key route by which this innovation can happen and technology be developed and brought into general use. In 1998, the World Business Council for Sustainable Development set up a task force to study this contribution to sustainable development and how it might be made more effective.

This is a progress report describing the task force's main conclusions. Every effort has been made to check that the information and case studies provided by companies and other organizations have been reflected accurately and the WBCSD's Executive Committee has cleared the report for publication. However the report and its conclusions remain the responsibility of the authors named below and do not represent a formal position of the WBCSD or its members. Questions can be directed to Andrew Dearing at the address indicated or to the offices of the WBCSD.

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The WBCSD continues to work on this subject under the joint chairmanship of the Chief Executive Officers of Aventis and Dupont.

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# Summary

People often describe sustainable development as requiring a joint and long-term outlook by society that integrates social, economic and environmental objectives. Today, the private sector's contributions come from developing and using environmentally better, eco-efficient, ways to produce and provide products and services and by creating wealth and employment respectful of changing expectations of corporate responsibility and behavior.

Delivering and extending this contribution beyond eco-efficiency depends upon the continued innovation that effective design and the development and use of better technologies make possible. Sustainable development is a metaphor for opportunity and progress as well as a reminder of obligations and uncertainty. It requires a step-change improvement in performance. Merely doing better what we are already doing is not sufficient to meet the needs and aspirations of a growing world population with dignity.

This is a progress report describing the WBCSD's work on this process of innovation towards society's sustainable development. The Global Scenarios and Biotechnology Scenarios provide the starting points. Building on these scenarios, we have surveyed leading companies committed to sustainable development to learn how they are managing innovation and using technology. We have explored the results with stakeholder groups worldwide to understand how they view this contribution, heard their concerns and discussed what they consider are the targets to strive for.

Commercial success involves carrying out business in value-creating ways. Increasingly, we believe that this will depend upon recognizing and addressing the challenges that these stakeholders are posing on behalf of society at large. No single approach will apply to all firms in all situations but there are some common underlying principles, summarized below.

Sustainable development offers an organizing framework based on opportunity and respect for human values. Innovation is about using change to better meet human needs and values. The connection seems obvious although, in the absence of clear market signals and a common language, it can be hard to realize, especially since innovation can come unexpectedly "out of left field" and have uncertain consequences.

Better design and new technologies give us the means to act smarter but technology also creates uncertainty. Using these tools well depends upon understanding what the public is expecting and being able to meet its needs cost-effectively and in a more sustainable fashion without raising alarms and fears.

The process of innovation will happen within increasingly networked economies with changing social values and growing environmental pressures. While these forces are unavoidable, they are not unmanageable. Successful commercial approaches depend on having the flexible, multidisciplinary skills to respond to sustainable development in ways that reflect this changing context.

Within developing nations in particular, technology's contribution to sustainable development comes largely through business-to-business transactions. The large gap in performance is typically not a consequence of the lack of cost-effective technologies. The priority is to increase the capacity to apply available solutions well. Key focus areas are to develop skills and capacity especially in the small-and-medium enterprise (SME) sector and to find ways to reduce project investment risk. Overseas Development Assistance (ODA), Foreign Direct Investment (FDI) and the newer flexible market instruments such as the Clean Development Mechanism can be brought together to support innovative and effective public-private partnerships to address these points.

Some organizations respond best to sustainable development as a vision, whereas others prefer more pragmatic approaches. Whichever approach is preferred, innovation often comes from facing strategic dilemmas that can only be resolved by finding new approaches. This is one reason why credible stretch targets can be an effective way to secure major improvements.

The leadership task is to harness economic and social trends, capture the tremendous amount of knowledge and experience that exists in networks worldwide and combine these in ways that command respect, generate enterprise and create value. Traction is likely to be greatest when the management approach is positioned appropriately for the company in its network and seen by staff to be relevant and self-evident, if not simple, in purpose and content. This requires clear direction backed up by resources, management support and good metrics.

The task involves extending the principles of transparency and learning, corporate social responsibility and eco-efficiency throughout the innovation process. This extends from research and development through technology selection and use, product and service design, investment and employment policies and global and local business activities, as well as to issues management and government relations.

Already, leading companies have demonstrated the willingness to express what they stand for and in turn understand what society expects of them. These companies are actively developing and incorporating the tools to improve performance across the three pillars of sustainable development. They are learning how to stimulate innovation and are setting focused targets that measure progress and assure the link between their own values and those of their customers. But there is much more to be done and important lessons to be learned and applied, especially to obtain innovation that addresses the social pillar of sustainable development.

There are many ways in which other stakeholders can assist these efforts. For example, governments can design regulatory frameworks that set the direction, encourage and reward the experimentation that fosters innovation and improves sustainability. They can demonstrate (through procurement policies and the information provided to the public) that they are committed to achieve the same objectives being expected of others.

In summary, the challenges are to learn to treat sustainable development as a framework for innovation, then use and extend established management principles to make this framework operational and effective. As one of our member companies put it, we have to become able to discuss, decide and then deliver sustainable value.

Geneva  
June 2000

# ROAD MAP

## 1: Why did we start this project?

To identify value-creating ways to link Sustainable Development and innovation (*chapter 1*)



## 2: Concepts

Thinking about innovation and technology in ways that deal well with uncertainty and ambiguity (*chapter 2*)



## 3: Evidence

Public perceptions of innovation. Worldwide surveys of companies' management practices (*chapters 2-3*)



## 4: Critical challenges

Improving sustainability beyond the developed nations (*chapter 4*)



## 5: Dialog

Exploring the results with stakeholders and drawing conclusions (*chapter 5*)



## 6: Conclusions and Checklists

(*throughout*)

# Innovation and Sustainable Development



Sustainable development cannot be addressed in isolation from considerations of social and economic well being. Technology enables change but cannot be the sole driver of innovation.

Firms have used technology as an engine of progress since at least the time of the Industrial Revolution, which gave us remarkable ways to marshal the physical world for human benefit. While innovation – the successful implementation of new developments and ideas – depends upon much more than technological advance, technology has consistently provided the opportunities from which we have been able to make and sell better goods and services and to do so more cleanly and more safely.

Many of today's social and economic developments are a result of technical discoveries and developments in fields such as communications, information processing, health sciences and energy supply. These promise smarter, more tailored solutions to the tasks we wish to accomplish. Rather than being monolithic in approach, the tools are used by dynamic and responsive networks of small and large, public and private organizations, working together and in competition in ways that were never before possible.

The changes are tremendous and the opportunities profound. But technology can only be part of achieving a more sustainable development and its contribution is not always as positive as we might wish. Furthermore, other factors that drive and support progress are themselves changing. The well-defined social categories for which post-war Western institutions were designed no longer fit well with people's aspirations and values. Richer countries are experiencing

a shift towards an increasingly multidimensional and diverse "Mosaic Society", with uncertain needs but very real concerns about many subjects including science and technology.

At the same time, despite there being greater affluence than at any time in history, most of the world's population remains poor yet very much aware of its relative poverty. For these people, the economic and social benefits of globalization and global markets are increasingly being questioned.

Other writers have offered cogent, visionary ideas of the improved sustainability that can be obtained by marshaling recent developments (see for example Lovins, Natural Capitalism). Our focus in this project has been on how firms can organize themselves to realize these opportunities in ways that benefit and are acceptable to society and also create value.

The approach we suggest is based on understanding how the concepts of corporate social responsibility and eco-efficiency have been implemented and extending these concepts to cover the management of innovation.

Leading companies have built their approaches to sustainable development upon principles such as those in box 1. For existing business operations undergoing normal business development, these are mutually reinforcing principles. They provide a positive and effective framework that firms can use in mitigating environmental impact

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**Box 1: Corporate responses to eco-efficiency and corporate social responsibility involve:**

- Ensuring the corporation understands what society expects of it, in return expressing clearly what the firm itself stands for, then reinforcing these values to stretch the organization and create a spirit of continuous improvement. (Attitude)
  - Developing the tools and approaches to improve performance across the social, environmental and economic pillars of sustainable development and incorporating these tools within routine business processes. (Build the capacity to act)
  - Setting focused targets and putting in place the means to measure performance and confirm that the targets are being achieved. (Check progress)
- 

and allaying public distrust (see Schmidheiny, *Changing Course*; Fussler, *Eco-Innovation*; WBCSD, *Corporate Social Responsibility*).

The stock market returns achieved by companies included in the recently launched Dow Jones Sustainability Index suggest that investors are recognizing the management qualities that make this possible.

Whereas twenty years ago, most companies based their performance standards on regulatory requirements, today many choose to go beyond regulation because they see commercial benefit in doing so. Established practice in areas such as safety and quality management has demonstrated that uncompromising principles are perfectly compatible with the spirit of continual improvement.

Stakeholder dialog has helped firms learn more about others' points of view and then use this understanding to set better priorities and move away from confrontational approaches. In extending systems of financial control and audit to cover environmental impact, they have recognized the need to gain early "buy in" by ensuring relevance to the specific priorities of individual business units. Technology is playing a central role in moving forward and engineers generally

seem to relish the opportunity to find more eco-efficient solutions once the parameters for improvement have been established.

### Good Enough or Could Do Better?

This is intended to be a rhetorical question. During the last decade, the arguments and counter-arguments about rates of improvement have been well rehearsed. Economic focus leads to "short-termism". Regulatory frameworks offer too much (or too little) "command and control", so we are not properly pricing public goods, environmental services and social well being. New approaches are uneconomic in the face of established manufacturing capacity.

Undesired impacts are associated with large, interdependent infrastructures (for example, the car, its fuel and the city), so require more systemic approaches that can transcend traditional business and political boundaries and avoid stranded assets. Technical progress is slower than expected, gets sidetracked through lack of customer pressure or creates "rebound effects" by stimulating new demand that consumes the improvements that have been achieved.

These concerns are valid but (with effort and a fair dose of humility) there are ways to overcome them. In some cases, effective solutions are already available; in others, we

may need to change the market's rules of the game. For example, it seems likely that economic instruments such as tradable carbon emissions permits will improve the market's effectiveness in dealing with climate change. Demonstrating that these instruments do work well requires agreement on rules and modalities and the willingness to take action and learn from our mistakes.

