DEDICATED TO MAKING A DIFFERENCE

Towards a Low-carbon Economy

A business contribution to
the international energy & climate debate

World Business Council for
Sustainable Development

Purpose

The World Business Council for Sustainable Development (WBCSD) and its member companies have been working together to contribute to the debate on climate change, energy access, energy security and competitiveness by sharing knowledge, new ideas and pragmatic solutions. In our *Energy and Climate trilogy – Facts and Trends to 2050*, *Pathways to 2050*, and *Policy Directions to 2050* – we took readers along a journey that outlines the climate change challenge, the options available to stabilize and eventually reduce greenhouse gas (GHG) emissions, and a proposed roadmap of policy ideas and concepts to support a transition to a low-carbon economy.

In July 2008, the WBCSD and the World Economic Forum delivered a set of recommendations from over 80 chief executives of leading global companies to the G8 regarding the structure of an environmentally effective and economically efficient, long-term climate policy framework.

This publication reflects a continuation of this journey. It aims to confirm the relevance and potential implications of the Bali Action Plan and any future international climate agreement on business. Further, in the spirit of our continued contribution to the international energy and climate dialogue, the WBCSD provides a business perspective on the key issues under negotiation at the United Nations Framework Convention on Climate Change (UNFCCC), as governments work towards the development of a future international climate change framework post-2012.

As a group of companies from diverse sectors, operating globally and across geographic borders, we hope that our experiences and policy recommendations on climate change mitigation, technology, finance and adaptation will bring an insightful business perspective to the policy debate.

Energy and Climate Trilogy

Facts and Trends to 2050:
Presents key facts and trends related to energy and climate change and outlines corresponding dilemmas. Primarily designed for business, the issues are presented succinctly and illustrated by graphs and projections.

Pathways to 2050
Builds on Facts and Trends to 2050 and provides a more detailed overview of potential pathways to reducing CO_2 emissions.

Policy Directions to 2050
Explores potential policy approaches and mechanisms that might be deployed to introduce the required changes in the energy system.

About the WBCSD

The World Business Council for Sustainable Development (WBCSD) brings together some 200 international companies in a shared commitment to sustainable development through economic growth, ecological balance and social progress. Our members are drawn from more than 36 countries and 22 major industrial sectors. We also benefit from a global network of 58 national and regional business councils and partner organizations.

Our mission is to provide business leadership as a catalyst for change toward sustainable development, and to support the business license to operate, innovate and grow in a world increasingly shaped by sustainable development issues.

Our objectives include:

Business Leadership – to be a leading business advocate on sustainable development;

Policy Development – to help develop policies that create framework conditions for the business contribution to sustainable development;

The Business Case – to develop and promote the business case for sustainable development;

Best Practice – to demonstrate the business contribution to sustainable development and share best practices among members;

Global Outreach – to contribute to a sustainable future for developing nations and nations in transition.

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Contents

Introduction

A rapid transition towards a low-carbon economy is essential to addressing the climate change challenge. The International Energy Agency's (IEA) World Energy Outlook 2008[1] highlights the unprecedented scale and pace of change required to mitigate the most damaging impacts of climate change. Scientific evidence has confirmed this as a necessity and economic analysis has shown this to be possible. Political impetus is converging around the negotiation of a new international climate change framework at the United Nations climate change meetings (COP 15) in Copenhagen in 2009. Business strongly supports this negotiation objective and we are prepared to work with government in this process.

The Bali Action Plan, agreed at COP 13 in Indonesia in 2007, and advanced at COP 14 in Poznan in 2008, outlines the key elements of the negotiation process leading up to COP 15:

1. A shared vision for long-term cooperative action
2. Enhanced national/international action on climate change mitigation
3. Enhanced action on adaptation
4. Enhanced action on technology development and transfer
5. Enhanced action on the provision of financial resources and investment.

These issues are at the core of business activity and operations. Business innovates, develops and deploys technology on a daily basis. Finance flows through business transactions and projects globally. Our infrastructure and operations are already adapting to the impacts of climate change. An effective international climate change framework that leverages business engagement is, therefore, essential and we see a significant opportunity to contribute to the solutions.

In this publication we share the business experience as it relates to technology development and deployment, finance and carbon markets, cooperative sectoral approaches and adaptation. We propose policy recommendations, suggest improvements to existing mechanisms, and bring ideas for new mechanisms under the international climate change framework that might enhance mitigation and adaptation action globally.

Summary of key recommendations

- A future climate change framework must provide the elements to enable all countries to collectively work towards a low-carbon economy with the urgency needed. This includes GHG emissions reduction targets for developed countries and supporting infrastructure to enhance the financial and technology flows to developing countries to slow emissions growth and work towards net emission reductions in the longer term. National and regional social, environmental and economic circumstances should be recognized and taken into consideration.
- Low-carbon technologies exist and have the potential to significantly reduce global emissions, but enabling frameworks and specific policy responses are needed to support their rapid deployment, in both developed and developing countries.
- New technologies will also be needed. A future framework must facilitate the scale-up of research, development and demonstration of these clean energy technologies through new financial mechanisms and international cooperation.
- A future framework must strive to unleash large-scale private and public investment by enhancing carbon markets and effectively using public funding to leverage private finance. The framework will support global cost-effective mitigation actions by providing the necessary elements that enable carbon markets to link as they develop at regional and national levels.
- By addressing investment barriers, extending and streamlining the Clean Development Mechanism (CDM), and establishing new mechanisms to drive large scale investments, financial flows to developing countries will be enhanced.
- The concept of cooperative sectoral approaches should continue to be explored as one of several tools under the future international framework. An approach under the international framework that enables developed and developing countries to collaborate on sector specific mitigation and adaptation activities, drawing from supporting finance and incentive mechanisms from within the framework, can enhance actions and increase financial flows to developing countries.
- With adaptation as a pivotal element of climate change processes, a future framework should enable the establishment of strong integrated infrastructure planning and policy environments to promote adaptive capacity and resilience planning.

Elements of a future international climate agreement

All countries must work collectively towards a low-carbon economy. Developed countries must take on and implement GHG emission reduction targets, and developing countries must slow emissions growth, enhance carbon sequestration and eventually work towards net emissions reductions over the longer term. The pathways for the management of GHG emissions should be expressed in terms of a long-term carbon emissions trajectory and be based on science, including up-to-date results from climate research, an understanding of the impacts of climate change, and the social, environmental and economic drivers of national and regional importance. A framework that provides the elements to enable this is critical to the sustainability and effectiveness of any international agreement on climate change.

The framework would start with a global long-term goal. This goal would not just be a distant aspiration, but would be supported by intermediate targets for developed countries, the first of which should be no later than 2020. The target would provide the context for necessary reductions at national and regional levels.

Six infrastructure "pillars" must be in place as part of the agreement under the United Nations Framework Convention on Climate Change (UNFCCC), as supporting infrastructure for developing country action. They would also facilitate the development of global markets that would stem from the policies implemented in developed countries:

1. Direct funding for low-carbon technology discovery, development and demonstration
2. Mechanisms to facilitate the deployment of clean technology, such as an enhanced CDM or the development of new mechanisms
3. Infrastructure to facilitate the development of a global greenhouse gas market
4. Measurement, reporting and verification (MRV), which constitute a series of robust processes to ensure that actions taken are measurable, reportable and verifiable
5. A framework to support cooperative sectoral approaches and sector-specific actions
6. Direct funding for adaptation projects, which remains separate to funds applied to mitigation actions.

The sections on technology, finance, sectoral approaches and adaptation that follow outline recommendations related to the design and use of these six pillars, with the objective of driving large-scale mitigation and adaptation actions.

Technology

Technology in the Bali Action Plan

Technology is a key element in the Bali Action Plan. It covers issues related to the removal of obstacles to and provision of incentives for scaling-up and accelerating low-carbon technology deployment, diffusion and transfer to developing countries. The Bali Action Plan also calls for cooperation on the research and development of current, new and innovative technology, and cooperation within sectors.

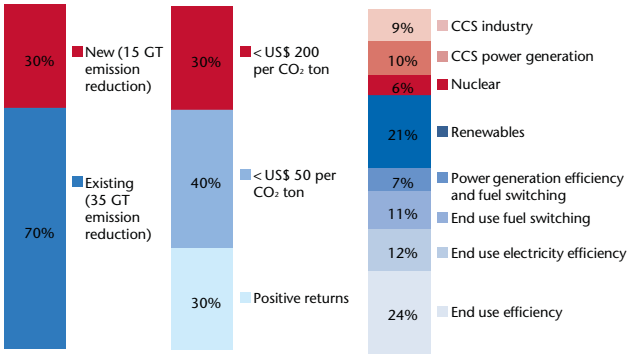
Generally, it is business that develops, owns, uses and deploys technology, rather than governments. Technology is essential to business and to value creation and wealth generation. Whether technology takes the form of "hardware", such as machinery and equipment, or "software", such as information technology, skills, science and best practice, modern business cannot operate without it. From a business perspective, technology is generally not the end goal, but a tool to enhance the delivery of revenue and profit generating activities that contribute to economic and social development.

In many circumstances, business invests in technological advances to enhance their competitive advantage. Therefore, to ensure business engagement in international technology cooperation processes, appropriate international frameworks will be required to maintain the principles of using capital, generating revenues and creating wealth to fuel global sustainable development.

The IEA's *Energy Technology Perspective 2008*[2] highlights that the diffusion of technologies that are currently available or at an advanced stage of development, could reduce GHG emissions against "business as usual" (BAU) by 35 GT CO_2 back to current levels by 2050 (ACT Map Scenario).[3] A further reduction of 15 GT CO_2 could be achieved with the development of new technologies (BLUE Map scenario).[4] In terms of cost, 30% of emissions reductions could be achieved with positive returns, a further 40% at a cost below US$ 50 per ton CO_2. The remaining 30% of emissions reduction needs would require the discovery and development of new technologies (Figure 1).

Technologies are diverse; they have different maturity stages as they progress through each phase down an initial learning and cost curve; they have different carbon mitigation potential and require different policy

Figure 1: The IEA energy technology perspectives



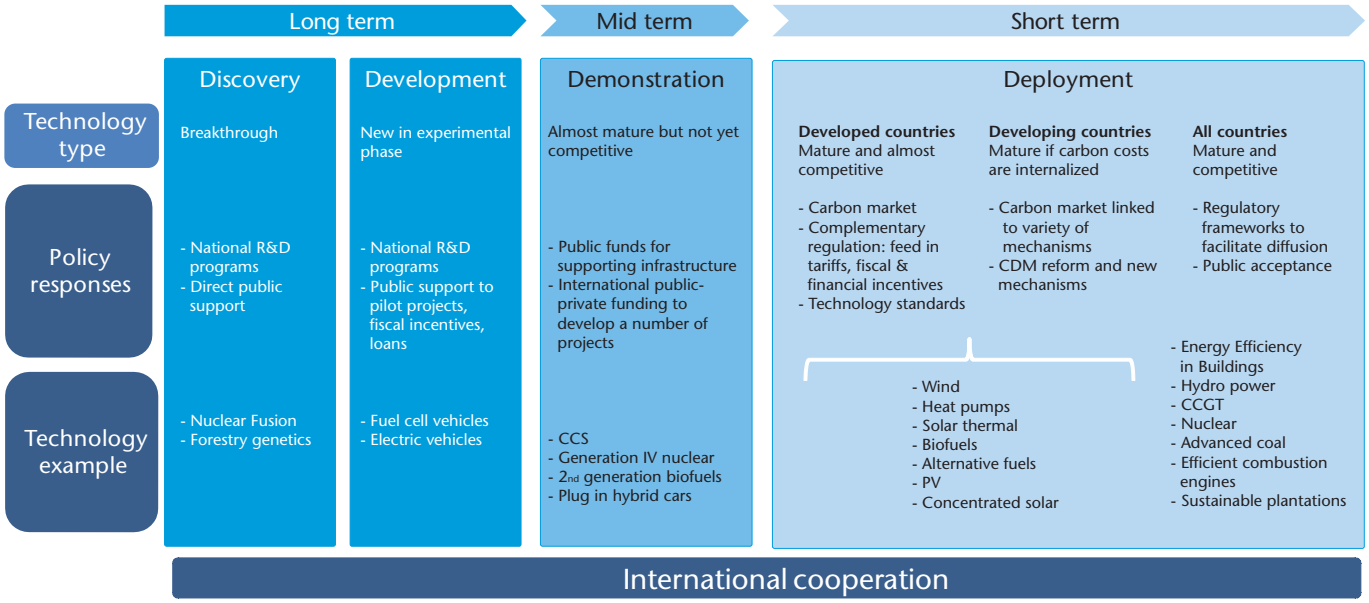
Source: IEA, Energy Technology Perspectives, 2008.

responses in developing and developed countries (Figure 2). To stimulate investment in appropriate technologies at the right time and place, countries will need to consider the full life cycle of technology and enable a portfolio of technologies to be developed in parallel, not sequentially.[5] In addition, it is important to consider the life-cycle and turnover of existing capital infrastructure as new low-carbon technologies are phased in and new long-term energy infrastructure is built.

International cooperation has an important role to play as a catalyst to accelerate technology progress at each stage. Businesses have been historically active in international cooperation in the deployment of technologies. For example, wind manufacturers and developers frequently cooperate with local partners on the deployment of wind energy in different markets, including training sub-suppliers, transferring technological know-how in the form of, *inter alia*, personnel training, and implementing high-level quality standards.

In order to achieve the required emissions reductions there is a need to unleash the potential of existing low-carbon technologies, bring new technologies to the market and deploy available technologies to developing countries.

Figure 2: Technology learning phases and policies



Reducing CO_2 emissions in road transport

Road transport entails a complex energy use chain including fuel production, vehicle technology, consumers etc., all influencing the carbon intensity of transport. Reductions in road CO_2 emissions can be delivered by all of the many stakeholders involved – these include the automotive industry and its suppliers, the fuel industry, policy-makers and infrastructure providers, car buyers and users, etc. Vehicle manufacturers develop and deploy fuel-efficient technologies; fuel manufacturers are responsible for providing appropriate fuels; consumers can influence transport emissions when purchasing low-carbon vehicles or changing their driving behavior (e.g., eco-driving). Road infrastructure design and intelligent transport systems can improve overall transport efficiency. Therefore, an "integrated approach" is needed in which all relevant stakeholders cooperate in concerted efforts across the whole chain in order to reduce CO_2 emissions in the most cost-effective way.

Policies could contribute to such an integrated approach by building appropriate frameworks. Measures could include R&D support, regulatory instruments, market-based programs and voluntary programs that coordinate to support the overall goal of reducing GHG emissions from the transportation sector. All measures should be technology inclusive as well as competitively neutral and be implementable in a cost effective manner. These policies have to consider the country's particular circumstances, especially in developing countries.

Harmonization is necessary. On the one hand, countries should work together to harmonize the methodology for transportation sector data collection on CO_2 emissions from vehicles, fuels, and consumer behavior such as vehicle miles traveled. On the other hand, governments should follow the same methodology for setting standards (while the level of stringency would have to take into account the country's capabilities and circumstances) or providing for the adequate infrastructure in terms of fuel quality and fuel choice, etc. Companies, developing vehicle technologies or alternative fuels (ethanol, biodiesel, hydrogen), could then focus on their preferred technology routes without the need to multiply their investment in developing products adapted to each market regulation separately.

An appropriate international scheme could further move forward the integrated approach, sharing best practices, providing incentives for efficiency and fuel improvements, and lowering vehicle miles traveled, even beyond current policies and measures, and giving additional flexibilities in bringing CO_2 reductions in the transport sector.