In other words, sustainable innovation involves risk but it also requires structure. While much can be achieved by "continuing to do better", it will be far more challenging and rewarding to learn to provide mechanisms that will:

- Bring design, smart technologies and the "new economy" together to drive growth in ways that reflects changing concerns and values of a connected world
- Support faster and more sustainable development in the developing nations

We believe that success with these tasks can turn sustainable development into an approach that is intrinsically value creating. But we also believe that some established ways of doing business and the assurance processes that accompany them will need improving in order to achieve this.

For example, sound science is a lynch pin of corporate approaches to technology risk management. Even though no one questions the need for high safety standards, too much recourse to scientific evidence and argument can come across as complacent and paternalistic. The public's sense of the role of technology has changed and its awareness of past mistakes has grown. Today we need to find better ways to show that firms (and governments) are keeping their scientific houses in order.

A paradox is that the success of today's activists owes much to their mastery of communication technologies in getting their messages heard. Governments, inter-governmental bodies and corporations now find themselves to be hopelessly cumbersome in the face of resolute single-purpose

advocacy. Stakeholder dialog offers a way forward but requires that we learn how to achieve open discussion when the risks seem large and the benefits unclear.

With this background, subsequent chapters describe the work as follows:

- Thinking about innovation and its connection to sustainable development and changing social attitudes and values.
- Lessons to be learned from how corporations committed to sustainable development are already managing these questions.
- International equity, technology cooperation and how companies can use their creative and technical capacities and global outreach to foster more sustainable economic growth within developing nations.
- A management framework for innovation to help companies guide staff through these questions.

The main conclusions in each chapter are used to construct checklists that can be adapted to assess firms' own approaches to sustainable innovation.

# Thinking about Innovation and Technology



To achieve greater sustainability, we will need both the experimental spirit of Jazz and the effective governance that GEOPolity can provide. Consumers expect companies to go beyond minimum requirements and be main actors in realizing these conditions.

In preparing for an uncertain future, we need a sense of what might develop while avoiding placing expensive bets on particular outcomes. Scenario planning offers one way to extend our strategic thinking.

The WBCSD used this tool in its Global Scenario and Biotechnology Scenario projects and we found the approach helpful in looking at the broad questions of business-led innovation and use of technology. This section gives a brief summary of these two sets of scenarios. Other publications (see reading list) describe the method and give the complete stories.

The Global Scenarios explored sustainable development in terms of two parameters:

*Uncertainty: How we will recognize the resilience, limits and critical thresholds faced within the global ecosystem.*

*Governance: What forms of social system can best respond to the challenge of sustainable development.*

*FROG!*, *GEOPolity* and *Jazz* describe different ways in which people view and respond to these parameters. The real world reflects aspects of all three.

Some who have worked with the results want to realize the benefits of the dynamic *Jazz* world and look for solutions that will foster its innovative spirit and market-based approach. Others feel that *Jazz* will be a very challenging world in which to live and work and consequently may not deliver everything

they wish to achieve. *GEOPolity* offers other ways to approach these challenges.

## **FROG! - First Raise Our Growth!**

*FROG!* describes a low-trust world in which people focus on jobs, economic survival and short-term financial returns. Although people believe they value sustainable development, local economic pressures dominate their thinking. After all, people (at least those who are already affluent) find it obvious that their neighborhoods have become far cleaner, presumably because they have already adopted the right approaches.

This local focus leads to a poor reading of signals. Signs of global environmental problems – for example the risk of climate change – and growing social inequity either go unnoticed or trigger disagreement about what signs of change mean. No action will be taken until it becomes impossible to continue ignoring the signs, by which time it will be correspondingly harder to respond effectively.

In the meantime, the public takes advantage of what business offers and punishes companies that are seen to cause harm through their goods and services and ways of operating. Voter-sensitive governments ensure that exposures are discovered and dealt with promptly, so firms act defensively to anticipate and limit liabilities.

*FROG!* generates solid economic growth yet this will probably be unsustainable because no one takes care to address sustainability as

their ambition. There will be continued technological progress but this is unlikely to be directed towards greater sustainability. Existing approaches, ways of working, etc., will be extended rather than replaced by something better. There will be an emphasis on tools for monitoring, quantifying and documenting the performance of existing operations rather than going pro-actively beyond these standards.

Governments will legislate, set technology policies and support R&D in order to stimulate local competitiveness and aspirations. Aspects of these policies, and the innovations that result, may accidentally align with the ambitions of sustainable development. Ambivalent consumer attitudes and lack of long-term thinking about ethical and other implications will limit the sustainable value of the results.

### GEOPolity

*GEOPolity* starts with a recognized environmental crisis. The palpable failure of national governments and multinational companies to deal with the crisis as well as past problems destroys the already limited credibility of these existing institutions. People recognize the need for new mechanisms to address global issues such as the health of the planet and to resolve conflicts of interest in a peaceful manner.

The spirit of the age – the “mood of the millennium” – captures the attention of people who have the ambition to put things right. This aligns their effort into a collective sense of purpose and they build an interlocking global governance system coordinated at an international level.

*GEOPolity* reflects a human desire for big solutions to grand challenges. Its institutions work towards market-based solutions but set new rules and regulatory frameworks for markets to follow. To achieve greater sustainability, these global institutions may engage companies in a joint attack on big challenges.

Consequently, this scenario will develop world-scale technologies and drive forward major global infrastructure projects. One can imagine the 21<sup>st</sup> century equivalents of *Concorde* and *Apollo*, designed to address climate change, provide equitable supplies of clean water and food, manage critical ecosystems and foster “connectedness” and opportunity.

In such a world, technological prowess will be a key tool that firms use to ensure credibility and secure their license to operate, shape legislation and achieve competitive advantage. Technology-rich companies may see great value in encouraging and becoming contractors to these initiatives. (Today's nuclear industry developed very rapidly in a world rather reminiscent of *GEOPolity*.) As symbols of their prowess, they are likely to prefer process and product technologies that can be patented to intangible knowledge-based approaches.

A strength of *GEOPolity* is its ability to set decent rules and regulations to steer the collective effort. This scenario will probably be very effective if global standards and regulatory frameworks are needed (and can be agreed) in order to build better solutions.

Its weaknesses include the difficulty of changing existing institutions that already feel empowered to deal with matters and the general risk of bureaucracy and slow response associated with “big institution” processes.

As a result, there may be undue up-front selection of “winners” within *GEOPolity*, too little engagement of customers in the choices being offered and too little attention to unintended consequences and side effects.

### Jazz

*Jazz* describes a world in which people recognize that they can care about issues such as sustainable development without needing others to legislate the solution. These people harness the markets to find solutions to their concerns, in the process creating a complex market-led world of *ad hoc* experimentation.

This is a demanding world of partnerships between consumers, businesses, governments and non-governmental organizations. Alliances form and break fluidly to meet civil demands. High transparency enforces quick learning by allowing the public to identify and punish companies and governments that break the social norms. In *Jazz*, the public sees no need to applaud expert opinion for its own sake.

In this world, technology is a cross-fertilizer that enables firms to work within diverse partnerships but it also creates challenges for them to overcome. For example, in a transparent world, innovative companies need new ways to safeguard their intellectual assets. This will encourage greater speed of use of these ideas and emphasize the less-tangible, knowledge-rich technologies suitable within a service economy.

*Jazz* can align people worldwide to common cause but the nature of their alignment cannot be taken for granted. Initiatives such as the redesign of large infrastructures or the handling of sensitive new technologies still require a consensual basis and public groundswell to move forward. Furthermore, even though its public wants to achieve progress across a broad front, communities and organizations that lack resources and skills may find it hard to join the *Jazz* band.

### Implications for Company-led Innovation

Scenarios help focus our aspirations and actions by sharpening our understanding of the diverse forces within today's society. Of the three Global Scenarios, *GEOPolity* and *Jazz* appear more able to support sustainable development. Signs of all three can be seen around us today.

Many people consider *Jazz* to be the more appealing world to aim for, because of its sense of personal responsibility, collective effort and transparency but it also seems important to maintain the framework-setting strengths of *GEOPolity*.

The stories suggest (see Dearing, Have We the Foresight for Sustainable Development) that sustainable innovation will involve companies in:

- § Taking advantage of dynamic, experimental approaches and providing consumers the information and price signals to exercise informed choice.
- § Being willing to build and work within institutional structures to coordinate large-scale tasks and constrain unacceptable behavior while avoiding the tendency to "plan mega-solutions" as a matter of course.
- § Expanding local focus to legitimize action on a broader front, for example by actively disclosing impact and working with the public on risks and benefits.

An important conclusion is that the approaches taken to education, regulation, social values, public understanding of complex subjects such as technological risk and the precautionary principle strongly influence how well societies can address their sustainable development. With no single point of leverage, a broad base of action is needed that will extend throughout and beyond the firm.

### The Biotechnology Scenarios

This project was carried out after the Global project was complete. It focused on the certainty that someone, somewhere will put scientific developments in areas such as biotechnology to use and the inevitable human anxieties about the unknown.

It generated three scenarios, *The Domino Effect*, *The Hare and the Tortoise* and *Biotrust*. The scenarios explore the impact of unintended consequences on the acceptability of a technology, the balance of risk and liability issues and consumer choice on sustainable development and the consequences of a widely accepted biotechnology industry.

These scenarios build on similar forces as the Global project and also draw similar conclusions about the importance of linking

public initiative with framework setting approaches.

Depending on the nature of public reaction to the unintended events that new technology triggers, the acceptance of technology can vary widely. This is the story that is explored in *The Domino Effect*. This presents a low-trust world in which events take a negative course, leading to heavy regulation: in the language of the Global scenarios, *FROG!* leading to *GEOPolity*.

Apart from any such event, an industry that grows up around the new technology could prosper or not for reasons that depend on factors other than technology or sustainable development. This story is explored in *The Hare and the Tortoise*, a *Jazz*-like world in which new technology is not much of a player.

The third unknown has to do with the consequences of a successful and widely accepted technology-based industry. What kind of world might this produce and how might acceptance come about and be assured? This is the story of *Biotrust*, also a *Jazz*-like world but with some of the framework overtones of *GEOPolity*. Of the three scenarios, this is the one that achieves the most extensive application of the new development.

These stories help focus attention onto the sources of the unpredictable and so help us appreciate what imaginative worlds it would be wise to inhabit (at least for a while) if we are interested in the future of technology and want to learn how to achieve the desired outcome.

### Social Expectations as a Driver for Sustainable Innovation

We discussed these conclusions with people and organizations worldwide concerned with sustainable development to learn their views on the role of company-led innovation. What we heard confirmed many of the tensions apparent in the Global and Biotechnology Scenario studies:

- growing awareness of social values and environmental issues,
- rediscovery of the sense of co-dependency,
- a more determined public with different priorities for innovation and use of technology.