Unleashing the potential of existing technologies

The IEA estimates that 70% of emissions reductions could be achieved through the diffusion of existing low-carbon and energy-efficient technologies, along with technologies in an advanced state of development. Delaying the implementation of these technologies today will cause economies to become "locked-in" to carbon-intensive development, making it more difficult to achieve the necessary emissions reductions in time.

Business believes an array of harmonized policy measures is urgently required to enhance the rapid diffusion of existing technology, including: effective energy pricing, developing carbon markets, providing other market-based incentives and tax credits, ensuring an appropriate power grid infrastructure is in place, improving product information, and designing norms, technical standards and methodologies for standard setting. Changes in consumer behavior and technology choices, together with these measures, would create further energy savings.

Energy efficiency is widely accepted as the most cost-effective way to mitigate climate change and accounts for 50% of the potential to halve energy related CO_2 emissions by 2050.[6] The business case for energy efficiency is clear and includes: reducing energy costs, alleviating energy dependency, decreasing vulnerability to energy price volatility, reducing emissions and improving the efficient use of natural resources. Energy efficiency can generate positive returns on investment and has the potential to promote high value adding activities and job creation. The deployment of energy efficient technologies can alleviate energy supply shortages and contribute to reducing energy investment costs. Since its inception, the WBCSD has been promoting energy efficiency[7] and our companies have achieved substantial efficiency gains. However, energy efficiency faces barriers when it comes to implementation and we recommend a number of policies to address these challenges (Figure 3).[8]

Market reforms in tandem with other policy instruments can unleash the potential of the diffusion of existing low-carbon and energy-efficient technologies. At the same time, the potential of end-use energy efficiency must not be underestimated. There is a need to educate consumers about the financial and environmental benefits of energy conservation, which will support effective consumer decisions.

Figure 3: Barriers to the deployment of energy-efficient technologies and practices

Barrier	Why is this a barrier?	How to overcome the barriers
Low or volatile energy prices	▪ Subsidies ▪ Prices do not include environmental costs	▪ Eliminate perverse subsidies globally ▪ Put a value on carbon and ecosystem services
High upfront costs and long pay back periods	▪ Most consumers value the present cost of consumption ▪ Lack of capital	▪ Economic incentives (e.g., tax reductions) to decrease first cost ▪ Use finance mechanism to leverage investments
Slow diffusion of technologies	▪ Lack of skills, knowledge and support on the use of technologies ▪ Fragmented and non integrated industry structures (e.g., building sector) ▪ Lack of effective intellectual property rights (IPR) protection	▪ Technology standards ▪ Enhance capacity building ▪ Ensure IPR protection in accordance with WTO regulations ▪ Boost best practice sharing and energy efficiency education
Entrenched business models	▪ Lack of incentives for energy companies to reduce customer demand	▪ Internalize carbon prices in energy services ▪ Financially reward end-user energy efficiency measures ▪ Promote energy service companies (ESCOs)
Diversity of consumers and energy needs	▪ No single solution fits all	▪ Promote voluntary sectoral initiatives and negotiated agreements
Information failures	▪ Lack of information or imperfect information regarding future energy prices and energy efficiency alternatives	▪ More effective technology standards (e.g., building codes) ▪ Product energy labeling ▪ Advice on smart energy metering
Split incentives (principal agent problem)	▪ Those making decisions on energy efficiency do not benefit (e.g., building owners and tenants)	▪ Provide clear information and incentives (e.g., tax rebates, mortgage discounts, rebates, preferential loans)
Uncertainties on investment and risks	▪ Uncertainties add a premium to investments	▪ Economic incentives to reduce costs and risks ▪ Develop robust energy and carbon markets ▪ Establish stable regulatory frameworks
Consumer behavior	▪ Low priority of energy efficient investments ▪ Lack of awareness and information on energy consumption and costs	▪ Improve product information ▪ Incentives to remove and replace old equipment ▪ Raise education and awareness on energy efficiency
Investment costs higher than expected	▪ Projects do not include all transaction costs	▪ Boost best practice sharing and energy efficiency education

Public and private partnership

The Asia Pacific Partnership on Clean Development and Climate (APP) was established in 2006 as a multilateral public-private partnership and now includes seven countries: Australia, Canada, China, India, Japan, Korea and the US. Its objective is to promote activities for improving both global and regional environmental performance through the development and deployment of cost-effective cleaner technologies and practices. The partners work within eight public-private sector task forces: aluminum, building and appliances, cement, cleaner fossil energy, coal mining, power generation and transmission, renewable energy and distributed generation, and steel.

Within each of these task forces, governments and the private sector collaborate on activities, including, among others, the sharing of best practices for operation and maintenance of power plants (in the electricity sector); the establishment of global common guidelines for energy-efficiency calculations and target setting (in the steel sector); and enhanced production processes through the uptake of best practices (aluminum).

This partnership model has the potential to be scaled-up to contribute further to climate change mitigation activities.

R&D investment trends

Since 1974 public and private R&D investment has decreased considerably in OECD countries and has remained at relatively low levels in recent years. Low energy prices and the lack of clear regulatory signals contributed to this trend. The IEA recommends policies to reverse this trend that include direct funding of basic research, improved patent protection, more tax measures to support increased R&D in the private sector and other market measures that can indirectly stimulate private sector investments.

Ramping up the development of new technologies

According to the IEA, if we are to meet the BLUE Map scenario there is a need over the next 10 years to bring new technologies to the market that will facilitate a peak and reduction in total global emissions (Figure 4). Only if we fully use existing low-carbon technologies and succeed in bringing new technologies to the market before 2020 can we meet this objective.
The IEA estimates that annual investments of approximately US$ 150 billion in research, development and deployment (RD&D) is needed. This will require an urgent acceleration in R&D investment and a clear commitment by parties in Copenhagen will provide appropriate signals to encourage this.

The delivery of critical, new low-carbon technologies by 2020 are often far beyond the financial and technical capacity of individual countries or businesses, and requires large-scale cooperation in the demonstration of key technologies. A major shift in national strategic innovation priorities is needed to make international collaboration on R&D activities work at the scale and pace needed. New forms of public-private partnerships need to be defined where governments, R&D institutions, suppliers and potential technology users work together to organize, fund, screen, develop and demonstrate selected technologies in a shorter time frame. Incentives for enhanced collaboration could be built under an international sectoral approach framework, which is described in the following section.

Technology deployment

Technology is transferred through projects, beyond national borders and spreads at a rapid pace. Business deploys technology within the company, between companies and to suppliers and customers at home and abroad. The private sector is responsible for 85% of global investment and plays a leading role in the deployment of low-carbon energy technologies.

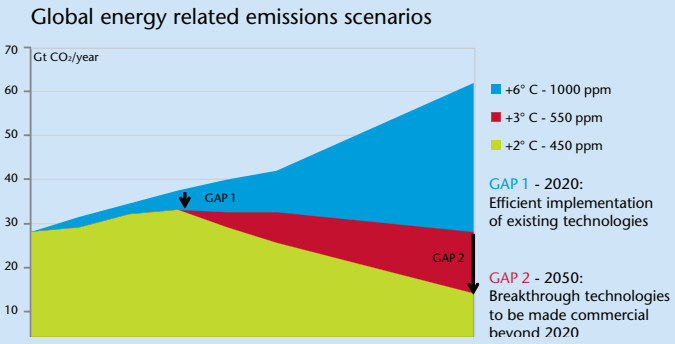
Increasing these investments requires an understanding of the business investment analysis and decision-making process, and a need to identify and address the reasons why investments are withheld.

When a company seeks to invest in a project, an investment analysis is undertaken and a series of investment options are evaluated before project implementation. This requires a number of crucial considerations to ensure the long-term viability and success of a project:

- The investment analysis will assess if a project generates economic returns and will ensure capital is available. Multinational corporations are increasingly investing to gain long-term strategic advantage, and not only to receive short-term commercial returns or manage a carbon compliance position. Some mechanisms (e.g., CDM) provide the opportunity to generate additional revenues needed to develop the project.
- In addition to the consideration of economic return, an assessment of project risks is undertaken. These risks may include, among others, market, regulatory and environmental risks.
- The company will decide how best to structure the investment. This may include the involvement of local joint venture partners.