The results of part of this study, the 1999 Regional Dialogs, are given in the Appendix.

*“People are placing less value on technological progress and economic growth and relatively more value on conserving and protecting the quality of the environment in which they live.”*

This quote came from a book written over twenty years ago (see Schein, *Career Dynamics*) but the 1999 dialogs reinforced its message that innovation is widely desired but not always seen to be positive.

Many people perceive innovation as technological progress creating indiscriminate economic growth and leading to depletion of the natural environment and increasing pollution.

A real commitment on the part of corporations, rather than technology itself, is seen as the pre-requisite for creating the conditions for sustainable growth and better quality of life. Consumers expect companies to go beyond minimum requirements and be main actors in realizing these conditions.

Leading companies have recognized that resolving these tensions provides the only basis for their profitability in the years ahead. Put one way (by Richard Branson) *“the brands that will be big in the future will be those that tap into the social changes that are taking place”*. Or as Roger Cowe expressed it recently (*“Account-Ability”*, *The Planet on Sunday*):

*“Once a company has acknowledged it has to account for pollution ... it is harder to deny wider social responsibilities. And once outsiders have been through the gates, it is impossible to stop them looking beyond one narrow aspect of business.”*

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### Checklist 1: Playing within the Well-tempered *Jazz* Band

- Are our actions in tune with *Jazz*, more like the formal structures of baroque cantatas or simply discordant? Do we really want to be challenged to experiment and innovate, or are we accepting the security of established management processes and regulatory frameworks?
  - Do we know what tune people would like us to play? Will they find our tune too hard to share? Can we play theirs?
  - Are we willing to form partnerships and alliances that can create these new harmonies or do we join with the rest of the woodwinds (for example, our industry association) and argue that it is the percussion's turn to play? Have we also got the imagination and energy to build and work within the frameworks that can move us forward?
- 

*Curiously, this odd little world of social auditing threatens to fuel a debate about the purpose and nature of 21<sup>st</sup> century capitalism which has escaped the politicians for decades."*

The sense is that markets will increasingly be characterized by the power of vision: to think the future, imagine the future and shape the future. In other words, firms are being expected, and some are themselves expecting, to address sustainability by design. Examples such as Dupont's "To Do list for the Planet" demonstrate that this is already happening.

# How Companies Manage Innovation



Companies are dynamically embracing sustainable development while searching for ways to align corporate and customer values and behavior. The tools are coming together but better metrics are needed, especially for social issues.

*"We have not done anything environmental that has been a bad business decision. It is the challenge of creating shareholder value and meeting customer requirements that keeps me awake at night." Bill Ford, Ford Motor Company*

We surveyed around eighty firms to explore how their commitment to sustainable development and environmental protection has been incorporated into their approach to innovation management and learn about the opportunities and barriers they are experiencing. Detailed results are given in an appendix to this report.

Where possible we approached senior business managers with responsibility for aspects of innovation, product development and technology management. Around one third were heads of R&D or Technology Development, a fifth held other senior positions within a business unit and the rest worked within the corporate offices.

A first observation is that the commitment to sustainable development extends well beyond those who work in corporate offices. 88% of those interviewed "strongly agreed" or "agreed" that *sustainable development is a key business driver for the firm* and 83% confirmed that *sustainable development is an explicit part of the firm's mission and values*. (Those that felt otherwise generally argued that this reflected the wider priorities of the marketplace.)

Figure 1 shows how various factors underpin this commitment. Company image and

brand values are considered especially important; direct pressures from regulators, customers or special interest groups less so.

Most of the firms have formal processes for innovation management and technology development. Generally these require staff to take sustainable development into account: 55% expect this for both environmental and social matters; 28% for environmental matters only. Responsibility for integrating these and other commercial considerations is considered to be a shared responsibility rather than of one role such as the Chief Technology Officer.

One of the clearest benefits of managing sustainable development this way has been to focus attention onto the technological opportunities at the firms' disposal. Practically everyone considered that improved technology and better engineering skills are, and will remain, essential tools for supporting sustainable development. Many of the examples in the Appendix are consistent with this view.

Information and energy supply technologies are rated highly: 92% and 88% of those interviewed see these as important in supporting greater sustainability. However, 25% rated developments in the biosciences as neutral or indeed inhibiting progress. This probably reflects the negative publicity over GMOs, which flared up around the time the survey was taking place.

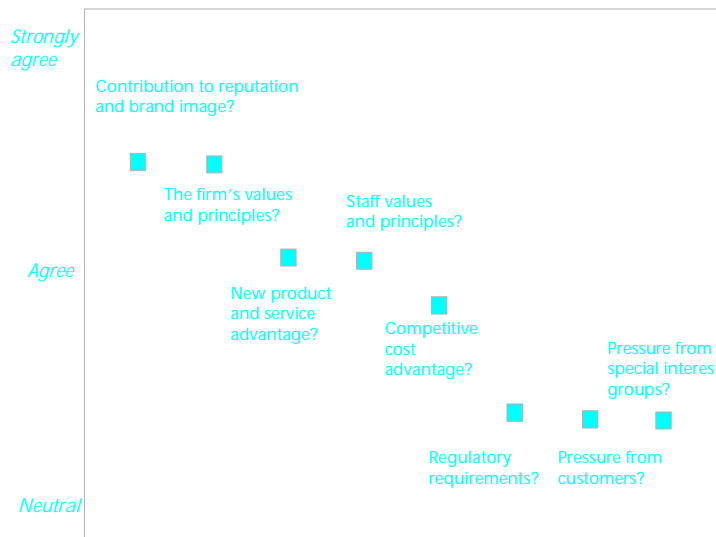


Figure 1: Reasons given why sustainable development is a key objective or business driver for the firm.

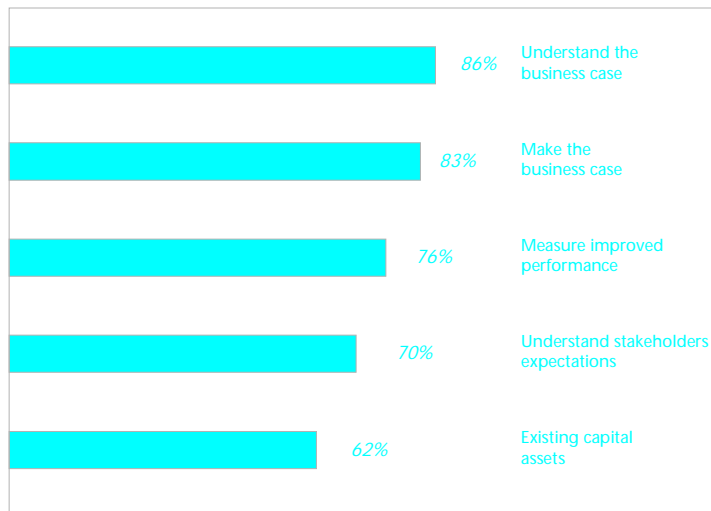


Figure 2: Percentage "agreeing" or "strongly agreeing" that these are key challenges that staff face in addressing sustainable development through innovation.

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## Box 2: Eco-Innovation

Carpet manufacturing involves potentially toxic and polluting processes, involving dye water being flushed into waste water systems, high emissions, and an end product that eventually ends up in landfill sites where it takes centuries to rot. Taking heed of scientific and environmental concerns, the management of Interface, the world's largest manufacturer of commercial carpet tiles, vowed in 1994 to make the entire company sustainable.

Realizing that a reduction in resource and energy use represented a cost advantage and contributed to a better quality of life, the company placed environmental concerns on par with production of goods and services and aimed to redesign their products from scratch. As a result, Interface conceived Solenium, a flooring product that uses a third less material and "embodied energy" than comparable products. Its European plants weave the product, which is currently available on the American and European markets, entirely through the use of renewable electricity. Instead of a nylon or PVC base, the new tiles use a new material, polytrimethylene terephthalate (PTT). PTT is a revolutionary fiber that creates a highly resistant textile flooring for use in hospitals, schools and airports, and can be fully recycled back into itself.

The added benefit of producing tiles instead of full carpets is to facilitate easy replacement of the 10-20% experiencing greatest wear without wasting the 80-90% that still has years of useful life. Representing a huge cost advantage, the product creates a new ideal for industrial products of the future that greatly reduces resource use and the use of landfill.

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30% expressed neutral or negative views about measurement technologies. This can be interpreted as evidence of a movement beyond regulatory reliance on such tools to measure impact and assess performance or a feeling that the ability to measure surpasses what is required in terms of the assessed risk.

### Achieving and Measuring Progress

Figure 2 shows that a key challenge for many staff is to understand and make an effective business case for investing into more sustainable products and services. There is an underlying belief that customers are keen to purchase more sustainable products but will not pay a significant price premium despite assertions in market research that they would do so.

Several managers commented on this tension between meeting short-term business goals and dealing with the uncertain, longer-term nature of sustainable development. Taken

together, there is still the risk that sustainability considerations are seen as additional selling points "other things being equal".

In general, respondents also felt rather uncertain of their ability to manage and assess the creative skills required to address the broader agenda of sustainable development. Other challenges, such as existing capital assets, managing partnerships (important in a networked economy for obtaining improvements throughout the supply chain), understanding the role of design and dealing with product launch strategies were felt to present less substantial barriers to successful innovation.

The survey probed how close firms are towards having a fully integrated management process that places sustainable development squarely within the innovation process. Responses resembled a normal

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## Checklist 2: Sustainable Innovation Management

- Does the firm view sustainable development as a strategic opportunity? Have effective processes been put in place to identify where this opportunity lies?
  - At what stage in the development of new products/services are questions asked about sustainability? Is this responsibility appropriately distributed and does it start at a sufficiently early stage in new product/service development?
  - Are all members of staff clear when to accept a balanced approach to the three pillars of SD and when there can be no compromises?
  - Is the firm well placed to understand emerging consumer values and then to use this understanding to create sustainable commercial value?
  - Are we creating the stretch that can take the organization to a new level of performance?
  - Have staff got the space, tools and organization to be able to respond? Who fills the gaps?
  - Are we placing appropriate reliance on technology as part of the solution? Are we managing and using this technology in ways the public finds acceptable?
  - How do we know that the public understands and supports our approach? What are our tools and our measures of success?
- 

distribution centered on “half way there”. Paradoxically, firms that had obviously made substantial efforts reported only modest progress. Others, newer to the game, felt they were further down the road. Perhaps the scale of the task only becomes apparent once the journey has really begun.

Most interviewees reported that considerations of sustainable development have helped the firm launch new products and improve existing products and processes. They find it more difficult to demonstrate that these have improved profitability. They also commented on the lack of adequate metrics for the social dimension of sustainable development and of ways to assess the ideas employees generate in response to the corporate commitment.

Differences in patterns of response between industry sectors were not marked and seemed to depend largely on how the person

interviewed interpreted the questions we asked.

Those working for manufacturing firms tended to see sustainable development as a particularly important business driver and stimulus to innovation. They also felt best able to measure progress. In the chemicals sector, there was more emphasis on cost reductions and dealing effectively with stakeholders and a lower-than-average sense of success in finding innovative solutions. Those in the service sector tended to be less positive about the benefits of the business drivers we mentioned and less focused on technology as part of the solution.

Regional patterns were more striking. Responses from European-based companies fell close to the average for the survey as a whole. Asian companies saw most direct connection between their commitment to sustainable development and sales, were

most likely to believe that sustainable products and services will offer competitive advantage and expressed the strongest sense that corporate values are driving events.

Australian companies saw themselves in the early stages of addressing sustainable development. North American companies focused on cost advantage and were less likely to make sustainable development an express part of their published mission.

In conclusion, the survey demonstrates that companies are in a dynamic situation of embracing sustainable development, understanding its implications and disseminating a leadership approach throughout their businesses.

Several comments reflected these views. While "*Sustainable development is ripe with opportunity*", "*the executive suite believes in the benefits but is still in the realm of affirmation*". Partly this is because "*the benefits are long term gains*" and "*only the cost savings show up quickly*".

The commercial benefits of sustainable development seem more likely to come from driving product innovation that supports brand preference and improves market share, rather than from improving margins directly.

Corporations are looking for innovative ways to align corporate and customer values towards sustainable development. They are generally placing strong reliance on technology and believe they can access the technologies they will need. But they lack the tools to support other management tasks such as measuring progress and mentoring staff, particularly in respect of the social dimension of sustainable development.

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### Box 3: Has business failed to innovate for sustainable development?

At the London stakeholder dialog, we presented the results of the surveys, then put ourselves on trial charged with “Failing to Innovate’. The following transcript illustrates how the trial brought out different interpretations of trends in innovation management. In a lighthearted way, it demonstrated the importance of understanding these perceptions when representing what is being attempted and achieved.

Prosecution: We claim that business thinking and practice has its origins in the 19<sup>th</sup> century and is no longer appropriate for today’s complex world.

Witness: The model and the thinking have changed and are still evolving. Business has a long history of innovating on economic, environmental and social issues.

Defense: In fact, firms are surely driven by economics to create products that are better, produced in smaller quantities and re-used?

Witness: Indeed, consider the massive improvements achieved in the safety and pollution emitted by the motor car.

Prosecution: But this example – the motor car – shows that innovation affects society for good and bad at the same time. What is the responsibility of the inventor in this respect?

Witness: In the 1980s, Dupont obeyed regulations while improving its understanding of impacts on local communities. When it discovered that some chemicals caused harm, it set up toxicology laboratories and then discontinued some of its activities. Today, the company has shifted focus again and has become interested in the potential offered by smarter technologies.

Prosecution: In other words, biotechnology? These products will stay in the environment a long time, perhaps transforming and remaining in perpetuity.

Defense: We agree that impacts do need to be considered thirty or more years ahead, but isn’t it true that this is already happening?

Witness: Yes. For example, energy companies such as Shell and BP are adopting precautionary approaches to global warming even though many people are still skeptical about the science and the politics. This process is driven by business considerations.

Prosecution: Business has a responsibility to provide systems stewardship and to ensure there are governance structures to address these risks. We claim that the boardroom is not qualified to make these judgments.

...continued

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### Box 3 (continued)

Prosecution: Isn't it true that Severn Trent has successfully changed its emphasis from maximizing throughput and now sees itself managing environmental resources rather than using natural resources? This has resulted in a huge change in management style. Perhaps the firm could only be successful because it had a mix of public sector heritage and private sector instincts?

Witness: Actually the transformation has been possible because of the company's willingness to modify its policies according to what it saw customers cared about. At the same time, there has been a considerable shift away from approaches based on regulatory compliance towards those based on leadership. These include changes in business relationships, widespread use of stakeholder dialog and greater transparency.

Defense: Business may also be obliged to respond to voices that are not necessarily representative of the consumer at large. "Rational ignorance" means that not everyone has the time or opportunity or sees the need to get involved. In Seattle, the loud voices against trade did not reflect the views of a majority. Will these voices end up causing change?

Witness: Future success depends on anticipating social changes. Also, technological systems stewardship includes accepting responsibility for social impacts. Firms are learning how to use input from socio-cultural understanding to meet people's needs and wants. They are becoming much more open to the thinking offered by the social sciences and not just reliant on engineering.

Prosecution: Amazing! A new group of rabid social scientists. Does everyone in the company understand this approach or is it just a daydream in the minds of management?

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# Technology Cooperation within Developing Nations



Technology's contribution to sustainable development in these nations comes mainly through business to business transactions. In order to improve performance, key areas of focus are skill development and capacity building, the SME sector and project investment risk. Many good examples show how these improvements might be obtained.

*"Where is the business model that will permit us to extend top-line growth to those who have less than \$1000 a year?" Chad Holliday, CEO, Dupont.*

Developing nations seem to face desperate challenges in addressing sustainable development, with little choice but to adopt approaches that are less than state-of-the-art. Yet the problem is usually not the lack of cost-effective environmental technology or even examples of "best practice" that can be copied and improved.

Attempts to overcome the central challenge of poverty are undermined by a host of problems such as limited resources and skills, small and ineffective markets, poorly developed legal frameworks and our widespread inability to learn from examples of success.

The contributions that multinationals make towards overcoming these problems are highly sensitive and their records are coming under closer scrutiny. Public attention is being drawn to examine the benefits of globalization in ways that closely interweave issues of trade, technology and sustainability.

Companies may find it hard to respond to this scrutiny unless they are clear that local communities view their presence as beneficial. Evidence so far has often come from the labor standards offered by the multinational and the economic and social contributions it extends to the local community. Increasingly, firms are being judged more holistically, for example on

their contribution towards improving the performance of local businesses and attitudes towards corruption and on the relative economic performance of the developing nation within the global economy.

More generally, the risks and benefits of foreign direct investment (FDI) will be interpreted in terms of these local social and economic issues. In other words, the more firms' actions take place globally, the more their contributions will be assessed through local eyes.

During our regional dialogs, partner organizations confirmed the important role small and medium-sized enterprises (the SME sector) play in getting a country out of poverty to become a dynamic part of the world economy.

They told us that such firms might be far less able than the multinationals to mitigate their environmental impact but nonetheless have a wealth of practical experience and understanding that is not available to their counterparts in other countries. They also remarked on the Western tendency to lecture others about free trade while ignoring the barriers around our own markets.

## Technology transfer and technology cooperation

One way to contribute to faster and environmentally better economic growth is to improve the availability and use of appropriate technology. Consequently, some have suggested that governments within the

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#### Box 4: Globalization and the anti-trade lobby.

The word “globalization” is a catchall for processes that have been ongoing for many years. It can be quantified as follows. During the 1990s, world output grew on average by 3% per annum; trade in goods at twice that rate; trade in services at 8%. The real growth has been in foreign direct investment (FDI), which averaged 14% per annum.

This upsurge partly reflects the relative ease with which production technologies can now be transplanted. In some other respects such as the physical movement of labor, globalization has hardly happened. However, personnel policies such as expatriation and the proximity provided by television (and now the Internet) have led to much greater awareness of what is possible and helped disseminate the skills to make use of that awareness.

Opposition to trade liberalization sometimes reflects lobbying by vested economic interests but the challenge also comes from people and organizations that claim to speak for the poor, the consumer and the planet. They argue vocally about the harm that is caused by the modern business practices such as importing job-destroying technologies yet not developing other essential technologies such as the medicines needed to treat local diseases. The politics behind these groups are increasingly complex and have moved beyond old adages that sustainable development is “about sustainability” in the North and “about development” in the South.

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developed nations should transfer modern technologies to other nations as a matter of course.

This approach – “technology transfer” – has been widely discussed as a way to assist developing economies “leap frog” over environmentally and economically less effective approaches and avoid repeating others’ failures.

Unfortunately, the initially high expectations have not been met. Technology becomes useful by being applied, which happens mainly within and between companies and through the products and services they generate. Governments have neither “owned” the technology nor been well placed to create the skills and facilities to apply it properly.

Since technology is disseminated primarily through business-to-business transactions, the WBCSD and most governments now focus on market-oriented approaches to

technology cooperation. In this project, we have attempted to identify the most important factors in making these approaches successful.

#### Explicit and Tacit Know-how

Using technology competitively depends both upon having the right know-how and access to the right tools. This know-how has at least two components:

- The *explicit* skills to assess the problem and use the necessary tools.
- The *tacit* skills to solve the problem effectively and appropriately in its setting.

Explicit skills can be taught but tacit skills are learned through practical experience and are difficult for either the technology-rich company or the local community, with practical understanding of what works and does not work, to record and teach.

These skills combine to provide the knowledge capital that the economy requires

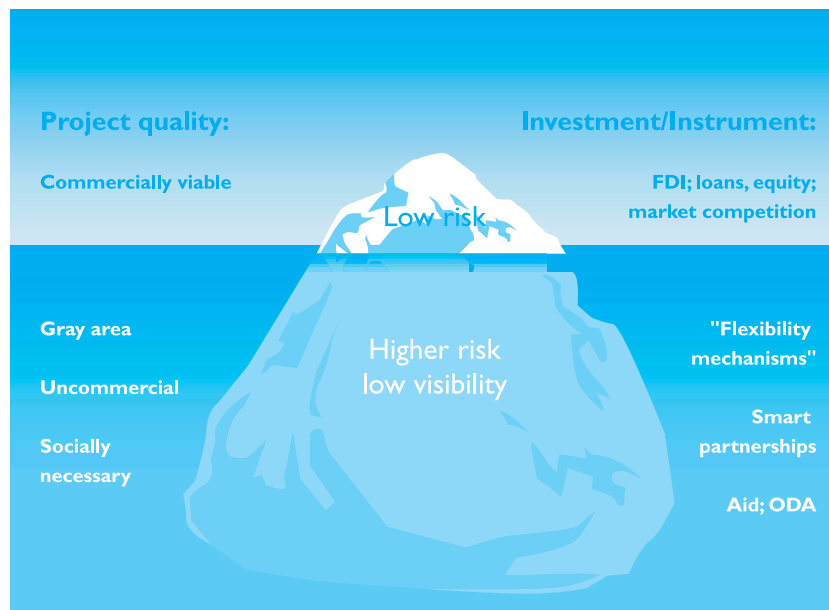


Figure 3: Technology diffusion matters throughout the project iceberg.

to grow. Unlike physical assets, many can possess the same knowledge capital at the same time and use it in different ways to create value.