Once a decision to invest has been made, permitting, construction and implementation of the project will commence, including the application of appropriate technology, hiring

Figure 4: IEA Scenarios on energy-related CO_2 emission and CO_2 concentration profiles



Investment analysis

Companies, financial institutions and investors employ different processes and screening criteria to evaluate investments. The internal rate of return (IRR) is commonly used to assess the expected commercial return or project profitability using cash flows generated by the project, the project lifespan and the interest rate. If the IRR is higher than the cost of capital the cost to a business of borrowing the funds plus a risk premium for the planned investment, the investment can be considered economically viable. When capital is a limiting parameter, companies will also impose company-specific criteria for investment viability that will reflect their core investment priorities. Typically, the IRR does not account for all associated project environmental or social costs and benefits.

local resources and ensuring that an appropriate supporting infrastructure and skills to produce and sell the goods or services are available.

Training and capacity building of the local team, particularly where related to technology use and maintenance and project management skills, is essential to ensure the long-term viability and sustainability of project operations.

Barriers to greater deployment

In many cases, the availability of technology is not the limiting factor in project development. Rather, a numbers of barriers are identified that can either halt project investment or limit project success once the decision to move forward has been made. A number of recommendations are suggested to address these issues and enhance project investments and technology deployment:

- Economic viability – Economic viability in low-carbon technology projects can be enhanced through the removal of barriers that block the introduction of energy efficient solutions (see section above), streamlining the planning process to reduce transaction costs, and rewarding investment in low-carbon technologies through, for example, fiscal incentives and direct public support with transparent frameworks.
- Capital availability – This is addressed in the finance section that follows.
- Supporting infrastructure – Some projects rely on the existence or development of a supporting infrastructure (e.g., grid access for renewable energy producers). The sometimes substantial investments may require host government support or parallel investment projects.
- Governance and regulatory stability – Business operates under the rules of law established by governments. Inconsistent or conflicting regulatory obligations will undermine foreign investment. In the case of energy projects, this is paramount due to their long-term nature and high capital cost. Foreign investment is enhanced by credible institutional frameworks and stable political and legal systems. Strong intellectual property rights are essential to the technology development and deployment process.
- Local capacity – The local business absorption capacity and competency to use the technology (organizational, operational, etc.) is critical to long-term project success. Resources need to be directed at improving education systems and strengthening knowledge absorption through programs that increase technology literacy in society, governments and businesses. Businesses can share in the cost of this development, but government must play a strong role in providing a platform that can support business development.

The role of intellectual property rights

Intellectual property rights are essential for business because they promote and protect innovation. They have supported the development of solutions to some of the world's toughest challenges. By giving inventors exclusive rights to their inventions for a limited period, patents encourage investment and innovation. By requiring inventors to disclose the details of their inventions in exchange for protection, patents also promote the broad dissemination of innovative knowledge.

The diffusion and transfer of mature technologies involves much more than intellectual property rights, and includes capacity building, technological and business know-how, consumer information and education, and regulatory stability.

In the energy sector there are often a range of ways to reduce GHG emissions that might involve a multitude of patents, while in other sectors, like pharmaceuticals, a single patent is often critical. The royalty cost for energy patents is a small percentage of the total investment cost (while for some drugs this might represent more than 90% of the total cost of development of the product). Much of the cost of bringing a new technology to market relates to the "soft" aspects, for example, operation and maintenance practices, training and organizational procedures, which are not patentable. With patents representing a small percentage of energy project investment costs, a specific focus on sharing patent property will not enhance "technology transfer". The focus must be on establishing adequate investment frameworks and environments that encourage and reward technology cooperation.

Some patents that provide environmental benefits may represent a large part of a company's assets, particularly where there are high R&D investments with high risks. When a country asks a company to relinquish these assets it discourages innovation in emerging technologies and holds back the diffusion of technology.

Innovation growth

Innovation, here measured by patent submissions, is concentrated in a few countries: Japan (42% of total patents), Germany (13%), the US (12%), China (6%), South Korea (5%) and Russia (4%). It is remarkable to note that the rate of innovations patented in developing countries grew at an average annual rate of 18% between 1997 and 2003 compared to 9% globally. Successful technology diffusion is correlated with a supportive business environment, lower barriers to trade and foreign investment and tertiary education.[9]

Finance

Finance in the Bali Action Plan

Within the Bali Action Plan the provision of financial resources and investment includes the mobilization of public and private-sector funding to support action on mitigation, adaptation and technology cooperation.

The IEA estimates that an annual incremental investment of US$ 1.1 trillion will be needed to reduce energy related CO_2 emissions by 50% from current levels by 2050. Over half of this investment is expected to be made in developing countries. Current levels of investment are insufficient and there is an urgency to increase and accelerate investment to slow the growth of CO_2 emissions by 2020. Market instruments, in tandem with other financial tools, are anticipated to provide a significant proportion of this investment.

As businesses are responsible for 85% of today's worldwide investment, for it to be directed towards low-carbon projects public policy should provide a "pull" for the deployment of existing technologies and reduce risks to "push" incremental investment in emerging technologies. This will help to enhance technology deployment and the flow of finance to developing countries.

This will require the establishment of a global carbon market, CDM reform, effective multilateral financing and the creation of new financial mechanisms. These various instruments must be designed and used concurrently to achieve an effective outcome.

Carbon markets

Carbon markets will play an important role in directing investment to support the achievement of long-term emissions goals. The effective design and use of market mechanisms to support GHG emissions reductions ensure that emissions abatement activities are achieved in the most cost-effective way. This applies both in and between developed countries and between developed and developing countries.

Effective market mechanisms should be fully fungible, highly liquid and transparent. Having such effective market mechanisms will enable incentives or funds to flow to the development of low-carbon projects around the world. An effective global carbon market

requires the establishment of a long-term emissions pathway with intermediate targets to create sufficient demand in national carbon markets, boost investor confidence in the market and drive investment in new technologies.

The effective design and subsequent linking of current and emerging carbon markets will enable the progressive harmonization and fungibility of global carbon markets and increase stability. The linkage should be based on different levels of recognition of emission trading schemes: unilateral (a government recognizes specific instruments in another country), bilateral (specific recognition between two parties) and, preferably, multilateral recognition. These require trading instruments with common definitions, similar structures (penalties, banking and borrowing rules, measuring, reporting and verification) and must provide the possibility to trade allowances such as CDM-JI credits.

A carbon price is one important signal for technology development, and deployment but it needs to be complemented with other policy responses to address the climate change challenge. These include standards, codes and policies to remove market barriers, which have been explored in the technology section.

Different financial needs for different mitigation opportunities

When designing a future framework to deliver the necessary investment, a "one size fits all" solution will not be effective. Financial mechanisms should be specifically designed to incentivize low-cost mitigation opportunities (e.g., energy efficiency) and higher cost mitigation projects (e.g., new low-carbon technologies).

Mechanisms should be created to prevent market failures between these. Failures could occur where low-cost opportunities from developing countries generate large quantities of offsets that depress the carbon price in emissions trading systems, thus preventing the development of higher cost projects. Failures could also be created when few offsets are delivered and the emissions trading systems include mainly higher cost projects per emissions reduced, resulting in overpayment for too little mitigation benefit.