Sometimes, economies have been described as pipelines for converting raw materials into products. Today, it seems more appropriate to view them as dynamic networks that transmit learning and generate value through connectedness. Indeed, some describe economies using the language of ecology and give similar explanations for their success and failure.

The resources and skills that multinational companies, governments and non-governmental organizations, universities and civil society deploy within these networks are essential to sustainable development. In order to become and then remain successful within this networked economy, people need to acquire more know-how and refresh their know-how more frequently.

Even within developed nations, the OECD recently estimated that the average half-life of worker skills has shortened to three and a half years. In the developing nations, the challenge of skill generation and skill maintenance is magnified further by the

changing nature of technology and by the imbalance between local needs and global trends.

Whereas the larger companies cannot remove this hurdle by themselves, progress is likely to be slow without their active participation. Using their economic power to strengthen and extend the connections within the networks helps reinforce people's awareness and understanding of what needs to be achieved and provides the means to transform values and local priorities into action.

As networks evolve, roles will also change. Increasingly, the multinationals' commercial success comes from funneling skills, technologies and sources of investment rather than holding proprietary control of all the key technologies and production processes. This makes it particularly important that they work in ways that will enhance the effectiveness and legitimacy of these channels.

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### Box 5: Electricity and Water in South Africa

Only 30% of homes in South Africa had access to electricity in 1990. In 1998, Eskom and other firms initiated a massive electrification program that increased this to 67%. However, it is unlikely that the grid will ever be extended to the smallest isolated rural communities.

The Solar Home System and its support infrastructure offer an innovative solution in these locations. A joint venture between Shell and Eskom aims to provide 50,000 homes – many with very little chance of ever being connected to the national grid – with access to electricity.

This venture is a blueprint for similar markets elsewhere, demonstrating the benefits partnerships can bring to providing a power solution for customers. The project provides a commercially viable way of tackling a key social issue. At a local level, it will lead to job creation, education, entertainment and a power supply that is superior in terms of quality, health and safety.

The system consists of a solar panel, a charge controlled battery and a security and metering unit. Solar panels are supplied from the Netherlands. This is the first time that pre-paid magnetic cards have been used for a solar home system, providing people with the opportunity to obtain solar power without making a large up-front investment in equipment that they might not otherwise be able to afford. The cost to customers (around US\$8 a month) is roughly what they spend today on less effective fuels such as candles and paraffin. This charge is stored on a magnetic card bought from local outlets.

Community workers provide education on solar energy and on the financial commitment. Regional branch offices are responsible for the finance, accounting and training on installation, maintenance and marketing. Local, community owned and operated companies will handle marketing, installation and maintenance. Community owned and operated outlets will be the first place for customers to make contact.

Suez Lyonnaise and the World Bank are testing a similar approach to water distribution in the Eastern Cape province as part of a series of initiatives aiming to bring clean water to a million residents by 2005. Pre-paid electronic cards costing around \$2 a month provide access to filtered water. Since previously the rate of payment for water services in the Transkei was 1%, it was important to help the local population appreciate that this was not simply a new way of taxing them. Already the villages have seen a marked decline in waterborne illnesses.

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### Project Investment and Risk Management

Economic growth requires investment as well as know-how and this investment spreads most easily towards projects that offer good financial returns and present low risk. It may be helpful to view the situation as an iceberg, as drawn in figure 3.

Floating above the waterline are the project opportunities that will be successful in any case. Below the surface are a far larger number of potentially vital projects.

Some of these projects may be commercially attractive but unnoticed; others may be desirable from the point of view of country development but too risky for the private sector to address.

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### Checklist 3: Technology Co-operation and Smart Partnerships

- Who benefits from the actions the firm takes and the technologies it deploys? Will these help local economies become more successful and their SME sector able to operate in a more sustainable fashion?
  - Are appropriate technologies already available for handling local environmental problems? Who ensures these get developed and adapted to suit local needs and local budgets?
  - What is the best way for firms that have an international outreach to work with local governments and the local community? For example, can they transfer expertise through business support groups within the local community or provide management training – perhaps linked with the university system – about successful approaches?
  - Is the firm’s approach to the management of its intellectual assets compatible with the need to deploy technology in ways that will enable poorer countries to develop economically?
  - Who sets and who monitors the performance standards? While some standards depend on the local community’s objectives and capacity to absorb given technologies, others, such as safety, risk assessment and management vision, cannot be relative. Are effective assurance mechanisms in place?
  - Is our behavior consistent with these answers? Are we actively seeking out examples of what works and consciously modifying our approaches accordingly? Do local communities believe that they live better lives as a result of our presence?
- 

One challenge for governments, firms and the international community is to find ways to increase the number of projects that are actually selected for investment and progress to completion – to improve the “supply side”. This depends on reducing the risk of key projects “close to the water line” and generally raising the level of other projects that today lie deep below the surface.

Project risk has many components: location, choice of partners, suitable technology and means of finance. The market may seem too small or ineffectively regulated, the workforce unskilled, intellectual assets poorly protected, or the restrictions on repatriating profits too stringent. Only some aspects can be expressed objectively. Yet obtaining productive investment requires finding

approaches that minimize the risks perceived by the investor.

### Smart Partnerships

Official Development Assistance (ODA), including debt write-off, has been one vital tool for addressing the intractable needs of the poorest nations. Arguably, its real justification is to deal with the socially vital projects deepest beneath the water line in ways that also build capacity for the future. But too often it seems to be applied in ways that do not reduce future project risk.

In the course of this work, we learned about the contribution that can be obtained through public-private initiatives: “Smart Partnerships” as the Commonwealth Partnership for Technology Management describes them. These partnerships can

operate at all scales from the skilled engineer upwards. They provide the means by which people can learn from and apply the tremendous experience available in small and large companies, governments and civil society.

Combining grant-based, capacity-building approaches with practical experience, education and skill development increases both the competence of the individual to address local needs and the international community's understanding of these needs.

Once the capacity has been created, sound legal frameworks make it more likely that this can be used to good purpose and correct decisions made about design and construction. This in turn helps the international partner complete projects more effectively, producing a virtuous circle that further improves local capacity and makes future investments less risky.

The newer market instruments such as the Kyoto Protocol's Clean Development Mechanism, Tradable Emissions Permits, etc., also offer ways to increase project visibility. We feel it is useful to view these as *development tools* that can tip the balance in favor of cost-effective investments addressing particular policy goals (in this case reduced carbon emissions).

Provided it is possible to agree the rules and modalities, these instruments can be used to reduce overall portfolio risk and shift investment towards greater sustainability without constraining the investor to use pre-determined solutions. We believe that running these schemes in ways that encourage participation rather than create bureaucracy will provide substantial leverage and improve project visibility.

### Points of Leverage

However committed a firm is to sustainable development, the growing concerns about globalization mean that it is likely to be challenged on its record in emerging economies. In working towards technology co-operation and smart partnership, the main

messages are to focus on economic development, learn from examples of success and work in ways that will improve skills, reduce risk, foster partnership and extend the network.

There is a widespread willingness (and the resources) to invest provided there are the skills, capacity and institutional frameworks to support that investment. Technology follows investment and when the perceived rules of the game change, so too will people's behavior.

The SME sector plays a particularly crucial role as economies develop: a hot-house of effort with tremendous understanding of what is possible but often stretched in its ability to take up and use the tools already available to the multinational. Without a vibrant SME sector, economies do not flourish.

Finding better ways to drive this dynamic is a test of cooperative economic leadership, in which governments, multinational companies and local businesses each have key roles to play.

# A Management Framework for Sustainable Innovation



Sustainable value creation depends upon pro-actively managing innovation to address both changing values and public perceptions of risk. Attention starts in the early parts of the innovation S-curve.

The messages we heard during this project offer a clear sense of both opportunity and obligation. Once the public believes (rightly or wrongly) that corporations – specifically multinationals – are the main actors able to influence the future and drive innovation and the development of technology, corporate social responsibility inevitably extends to cover these processes.

At our London Innovation Dialog, held to explore the work covered in this report, participants from outside the business community told us to:

- Pay more attention to how business is being framed and recognize that few people are actually promoting the benefits that companies themselves consider that technology is providing,
- Recognize that innovation can be highly disruptive and requires ethical guidelines that are fit for the time and place,
- Pay more attention to the contributions made by government and regulation and not believe that a *Jazz* world can be achieved by industry alone,
- Learn how to structure dialog on the difficult issues surrounding the use of advanced technologies to obtain challenge without polarizing matters to a point at which progress becomes impossible,
- Take what we have learned and ensure it gets put into practice.

Eco-efficiency shifted the response to environmental impact from end-of-pipe solutions towards ways of eliminating impact at source. Its success has come from expressing a clear but challenging objective “to do more from less” that channels our aspirations to find environmentally better and more cost-effective solutions. Once companies recognized this was possible, eco-efficiency became established.

Similarly, there is no future in looking at sustainable development just in terms of costs and obligations. This is one way to get caught in the commodity trap. To be a successful, integral part of business thinking, sustainable development has to provide the food for long-term growth and profitability. To nourish innovation, its roots have to extend deep within companies’ business units, not the corporate centers where the early attention to sustainable development has often been focused.

*“When we looked at our publications on sustainable development, we realized that all the people in the photographs worked in our corporate office. There was no one there from our business units.” Participant at London Innovation Dialog, 1999.*

The nature of the challenge is apparent from the results of the company survey. It concerns people and economics much more than technology. Individual firms, with different spheres of business, will encounter different aspects of this challenge.

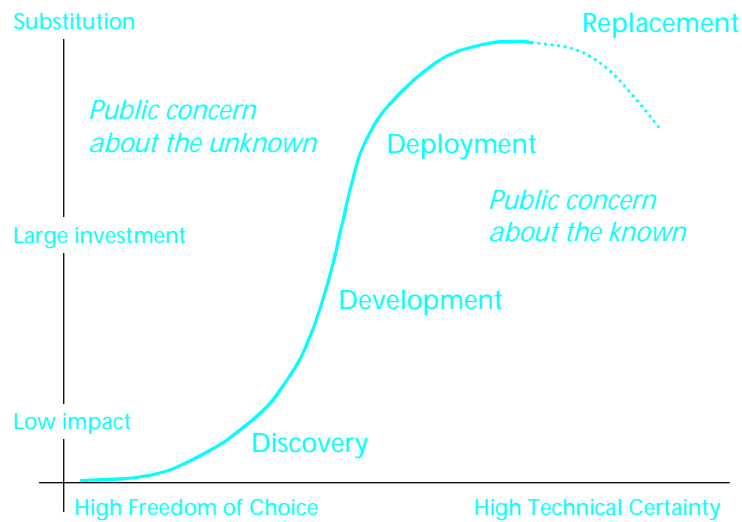


Figure 4: The S-curve illustrates the changing impact of technology through its life cycle.

In larger companies, the required skills may already exist but may not be combined as a team. For example, technology management is often treated as an engineering task receiving little input from the social sciences. SMEs may be particularly strong in their design skills, in science or in their appreciation of the needs and values of the local economy, but weak in other important areas.

Sustainable innovation requires us to combine these skills without creating inflexibility, reinforcing the on-going shift towards dynamic, results-oriented styles of management that is already happening for other reasons.

This report has not attempted to identify which technologies might solve which sustainability goals or which innovations will be successful and sustainable. That is something that (in general) we believe is best determined through well-regulated markets.

However, we suggest that it is worthwhile for firms to look in more depth at how they are managing innovation and consider whether this approach can respond to the challenge of

sustainable development during a period of rapid commercial, social and technical change.

### Managing the S-curves

The S-curve offers a useful way of presenting the distinct stages of discovery, development, deployment and maturity of ideas and technologies (see figure 4). Impact starts off low as the scope and nature of the idea or discovery are mapped out. It then grows rapidly after substantial investment has moved the idea into development, flattens off after the idea is implemented widely, then falls away as replacements (developed along their own S-curves) come along.

This reminded us that businesses need a balance of activities to remain profitable. What seem to be good business practices such as focusing investments and technology on the most profitable products currently in high demand (i.e. close to the top of their S-curves) can ultimately weaken the firm (see Christensen, *The Innovator's Dilemma*). The same is likely to be true when addressing sustainable development.

Breakthrough innovations of whatever form are likely to be rejected by mainstream customers because they cannot use them. Firms with too strong a customer focus may fail to create the new markets for products of the future and become exposed to more nimble competitors. On the other hand, firms that invest too much in new technology fail because of the time it takes to bring these options to market.

Depending on the nature of the technology and the degree of awareness of its potential consequences, public concerns about technology arise at different stages in its development and have different risk management responses.

Ways of managing innovation and technology development to resolve these tensions change over time.

Around 1970, many large firms separated the management of their R&D and business operations. R&D and innovation were often considered synonymous, a corporate responsibility that involved generating new options for business units while keeping an eye on the scientific horizons and minimizing technology-related risk and environmental impact. Business units were responsible for understanding the evolving market's requirements and for turning these options into products they could sell.

In many firms, this separation of roles disappeared towards the end of the 1980s. Their core technologies became mature and market forces required greater integration of product development and technology deployment. At the same time, innovation became seen as much more than the product of R&D (see Roussel et al, Third-Generation R&D). Eco-efficiency became a priority, which large corporations were in a position to address cost-effectively using the technical capabilities at their disposal.

Box 6 illustrates this evolution in a simplified way and suggests how it may continue as social values and the underlying desire for greater sustainability become important forces driving the innovation process.

## Reinforcing Trends

In determining the best approach to their innovation and technology management, corporations must take into account many trends. Some are directly related to the growing attention given to environmental and social performance; others may only be co-incidental. Nonetheless, we do not believe that they can be treated separately from sustainable development.

Networking has already been mentioned several times. Another trend is that time to market has shortened dramatically in some sectors. The nature of new technologies, combined with large companies' focus on core competencies, has made it possible for small firms to take a leading role in bringing new ideas rapidly to market. Many younger people now prefer to work in these small firms and do not expect the certainties that large corporations used to offer.

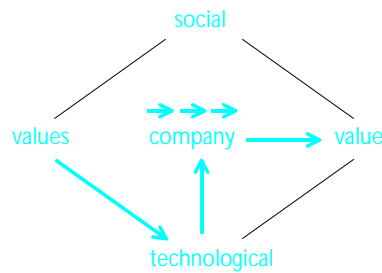
In turn, large companies now spread their antennae much more widely to obtain the competitive tools they use in their businesses. The trends go together and it would not be possible for the new SMEs to be successful without strong connections to larger organizations.

Another important development is the changing profile of public concerns about technological risk and technology ownership. When most of the life cycle happened inside a large corporation, public concerns tended to arise during the later parts of this cycle (at the top of the S-curve), hopefully after companies had taken steps to understand and minimize the risk.

Today, concerns become visible sooner ("novelty" leading to "uncertainty") and the extent of use of some technologies goes beyond the scale that people can comfortably handle ("too big"). This means that new mechanisms may be required to ensure that what is introduced is, and will remain, acceptable to the public.

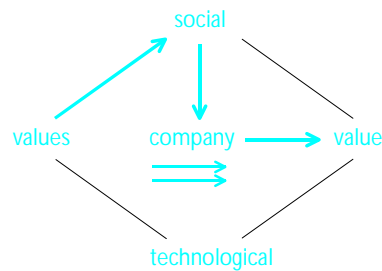
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## Box 6: Changing Approaches to Innovation Management



### a) Technology push, functional coordination (1970-1990)

Central Research generated options to address Business Units' requirements, maintaining knowledge access to appropriate (often proprietary) technology. Business Units determined the firm's manufacturing and marketing focus and selected which options to develop. Technology push ensured that the "shelf remained full". However, lack of engagement of the business units in generating the options meant that some of these remained unused on the shelf. Companies adopted and extended government-defined regulations based on expert risk assessment.



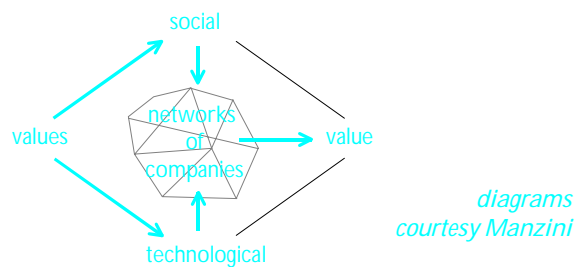
### b) Market-led, business unit coordination (1990-?)

Business units incorporate research and technical functions to develop products and services to meet consumer needs. Market pull focuses the technical effort and businesses marshal core competencies according to the structure of key markets. While technology remains an important success factor, there are fewer unused options on the R&D shelf. The risk of being unresponsive to changing customer needs and technical possibilities is dealt with *in principle* by the transparency provided through the market. Public awareness of complexity and risk is starting to challenge the established assurance mechanisms based on "sound science".

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## Box 6 (cont): Changing Approaches to Innovation Management



### c) Values-oriented, externally driven (2005?)

Public values (some local, some global) will increasingly shape the business environment for innovation. Networked businesses will operate within this framework in ways that ensure legitimate global outreach and local presence. Success will depend upon recognizing and amplifying the weak signals provided by emerging behavior and ideas and the results of early demonstrations of promising technology.

This will require the competence to know what is available within the network and to move quickly enough to capitalize upon that knowledge. Depending on the nature of the innovation, the ability to move “out of the box” will require the informed consent of the consumer and citizen as well as the network partner owning the intellectual property rights. This consent may be easier or harder to obtain depending on the governance mechanisms society provides and the credibility of the firm within its network.

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# Shaping the Future or Responding to the Past?



Sustainable development can act as a catalyst for innovation if there is a compelling vision, consistent tools to support that vision and effective ways to measure progress. Traction can be increased by connecting the approach to trends such as networking and changing social values.

Achieving an effective balance to these trends raises new questions. One way to formulate these is to ask what corporate social responsibility means for companies operating within a networked world. No single approach will apply to all firms in all situations, but there are some clear common principles.

1. Sustainable development offers an organizing framework based on opportunity and respect for human values. Innovation is about using change in ways that better meet human needs and values. The connection between the two seems obvious although, in the absence of clear market pressures and a common language, it can be hard to realize, especially since innovation can come unexpectedly “out of left field” and have such uncertain consequences.
2. Some organizations respond best to sustainable development as a vision, whereas others prefer more pragmatic approaches. Clear direction backed up by resources, management support and good metrics seems more likely to achieve the desired results than reinventing business processes to accommodate sustainable development.
3. Whichever approach is preferred, innovation has often been the result of presenting (or being presented with) a credible strategic dilemma: a shock that can only be resolved by developing wholly new approaches.
4. Economies are networked, social values are changing and environmental pressures are here to stay. These are unavoidable but not uncontrollable forces. Commercial success depends on having the flexible, multidisciplinary skills to respond. This applies as much to sustainable innovation as in any other area. Metaphorically, we must ask ourselves whether to concentrate on stopping the tide from coming in or using it to get where we want to go.
5. Innovation based on better design and new technologies gives us the means to act smarter and more sustainably. Using these tools well depends upon understanding the public’s expectations and concerns and being able to meet needs cost-effectively without raising further alarms over the scale or novelty of technology.
6. The leadership task is to harness these economic and social trends, capture the tremendous amount of knowledge and experience that exists in networks worldwide and combine these in ways that create value. Traction is likely to be greatest when the management approach is positioned appropriately for the organization in its network and seen by staff to be relevant and self-evident, if not simple, in purpose and content.
7. Corporate social responsibility and eco-efficiency form important elements of the business response. Attention to these principles must be devolved throughout the corporation.