There are four different types of mitigation opportunities with different financial needs and policy measures:

1. The opportunities in low-cost mitigation projects, principally energy efficiency measures, can theoretically be largely self-financed but require specific policy measures to overcome the main barriers to implementation (see Figure 2). In developing countries' domestic actions, both policies and measures (PAMs) and nationally appropriate mitigation actions (NAMAs) should capture these opportunities. A reformed CDM would also encourage its implementation in countries with higher costs.
2. Manufacturing industry and power generation mitigation projects require stable, long-term incentives. Funding for these low-carbon solutions should come primarily from carbon markets, as they develop at national and regional levels and, in some countries, capital support.
3. Reforestation and avoided deforestation are low-cost opportunities, but require stimulated activity through some tailored financial mechanisms or funding. The current CDM precludes recognition of the important carbon management potential of managed forestry projects. Carbon markets, forest carbon policy and financing mechanisms must be designed to achieve the multiple benefits offered by sustainable forest management and should be based around real and verifiable practices.
4. High-cost mitigation options require international financing and new funding mechanisms to leverage private sector investment and bridge the funding gap for innovators as they attempt to scale-up demonstration projects.

Beyond REDD: The role of forests in climate change

Forest carbon markets and forest carbon public policy and financing mechanisms must be designed to achieve the multiple benefits offered by sustainable forest management strategies and be based around real and verifiable sustainable forest management practices.

The Bali Action Plan focuses attention on reducing emissions from deforestation and forest degradation (REDD) in developing countries. Many forest sector stakeholder – environmental and social groups, business, indigenous peoples' and forest community groups, trade unions, forest owners and international organizations – share a common concern about such a narrow approach.

Governments are encouraged to take a broader perspective to:

1. Ensure that forest-related policy options support sustainable development in both forest-rich and forest-poor countries
2. Tackle drivers of deforestation that lie outside the forest sector
3. support transparent, inclusive and accountable forest governance
4. Encourage local processes to clarify and strengthen tenure, property and carbon rights
5. Provide substantial additional funding to build capacity to implement sustainable forest management practices.

Multi-stakeholder endorsed guidance for climate negotiators – and other forests sectors actors – is provided in a report released by The Forests Dialogue in October 2008 – see: Beyond REDD – The Role of Forests in Climate Change http://www.wbcsd.org

Reforming existing mechanisms

To date, carbon mechanisms have delivered emissions reductions but are not yet delivering reductions or finance on the scale needed to meet mitigation needs over the coming decades. Some of the barriers that the CDM has encountered include the insufficient return on investment for technology investment in emissions reduction activities, an unbalanced CDM regional distribution, bottlenecks in project approvals and credit issuance (e.g., for small projects), prescriptive regulations on additionality for certain technologies (e.g., renewables) and the *de facto* exclusion of or strong limitations on key technologies (e.g., large hydro, carbon capture and storage, nuclear etc.).

Business supports CDM extension and reform to drive the deployment of low-carbon technologies and practices more effectively. Specific reforms include:

- The CDM Executive Board should refocus on its original mandate of "big picture" issues, such as CDM function and operations, and use external organizations for project-by-project approval activities. Efforts should be directed to reducing execution risk, timing and selection criteria and increasing predictability.
- Update the current assessment criteria for additionality to allow measurement on a wider basis, e.g., additionality could be measured for the whole renewable sector in a country, rather than project-by-project.
- Expand programmatic CDM to allow the large-scale "bundling" of programs to increase volume and reduce costs and implementation time.
- Introduce approaches to CDM that could be based on sectoral baselines (e.g., cement sector) or harmonized methodologies for efficiency standards. This will incentivize the diffusion of existing low-carbon technologies on a larger scale.

Programmatic CDM in practice

Renewable energy represents a growing share of CDM projects. However, renewable energy projects are still more expensive per credit generated than other types of projects, and require the revision of the CDM together with the appropriate support scheme to enhance the contribution of renewables to climate change

The use of programmatic CDM could potentially address the currently limited contribution of renewable energy by reducing administrative costs related to developing single projects and spreading those costs over a series of projects under the program. Additionality is addressed for the whole program in the region (e.g., establishing renewable production as a percentage of total power generated in that region), which avoids that incremental capacity additions in the region reduce the additionality requirement for projects installed later.

A program of activities could focus on a support scheme such as a premium feed-in tariff for renewable energy. The baseline for the CDM program in the region should be the average projected emissions of all the power plants. The renewable energy emission reductions and the corresponding CDM credit for each project will correspond to the difference with that baseline. For example, if the baseline is 500 grams CO_2 per kWh, the renewable facility will generate credits for 500 grams of CO_2 per kWh produced (under the assumption that the facility does not produce any emissions). Programmatic CDM will therefore increase the contribution of renewable energy to climate change mitigation.

International public funding

Sometimes market mechanisms will not be able to trigger the investment needed in the coming decades and public funding will be needed to leverage private investment. International public funding in developing countries should be directed to remove distortionary policies and barriers, provide capacity building, and cover some of the risks involved in those investments.

When funds are directed to investment in low-carbon projects they should follow market principles, ensure that any support does not distort competitiveness and encourage industry restructuring towards low-emission technologies and practices.

There are several institutions, particularly the multilateral development banks and the Global Environment Facility, that have adopted mechanisms to fund technology capacity building and mitigation projects. Some of the positive lessons learned are their ability to: create enabling environments; have a strong demonstration potential; foster public-private partnerships in project development; credit risk sharing arrangements in high-risk R&D private sector investments; cover the projects' incremental costs that would not otherwise collect private sector finance; and hire private sector fund managers to execute and manage investments within regional sub funds. This experience should be built upon and integrated within future collaborative public-private projects.

Developing new mechanisms

Expansion and reform of the CDM alone is unlikely to deliver emissions reductions of the magnitude and speed required to trigger the required financial flows to developing countries. New financial mechanisms are needed to:

- Enhance technology deployment for existing technologies
- Ramp up the demonstration of technologies with large mitigation potential.

Existing technologies such as large hydro, renewables and nuclear have to be extensively deployed across countries to implement concrete mitigation actions and avoid lock-in effects. New mechanisms should be put in place to finance the incremental cost of those technologies and foster technology transfer to developing countries.

Accelerating innovation requires well-designed policies and investment on the supply (technology push) and demand (market pull) side. New technologies face the challenge of attracting finance for demonstration and early stage commercialization because of the high risk involved. Public finance must play a critical role in bridging this gap and support private investment in the demonstration of new technologies. New forms of public-private partnership are needed to bring breakthrough technologies to market within the required time frame.

The WBCSD proposes the introduction of a cooperative sectoral approach framework as a flexible tool that can be "docked in" to the UNFCCC process to enhance financial flows, cooperation between developed and developing countries, and deliver large-scale mitigation and adaptation activities. These approaches are described in the sectoral approaches section that follows.

Sectoral approaches

Cooperative sectoral approaches

The concept of "cooperative sectoral approaches and sector specific actions" is included the Bali Action Plan with the stated objective of enhancing country promotion and cooperation in the development, application and diffusion of GHG emissions reducing technologies, practices and processes. Sectors mentioned include energy, transport, industry, agriculture, forestry and waste management.

This concept has expanded the nationally focused thinking that has dominated the climate policy discussion so far, by introducing the notion of internationally coordinated policy that includes the economic and commercial sectors. The logic is that action on this basis, in combination with or as a complement to national policy, may deliver a more manageable approach to the issue. This approach might also enhance cooperative activities between developed and developing countries.

Business has considerable experience implementing mitigation activities on a sectoral basis. Sector-based initiatives and projects have led to positive contributions to GHG emissions reductions through technology development, deployment and capacity building. WBCSD believes a new cooperative sectoral approach could be adopted to enhance the scale of mitigation actions globally.

Cooperative sectoral approaches can be developed as a new, large-scale tool within the international framework. It would focus on establishing activities to support emissions reductions across countries and sectors, drawing from incentive and support mechanisms provided by the international framework. Individual agreements would be developed through the voluntary participation of countries – developed and developing – and business working together to achieve emissions reductions or increase sequestration in specific sectors through specific activities.

These would promote action in developing countries by introducing new infrastructure and technologies, together with the capacity for ongoing operation and future expansion. Over time, developing countries could take on a number of activities, allowing them to build up national mitigation actions to substantial levels as appropriate given their development needs and capabilities.

Business sectors willing to participate would be consulted and work with the countries to design the cooperative sectoral approaches.

Some important parameters are:

- The agreement would be between a limited number of countries that decide to engage. Affected business sectors would indicate a willingness to participate.
  - Developing countries would engage in activities that support domestic mitigation actions
  - Developed countries would also engage in relevant mitigation actions and support the developing countries on agreed elements
  - The private sector would choose to implement the nominated activities.
- Agreements would focus on both current and future emissions reduction activities benefiting from the incentive mechanisms provided (e.g., large-scale emissions reduction programs or the development of future low-carbon technologies).
- The objectives, deliverables and timelines for all elements included in the scope would be defined and quantified.
- The scope of an agreement would vary according to the specific needs of participating countries and sectors, and could include:
  - Supporting the deployment of existing low-carbon technologies
  - Collaborating on clean technology development between governments and business
  - Crediting performance that exceeds an agreed baseline/ standard within a sector, to drive the efficiency of technology performance
  - Supporting capacity building programs to provide the technical capacity needed to deploy low-carbon technologies.
- The agreements would not result in the "carving out" of sector emissions from a participating developed country's overall target.
- The agreements would be formally recognized under the UNFCCC:
  - A board would be established to oversee governance and compliance
  - The agreements would be negotiated by the interested parties and then presented to this board for approval
  - Through a robust "measurable reportable and verifiable" process, activities within the agreement will be registered
  - The agreements would then be reported and recognized by the COP.

To illustrate how this approach might work in practice, we have outlined below an overview of how it could be designed for large-scale technology demonstration (e.g., CCS) and industry cooperation (e.g., cement). While this approach might be applied to a number of additional industries and sectors, these examples are included for illustrative purposes.

Meeting the needs of the parties

The cooperative sectoral approach is designed to meet both the mitigation challenge and the needs expressed by the parties within the Bali Action Plan.

Each agreement leads to nationally appropriate actions enabled by technology and financing and supported by robust "measurable, reportable and verifiable" processes. Typically, an agreement would relate to a sector and deliver technology capacity building to that sector through a series of activities. These are developed by business in response to the incentives set in place within the agreement.

The mechanism responds to the call for sectoral approaches and sector-specific actions:

- It focuses on economic sectors rather than targeting the entire economy.
- It identifies the range of technologies and/ or processes that a sector may use and incentivizes their deployment.
- By clustering common sector-based action across a number of countries, competitiveness concerns begin to be addressed.

A cooperative technology approach

In the case of technologies going through the demonstration phase (such as Generation IV Nuclear or CCS), a sectoral approach will involve:

- Support from financing frameworks to kick-start the technology demonstration project, drawing on existing and potentially new clean technology funds (e.g., the fund recently proposed by the G8), or other national and regional funding arrangements for technology demonstration
- Access to new mechanisms under the UNFCCC framework, such as crediting mechanisms used on a transitional basis to assist in the rapid scale-up of demonstration-phase technologies towards competitive commercialization
- Criteria for accessing financial support being set out in a transparent framework and consider:
  - The potential for the subject technology to yield significant emissions reductions
  - The maturity of the components of the technology to be deployed and whether individual components still require additional basic research to reduce costs
  - The cost of each component and the overall cost of deploying the technology per project
  - The degree of risk in developing each of the technology components
  - The amount and proportion of private sector and governmental contributions needed in the public-private partnership
- Specific timelines and deliverables for the overall project being agreed and outlined
- MRV processes for the technology project being established and possibly requiring institutional capacity building in the implementing countries, as part of the project agreement.

Recognizing mitigation programs

The cooperative sectoral approach mechanism, described above, could enable mitigation activities in developing countries, with support from developed countries, to deliver large-scale emissions reduction activities. These would be officially recognized under the international framework, and finance and crediting would be provided.

External to these agreements, mitigation activities and projects are currently developed with no direct link to the UNFCCC through the provision of crediting or financing, but that contribute to climate change mitigation. The inclusion of these programs in a registry under the UNFCCC would provide a more complete picture of mitigation activities within and between countries. Such information would develop a more complete picture of global actions to address climate change and enhance the negotiation process.

A cooperative sectoral approach in the power generation sector

What issues is the approach seeking to address?

The power generation sector is responsible for 41% of global energy-related CO_2 emissions, with projections suggesting that sector emissions might double by 2030. The question is how to meet increased electricity demand at an affordable price while mitigating climate change. The inherent specificities of the electricity industry, which includes a wide range of technology options, a high level of fragmentation within the industry, nationally focused policy development and decision-making processes, and the quality and availability of national energy resources, are such that no one sectoral measure can deploy all technologies that are urgently needed. A cooperative sectoral approach within the power generation sector could however aim to enhance technology cooperation and scale-up the deployment of existing technologies.

How would the approach work for existing technology deployment?

This approach aims to enhance the deployment of existing technologies. Programs such as the APP can be used and expanded to enhance capacity building in relation to technology deployment through peer review activities to share best practice in operation and maintenance of power generation technologies.

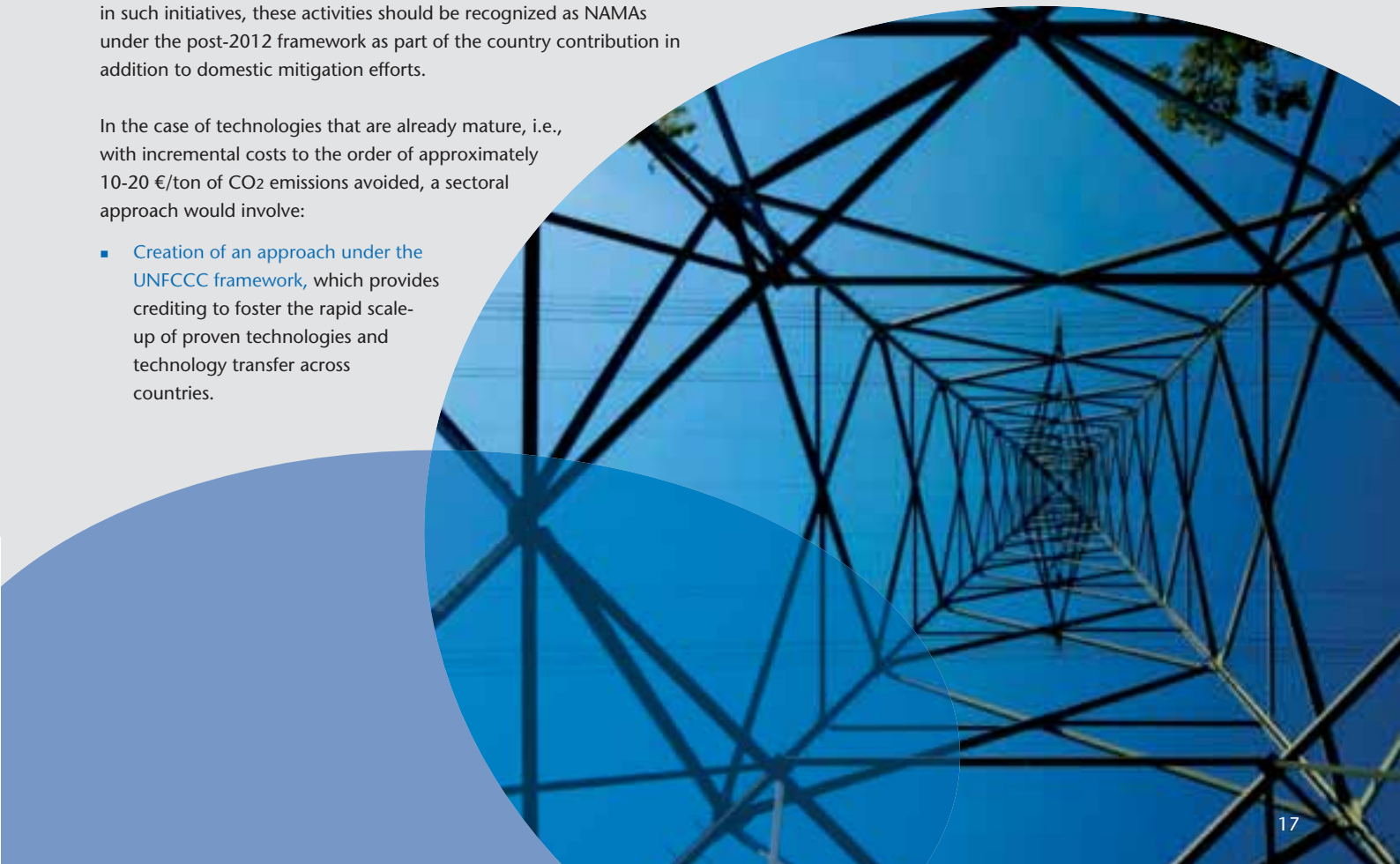
Furthermore, the scope of programs such as the APP could be extended to assess and create enabling frameworks for technology diffusion, which would appropriately reflect costs and electricity technology maturity timeframes, to assist in the appropriate development of international and national energy and climate policies.