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#### Checklist 4: Innovation Management in a Networked Economy

- Is attention on sustainable development centralized or decentralized within the firm? Who provides the shock – the strategic dilemma – that is intended to take the whole network forward?
  - Does the firm’s approach reflect all the implications of operating in a networked economy? To what extent do smaller firms (which are generally not yet affected by considerations of sustainable development) provide the innovative potential we use to develop new ways forward? How are we linking these efforts to support our commitment to sustainable development?
  - Is a suitable process in place to “scan the horizon” for the trends and opportunities that can form the basis for value-based growth? Does it treat sustainability as an important consideration and does it reflect the realities of a networked economy?
  - Commercial success in the global economy depends on local and global public acceptance of corporate behavior. Are we clear about the balance of responsibilities between small and large firms and how this balance will be achieved?
  - How will networks of small and large firms respond to public concerns about new technology? What is the appropriate balance between the advice offered by the expert and values established by other means such as stakeholder dialog, both for avoiding problems ahead of time and for resolving them when they do happen? Do we know how to put these approaches to good effect?
- 

At our dialog workshop in December 1999, Professor Manzini suggested that success also requires new business ideas and new ideas on business. He believed that these ideas would be design-based, amplifying the emerging signals from the marketplace in ways that cannot be reduced to either a “technology push” or a “market pull” approach.

The task force concentrated its attention primarily on what companies can do, but it is important not to overlook the role others play in supporting companies’ actions. An important role of governments is to provide the climate for sustainable innovation. This includes (see Hemmelskamp, Innovation-Friendly Environmental Regulation; Dearing, Technologies Supportive of Sustainable Transportation) the regulatory frameworks that reduce uncertainty that better solutions

will succeed in the market place. In the OECD’s view, such frameworks will be dynamic and will require multiple supporting instruments. Governments also act in ways that can reinforce the standards of behavior that are sought of others, for example within public procurement policies.

The financial markets have an important role to play in funding and rewarding the more sustainable solutions developed by companies. They are most likely to do so when there is compelling evidence that sustainable development has economic value. In March 2000, John Prestbo, Editor Dow Jones Indexes, commented about the new Dow Jones Sustainability Group Index:

*I believe that the Dow Jones Sustainability Group Index will [continue to] outperform general*

*market benchmarks over time. Enlightened and effective management means sustainability companies deliver more predictable returns, which also could be articulated another way: fewer negative surprises.*

*It is well known among money managers that the easiest way to beat your benchmark is not to find a bunch of hot stocks but simply to avoid owning the stocks that turn into disasters. Investors will seek out leading sustainability companies not for outsized performance, which is always temporary, but for the above-average growth on which they can rely.*

The challenge for these companies is to find new ways to align innovation with public expectations and so provide a management framework that is based on discussing, deciding and then delivering sustainable value.

Leading companies have understood that this depends upon understanding the evolving nature of society and redefining the relationships they want to build with customers, employees and suppliers, with governments and with the public at large. This approach involves recognizing the connection between rights, roles and responsibilities in society.

Dealing well with these responsibilities takes time, needs an effective view of what the future may offer as well as leadership, courage and measures of progress, but is essential for the influence of the private sector to be accepted.

*Turn, turn, my wheel! All things must change  
To something new, to something strange;  
Nothing that is can pause or stay.*

*Keramos, Henry Wadsworth Longfellow.*

# The Way Forward

Events that took place while this project was underway brought home some of the underlying issues. Public concerns flared up in Europe about food biotechnology, driven by mistrust of companies' motives, lack of perceived need for the product and uncertainty about the technology. The WTO, the World Bank and the IMF faced violent protests about globalization, a process made possible and visible by advanced communications technologies. NASA's probe to Mars vanished without trace while an international team of experts was noting that mankind knows far too little about the state of our own planet's key ecosystems. Millions died of water-borne diseases and rates of HIV infection reached 25% in some sub-Saharan countries, decimating the adult age groups on which these nations depend for their skill development and prosperity.

We do not believe that the dilemmas and inequities these events represent can be overcome without innovation. Without a belief in science and a willingness to learn, improve and apply better technology responsibly, sustainable innovation will not happen. However, unless innovators (which means companies) demonstrate that they have taken steps to ensure their own houses are in order, the public may be unwilling to accept developments that are important in achieving desired goals.

The WBCSD's Council recognizes that this depends on maintaining strong societal support for companies' actions. The *Innovation and Technology* Council project takes over from this task force to address these matters. Its goals are to:

- Deliver a set of principles and a framework for innovation, technology development and implementation that enhances sustainable development.
- Engage stakeholders on the issues surrounding information and biotechnology and similar advanced technologies to develop an understanding of the expectations of corporations for the societal transitions for sustainability.

We hope that the scouting work that this task force has carried out will help the new team meet these goals.

# Acknowledgements

This report reflects work carried out in discussion with over fifteen hundred people in a wide variety of organizations. The task force is very grateful to these people for their insights, ideas and data that have made the project possible. Nonetheless, responsibility for the conclusions that are drawn lies with the task force itself.

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# Social Surveys and the 1999 Regional Dialogs

During 1999, the WBCSD held dialogs with its regional partners within the Corporate Social Responsibility and Sustainability Through the Market Council Projects. Among the questions discussed were “What role does technological and social (behavioral) innovation play in achieving sustainability?” and “Is the atmosphere in your country receptive to this innovation?” This appendix summarizes the responses.

## Brazil

Here, the dialog explored a balance between positive benefit and caution. Participants from certain sectors felt strongly that innovation and technology play a key role in achieving sustainability. Others felt the need for more caution despite the potentially beneficial effects. There was a general agreement that it is currently difficult for Brazil to access new technologies.

There was also agreement that society needs to be more proactive in applying and introducing new technologies. Among the positive examples were clean technology, water treatment, material substitutions and recycling. However, some participants, particularly from government, felt that the first priority was human safety and felt that extreme caution must be applied to avoid premature decisions concerning the introduction of sensitive technologies.

Some participants regarded social innovation as key. They felt that education was critical to changing people’s lifestyles and that civil society and government must participate in the creation of new educational methods.

There was a mixed reaction concerning genetically modified organisms (GMOs).

Some felt that Brazil has been too liberal in accepting GMO products and noted that several biotech-based products forbidden in the USA are sold freely in Brazil. Others, claiming that GMOs could have a positive impact, noted that acceptance of GMO products will depend not just on economic viability but also on local values and beliefs.

*“Information is technology today. Society is being forced to think about the true value (beyond the purely economic value) of new ideas and methods.”*

*“Technology can play a key role in de-linking economic growth from the use of energy and natural resources.”*

*“Caution needs to be applied. Insufficient qualified labor and poor infrastructures may expose the country to higher risk levels, such as in the production and maintenance of nuclear facilities.”*

*“There is a need for investment in R&D with a view to reducing poverty and social inequality.”*

*“Innovation is linked to results. The market will decide whether or not new technologies are to be introduced. It is a function of need.”*

## Argentina

We heard that innovation is well received in Argentina. Participants told us about the important role it plays in achieving higher levels of sustainability, provided technologies respond to social demands and are adapted to local conditions and the public is kept appropriately informed and educated on potentials and risks.

During the period of protectionism and military rule, Argentina was less receptive to innovation. This changed during the

liberalization of the economy in the late 80s. Most of the fears expressed surrounding innovation came from unskilled laborers who lost their jobs (or fear the loss) through the introduction of new technology.

*"Innovation is a key factor for progress. The open market fosters innovation, as people can choose and compare and competition is strong."*

*"Argentina is open to innovation and the introduction of new technologies. Controversial technologies such as GMOs or nuclear power are not of concern to the general public."*

## Philippines

Overall, Filipinos are receptive to technological and social innovation but they proceed with caution. Technology was seen to be important to assure a certain standard of living. Social innovation was thought to be key as people need to learn how to do things differently and in a more sustainable way. Nevertheless, there is a widespread lack of knowledge regarding the opportunities for social innovation and technological choices.

There is a constitutional ban on nuclear energy in the Philippines. The new Clean Air Act intends to ban incineration as a waste disposal option.

Participants expressed skepticism towards some new technologies (such as genetic engineering) and made reference to the need to apply the precautionary principle. In the case of GMOs, some participants said that certain groups were not supportive of their production while others would adopt their usage if it can be shown that this is more profitable instead of traditional agriculture. There is a religious overtone concerned with dealing with aspects of human life. However most participants felt that GMOs were not an issue and that the public as a whole was quite indifferent to the topic.

Regarding social and behavioral innovation, many believe in a need to revert back to "more simple living" and "real" pleasures. There is a sense of needing more economical ways of living, adapting products and services to local needs and specific habits, and

including the situation of the poor in companies' decisions, product designs and operational or infrastructural development.

*"People must be cautious with innovation as it will have a determining impact on quality of life."*

*"We need many more 'how to' books and other type of self-empowerment tools, so that people can better understand the values of their lives and the pleasure in more simple living."*

## Thailand

In Thailand, the majority view was that technological and social innovation is critical to the country's development. Thai businesses are under strong pressure to raise quality and environmental standards of their products to remain competitive, particularly in foreign markets.

Thai businesses recognize that their ability to innovate and develop more efficient ways of operating is particularly critical to their survival, given the developing nature of the economy. Government is promoting foreign direct investment with the belief that it will bring technological "know how", capacity building and jobs to Thailand. However, there was a feeling that not all "innovations" are good, particularly if only the rich and educated benefit. Some stressed that traditional knowledge and technology have not lost their value and must not be forgotten in the light of new methods.

Participants proposed creating additional capacity-building projects in order to make the positive effects of innovation more widespread and better known.

*"One must always ask 'What is the value added?' when introducing a new technology."*

*"Traditional organic farming works well and is consistent with Thai beliefs that respect nature. It also represents a great potential for Thailand to enter into growing markets for organically grown food."*

# Results of the Corporate Innovation Survey

This survey was carried out between June and November 1999. We identified around 150 firms based on their public commitments to the principles of sustainable development or environmental protection. (This means that the survey is only representative of the part of industry that has already recognized the importance of the subject.)

Around 80 firms agreed to take part, 55 of which were WBCSD members. Most companies offered one response, although in four cases, replies came from more than one business unit. The breakdown of regional and sector responses was as follows:

Asia	17
Australia	13
Europe	30
North America	22
Latin America/Africa	4
Chemicals, Pharmaceuticals	13
Consumer Goods	24
Energy	22
Industrial Manufacturing	6
Natural Resources	9
Services	12

We aimed to interview senior business managers with responsibility for aspects of innovation, product development and technology management. Around one third of those who responded were heads of R&D or Technology Development, a fifth held other senior positions within a business unit, the rest worked within the corporate offices. Wherever possible, interviews were carried out by telephone rather than in writing.