In order to further enhance incentives for private sector participation in such initiatives, these activities should be recognized as NAMAs under the post-2012 framework as part of the country contribution in addition to domestic mitigation efforts.

In the case of technologies that are already mature, i.e., with incremental costs to the order of approximately 10-20 €/ton of CO_2 emissions avoided, a sectoral approach would involve:

- Creation of an approach under the UNFCCC framework, which provides crediting to foster the rapid scale-up of proven technologies and technology transfer across countries.
  - Key features of this mechanism
    - Open to all mitigating technologies
    - Technologies effectively deployed under this mechanism would be closely linked to national policies and needs, as defined in country NAMAs
    - Open to a group of project investments in order to accelerate technology experience in the host country, enabling them to descend the learning-curve
    - Aims to finance incremental investment costs, which should be assessed on a technology and based on host country conditions.
    - Granted credits for investment programs would be limited (i.e., for a limited number of technology projects within the program or a limit of level of power generation output); the number of credits generated by the programs would take into account the incremental costs to be financed.
  - Additional elements: Policies in host countries could enhance the effectiveness of this approach, for instance by implementing measures to reduce the incremental technology implementation cost or facilitating technology transfer, such as:
    - Measures to facilitate joint ventures with foreign partners
    - Tax credits for investments in manufacturing capacities
    - Reduced import tariffs on certain technology components.

See also *Power to Change*, WBCSD, 2008.



Sectoral approach in the cement industry

What issue is the approach seeking to address?

The cement industry is responsible for 5% of global anthropogenic CO_2 and production is projected to more than double by 2030. It is a major challenge to reducing global emissions while balancing growing demand, business success and national economic development priorities. A sector-based approach might offer a number of possible advantages over more traditional geographically organized responses. For this reason the Cement Sustainability Initiative (CSI) has been exploring the sectoral concept for the past two years and, based on recent analysis, believes it could make a useful addition to the suite of policy options available for managing climate change.

How would the approach work?

For the CSI, a sectoral approach involves the action of the major cement producers and their host governments to mitigate the climate impacts from the industry's products and processes. Specific agreements would be developed through negotiations between major cement producer trade associations and their host governments. Industry actions would differ from country to country, in line with materials availability, national government commitments and following the UNFCCC principle of "common but differentiated responsibilities."

In practice, a sectoral approach within the cement sector would aim to address emissions from major producers within the industry. An objective would be to address 80% of the climate impacts with the top 20% of the producers. For the cement sector, the G8+5 (Canada, France, Germany, Italy, Japan, Russia, the UK, the US, Brazil, China, India, Mexico and South Africa) countries encompass 80% of the world's cement production. For practical reasons only large facilities would likely be included in each country.

A wide range of different climate policies might be used, including a mix of absolute caps with emissions trading in some countries combined with intensity-based targets in developing countries. The latter improve emissions and energy efficiencies without limiting the absolute volume of emissions.

Modeling climate policy impacts

To evaluate the impact of a potential sectoral approach within the cement industry against a series of climate policy scenarios, the project has modeled different carbon policy choices and their impacts.

Specific scenarios evaluated include:

1. No commitments post 2012
2. European caps
3. Annex I caps
4. Global intensity targets
5. Sectoral approach
6. Global caps and a global carbon market

Results from the model include impacts on CO_2 emissions, regional cement production and trade, and analysis of abatement approaches, among other factors. More details about the modeling work and results can be found on the CSI website, www.wbcsdcement.org.

A cooperative technology approach to promote CCS

What issue is the approach seeking to address?

Overall, 40% of global electricity production comes from coal. In a number of developed and developing countries coal is a predominant source of electricity production. In South Africa and Poland, coal accounts for over 90% of electricity production, close to 80% in China and Australia, about 66% in India, and 50% in the US. By 2030, coal-based electricity is projected to double, with most of the growth taking place in non-OECD countries.

Managing emissions from coal-fired power generation in developed and developing countries is, therefore, a pressing issue. The necessary financial and technical capacity in developing countries is particularly necessary to curb growing emissions from this type of generation.

How would the approach work?

This example illustrates the demonstration of carbon capture and storage (CCS) technology within the electricity sector; however it is important to note that the use of CCS technology will be required within a number of industries to achieve the necessary global emissions reductions. A cooperative technology approach to establish CCS facilities, infrastructure and technical capacity in coal using countries over the period 2013 to 2020/25 could be negotiated. Parties to the agreement might include large coal using countries. As a result, CCS in emerging economies would initially be funded by the major developed economies. Later, emerging economies could support CCS themselves through a policy instrument such as "cap-and-trade".

Such an agreement has been fashioned in the EU for CCS and its elements could be replicated globally to continue to accelerate the uptake of this key technology:

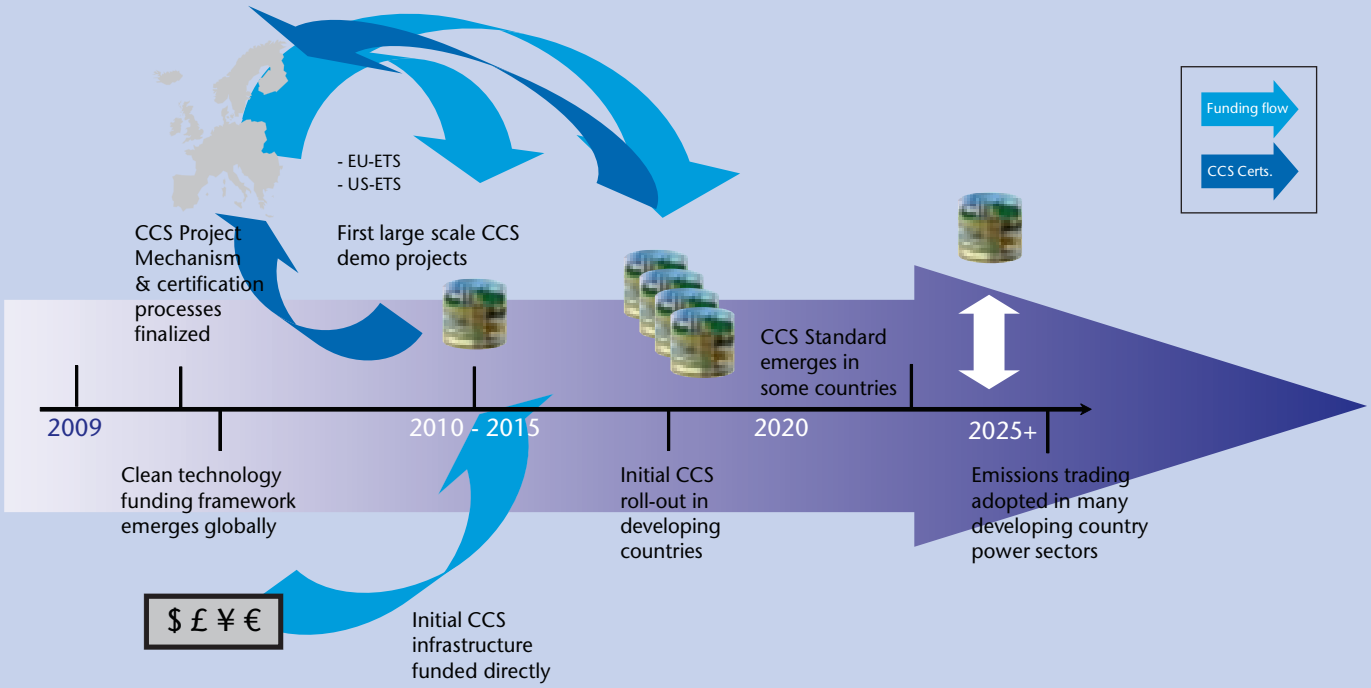
- A CCS demonstration program for the EU was announced comprising 10-12 major projects across the EU, ideally testing a variety of technologies and geologies. A timeline for investment decisions is defined through to 2015.
- CCS is now recognized as a mitigation option within the EU-ETS, thereby incentivizing long-term deployment via the CO_2 price when CCS will have reached industrial maturity.
- A legal framework is in place to allow CO_2 to be stored underground.
- A measurement and reporting framework for CO_2 storage has been agreed.
- An incentive to start the investment program has been developed. A set aside of 300 million EU allowances as award to early CCS projects for stored CO_2 provides effective government support for the early higher cost demonstration phase of the technology.

A mirror agreement operating at the international level could be similar. For example:

- A program is agreed for a number of 1GW CCS coal-fired power plants across developing countries that would accept to enter into the process.
- CCS is recognized as a mitigation option within the international project mechanism and is supported by an agreed CO_2 storage certification approach.
- The EU sets aside the necessary space within the EU-ETS to absorb the flow of CCS credits.
- Clean technology funds are identified to augment the higher cost of the first CCS facilities.

Such an approach is illustrated.

Figure 5: A cooperative technology approach to promote CCS – A "satellite agreement" that focuses on coal use in the power sector



Adaptation

Adaptation, business and international climate change policy

Business understands that adaptation is a pivotal element of the international climate change process. From a business perspective, climate change is likely to affect the location, design, operation and marketing of infrastructure, products and services. From a human perspective, climate change will have socio-economic implications for workforces and markets. Climate change also impacts many ecosystems and the associated provisioning (e.g., food, fiber and water); regulating (e.g., flood control), and supporting (e.g., nutrient recycling) ecological services upon which society depends.

Business can play a role in working with governments and society to prepare for and avoid the worst climate impacts through its information, technology and capacity. It is important to emphasize that although adaptation is site-specific with often non-transferable site-specific solutions, knowledge, technology and best practices can be shared.

Business understands that adaptation requires a holistic and long-term planning perspective. This encompasses different levels of activity (including international, national and local) and engages different stakeholders. An international framework is an important stimulus to drive change at national and local levels. Business input is essential at every level given the need for information, technology and capacity.

Through an enabling policy environment that facilitates the development of adaptive capacity, resilience and risk management, a basket of options can be built to support adaptation measures.

The first step is a comprehensive study of national risks and vulnerabilities led by national governments – enabled by access to information from business and including an evaluation of business risk. Once this is understood and internalized, national policy must include measures that will increase the resilience and adaptive capacity of the country – and by inference the ways in which its businesses understand and are prepared to address their own vulnerabilities.

To enable an effective evaluation, capacity in technical and planning disciplines is necessary. This will provide an understanding of potential climate impacts and the development of response strategies. Sectors like energy and transport have carried out extensive research on climate change and would be able to tap into that knowledge to tease out the implicit adaptation issues. Adaptation success depends in part on access to and, in some areas, the development of technologies suited to

What is adaptation?

Under the definition adopted by the UNFCCC, adaptation is a process through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes.

It is now acknowledged that even if we do succeed in reducing emissions, some climate change impacts are unavoidable because of the level of GHG emissions already in the atmosphere. As a result, adaptation will be necessary because temperatures will continue to rise with the attendant short- and long-term impacts that this will bring. There is an urgent need for adaptation assessment in the short term, as well as a need for the long-term assessment of effects that are compounded by rising population densities, eroding natural protection systems and aging infrastructure.

the specific needs and circumstances of different countries. This is a key opportunity for business and is also important for building business resilience, adaptive capacity and ultimately sustainability.

Adaptation policy and the role of business

According to the Intergovernmental Panel on Climate Change (IPCC), adaptation policy involves actions taken by governments, including legislation, regulations and incentives, to mandate or facilitate changes in socio-economic systems aimed at reducing vulnerability to climate change, including climate variability and extremes. The main objective of adaptation policy is to integrate climate change issues into developmental policies and goals. Development policies should be underpinned by sustainable development goals and should look for paths not only for climate change mitigation, but also to build resilience and adaptive capacity.

The policy tools available to aid decision-making for adaptation are similar to the ones identified for climate change mitigation and impact business activities directly or indirectly through customers.[10]

- Economic instruments – measures that influence the price that consumers pay for a product or an activity, including market-based instruments, tradable permits, deposit refunds, taxes etc.
- Direct expenditure instruments – channeling expenditures directly to foster technology innovation, from R&D to infrastructure development to capacity building.
- Regulatory instruments – creating change via legal avenues, including liability, enforcement activity, competition and deregulation policy instruments.
- Institutional instruments – changes in the workings of government to promote change, including internal education efforts, internal policies and procedures.

The role of business and governments

What can business do?

- Ensure that new investments include increasing resilience of infrastructure
- Ensure that decision-making fully integrates adaptation issues so that it is part of the process and not an expensive add on
- Investigate technologies that will improve adaptative capacity – and/or respond to impacts on resources (e.g., water availability)
- Consider alternatives in terms of siting (e.g., distributed generation)
- Factor in human settlement and health issues in medium- to long-term business planning
- Investigate innovative funding mechanisms that incentivize investment in new technologies
- Support a global carbon price and viable and sustainable carbon market
- Innovate in the insurance market

What can governments do?

- Create policies and regulation that promote adaptive capacity (e.g., labeling, standards)
- Create policies that provide an enabling environment for innovation in insurance and reinsurance
- Establish achievable standards with broad effect (e.g., building codes)
- Integrate adaptation issues into national planning processes
- Undertake vulnerability and risk assessments, especially regarding infrastructure development, resource availability
- Establish national forums (involving business) on economic diversification
- Ensure a fungible and sustainable carbon market

Notes

1. International Energy Agency (IEA), *World Energy Outlook 2008*, 2008.
2. International Energy Agency (IEA), *Energy Technology Perspectives 2008*, 2008.
3. The 2008 ACT Map scenario illustrates the necessary actions to bring global emissions in 2050 back to 2005 levels. This would require urgent deployment of key technologies and major commitments by public authorities as well as industry.
4. The BLUE Map scenario is the more aggressive of the two, and illustrates the radical actions, technology breakthroughs and investments necessary to achieve a 50% reduction in CO_2 emissions by 2050. Achieving this would require "urgent implementation of unprecedented and far-reaching new policies in the energy sector."
5. In the WBCSD publication *Power to Change: A business contribution to a low-carbon electricity future*, all electricity generation technologies are described together with the key challenges and policy recommendations
6. IEA, *Energy Technology Perspectives 2008*, 2008.
7. WBCSD activities include Energy Efficiency in Buildings, Electricity Utilities, the Cement Sector Initiative (CSI), and Sustainable Mobility.
8. Recommendations for specific sectors can be found by sector at www.wbcsd.org.
9. Dechezleprêtre, Antoine, Glachant, M., Hascic, I., Johnstone, N and Ménière, Y., *Invention and transfer of climate change mitigation technologies on a global scale: A study drawing on patent data, 2008*.
10. Adapted from IISD, TERI, 2003.

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