The following tables give a detailed breakdown of the results. (Questions for which there were only a few replies are

omitted.) The first column gives the question as asked; subsequent columns indicate the percentage of respondents giving the indicated answer.

Where the percentages add up to less than 100%, this is because not all respondents answered the question. The final column contains the average response calculated by weighting these percentages on a scale of 1 to N, where N is the number of possible responses to the question. For example, the value 4.3 for the first question indicates that the average response was somewhat stronger than "Yes".

	Strong no	No	Neutral	Yes	Strong yes	Average
1. Is sustainable development a key business driver for your firm?	0%	1%	10%	48%	40%	4.3
2. Is this because of						
a. the firm's values and principles?	0%	0%	2%	50%	36%	4.4
b. the values and principles of your company's staff?	0%	1%	15%	52%	19%	4.0
c. pressure from (potential) customers?	0%	17%	31%	31%	8%	3.3
d. competitive advantage through new products and services?	0%	5%	15%	44%	22%	4.0
e. competitive advantage through lower costs and better processes?	1%	7%	20%	43%	16%	3.8
f. the contribution to reputation and/or brand image and value?	0%	0%	5%	45%	38%	4.4
g. regulatory requirements?	2%	14%	27%	36%	9%	3.4
h. pressure from other stakeholders?	1%	14%	29%	37%	7%	3.4
3. Which drivers will increase in importance in the next 5 years?						
a. the firm's values and principles	0%	0%	27%	53%	20%	3.9
b. the values and principles of your company's staff	0%	0%	14%	71%	15%	4.0
c. pressure from your customers	0%	2%	26%	53%	17%	3.9
d. competitive advantage through new products or services	1%	0%	17%	52%	28%	4.1
e. competitive advantage through lower costs or better processes	1%	1%	24%	51%	22%	3.9
f. regulatory requirements	1%	7%	24%	49%	19%	3.8
g. reputation and brand image/value	0%	0%	10%	53%	36%	4.3
h. pressure from interest groups	0%	7%	23%	50%	19%	3.8
4. Would you say that						
a. factors underlying sustainable development have fundamentally transformed the way you approach business?	1%	6%	22%	56%	14%	3.8
b. your business is/will be fundamentally transformed for environmental or social reasons in the next five years?	1%	7%	17%	44%	29%	3.9
	None	<25%	<50% (1-5)	<75%	>75%	Average
5. For what percentage of sales are environmental and social factors						
a. a key selling point?	23%	42%	14%	9%	6%	2.3
b. a secondary but not key selling point?	12%	35%	26%	9%	12%	2.7
6. Does your firm have a formal process for product and service creation and development					No 15%	Yes 85%

		No	Yes			
7. Is sustainable development explicit in your published mission and values?		17%	83%			
		Social	Envir.	S&E		
8. Are staff explicitly required to take sustainable development into account within this innovation process?		1%	28%	55%		
9. Is the Chief Technology Officer (or equivalent) the person who integrates considerations of sustainable development as part of his job?		0%	8%	20%		
	Major neg.	Neg.	None	Pos.	Major pos.	Average
10. What has been the influence of sustainable development?						
a. on the overall quality and standard of innovation	0%	0%	27%	43%	24%	3.9
b. the culture & climate for innovation	0%	1%	29%	35%	31%	4.0
c. understanding customer and potential customer needs	0%	1%	22%	47%	28%	4.0
d. understanding the role of design in addressing these needs	1%	0%	22%	45%	22%	3.9
e. understanding technological opportunities and options	0%	1%	7%	49%	40%	4.3
f. your ability to manage the skills required for innovation	0%	5%	34%	33%	19%	3.7
g. staff creativity and ability to generate and screen new ideas	0%	2%	26%	40%	26%	3.9
h. the formation and use of partnerships and other forms of external collaboration for the purpose of innovation	1%	2%	22%	43%	28%	4.0
i. the definition of market, design and product strategy	0%	0%	36%	38%	19%	3.8
j. the definition of technology and R&D strategy	0%	1%	27%	38%	29%	4.0
k. decisions of which ideas to launch	0%	1%	27%	44%	21%	3.9
	Strong no	No	Neutral	Yes	Strong yes	Average
11. Are technology and engineering key tools for supporting sustainable development in your firm?	1%	0%	3%	41%	55%	4.5
	Don't know	A barrier	None	Modest	Strong	Average
12. Which will make significant contributions during the next decade?						
a. information and communications technologies	0%	5%	27%	65%	1%	3.6
b. energy technologies and new energy sources	0%	8%	26%	62%	1%	3.6
c. measurement technologies and sensors	1%	23%	44%	27%	1%	3.0
d. developments from the bio-sciences	1%	29%	33%	29%	2%	3.0
e. materials engineering	0%	14%	44%	36%	2%	3.3
f. process technologies including catalysis	0%	14%	40%	42%	2%	3.3
g. standards of technical and environmental education	0%	15%	43%	40%	1%	3.3

	Strong No	No	Neutral	Yes	Strong Yes	Average	
13. Where is the main challenge in dealing with sustainable development?							
a. understanding the business case	1%	6%	6%	59%	27%	4.1	
b. making the business case	1%	3%	12%	44%	38%	4.1	
c. understanding stakeholders' expectations	0%	10%	19%	47%	23%	3.8	
d. the firm's ability to measure improved performance	0%	10%	14%	52%	23%	3.9	
e. the technologies at the firm's disposal	1%	15%	22%	38%	22%	3.7	
f. ability to use "best-in-class" technologies/approaches.	5%	16%	21%	34%	23%	3.6	
g. the firm's existing capital assets	5%	13%	20%	44%	17%	3.6	
h. customers' willingness to purchase more sustainable products/services	0%	12%	16%	40%	31%	3.9	
i. legislative and regulatory frameworks	1%	15%	21%	41%	20%	3.6	
		Not at all	Not well	Quite well	Very well	Average	
14. How well does your firm measure/manage environmental and social criteria							
a. in the way it assesses its business performance		1%	14%	70%	14%	3.0	
b. environmental only		1%	8%	21%	13%	3.1	
c. social only		6%	26%	8%	3%	2.2	
d. in the way it assesses the performance of staff		5%	43%	42%	10%	2.6	
e. environmental only		2%	14%	19%	6%	2.7	
f. social only		9%	21%	9%	1%	2.1	
15. Have considerations of sustainable development helped your firm to							
a. launch one or more new products/services		2%	13%	50%	35%	3.2	
b. make major improvements to existing products/services		7%	13%	50%	30%	3.0	
c. establish new processes		3%	15%	53%	28%	3.1	
d. make major improvements to existing processes/operations		5%	15%	49%	31%	3.1	
e. develop new ways of doing business		8%	17%	53%	21%	2.9	
		Not at all	Not well	Quite well	Very well	Average	
16. How well do you feel you can							
a. demonstrate that current products/services/processes are more environmentally/socially responsible		1%	9%	50%	40%	3.3	
b. show how much this is worth in terms of shareholder value or profitability		8%	33%	48%	12%	2.6	
		<20%	20- 40%	40- 60%	60- 80%	>80%	Average
17. How close are you towards a fully integrated management process that incorporates sustainable development?	9%	27%	26%	24%	5%	48%	

18. Any comments or examples you wish to share?

- § Dramatic reduction in use of greenhouse gas in electrical components.
- § Production processes have reduced emissions from 71.5 in '70 to 6.5 in '98.
- § Emissions trading, Clean fuels, Technology program to fund greener ways of doing things. At a strategic level, new ways of doing business (still secret).
- § Risk control surveyors offer "value added service" during visits – they spot environmental risk, costs, missed opportunities.
- § Contributing to the development of one of the most sustainable community developments in the world. Technologies from around the world have been scouted on issues from wastewater treatment to transportation. Awaiting investor money
- § Diversified business group uses sustainable development as a screen for new ideas.
- § Greenhouse gas trading scheme.
- § Moving away from deep well extraction methods; Developing functional, yet biologically degradable polymers; Developing new processes using renewable resources.
- § Introduced new service to measure the extent sustainable development has been factored into regional and governmental strategies; guidance tool.
- § Formed international network of sustainable solutions for large companies, allows different regional offices to share best practices.
- § Introducing load management techniques using compact fluorescent lighting; Nuclear based power generation technology; solar, thermal, wind.
- § Development and application of best practices in power plant operation & maintenance.
- § Extensive vehicle product range based on compressed natural gas fuels; electric-hybrid cars; recycling.
- § Electric car is not selling well though this was a major initiative costing hundreds of millions of dollars.
- § Facilitating Information Technology access & usability within the developing world; medical & analytical technologies specifically.
- § Development of environmentally sensitive lubricants; Reduction of energy usage; Emissions carried out in a more structured manner; Process modeling employed to reduce inefficiency and waste.
- § Changed the way forests are harvested; increased the % of forest allocated to reserves.
- § Commenced demonstration project to build sustainable building.
- § Design & construction of closed loop chemical plant generating zero hazardous waste.
- § Materials sourcing now taking social concerns into decision making process.
- § Developed first chlorine-free pulp which required new processes and large invest; Developed high quality paper with 20-30% less mass.
- § Genetically transformed crop seed to improve crop yield.
- § Developing new enzymes which substitute for harsh chemicals reducing energy and water use
- § Forest certification that is less expensive when full environmental impact is reflected.
- § Stopped copper emissions into lake before emission reached harmful levels.
- § Outsourced management of water plants, aiming to offer support worldwide through internet.
- § New recyclable polyester developed, picked up by another company for carpet manufacture.
- § Environmental and societal impacts assessed before project decision; Working to end gas flares.
- § Proactive approach to stakeholder relations regarding recent plant expansion.
- § Stakeholder engagement with respect to plant expansion; Open communication with respect to stakeholders. But consumers not willing to pay premium for environmentally more benign products, price is still main driver.
- § Detergent powder manufacturing process redesigned to lower emissions and energy consumption; Global effluent emissions are now tracked to enable continuous improvement metrics.

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## What is the WBCSD?

The World Business Council for Sustainable Development (WBCSD) is a coalition of some 130 international companies united by a shared commitment to the environment and to the principles of economic growth and sustainable development. Members are drawn from 30 countries and more than 20 major industrial sectors. The WBCSD benefits from a thriving global network of national and regional business councils and partner organizations representing more than 600 business leaders.